THE PROCEEDINGS OF
THE 3RD INTERNATIONAL CONFERENCE ON VIRTUAL REALITY

15-16 NOVEMBER 2021

HARRAN UNIVERSITY
SANLIURFA
TURKEY

ISBN: 978-605-86579-1-5

Welcome

Hoş Geldiniz

सुस्वागतम्

خوش آمدی

خوش آمدید

Karibu

Bem Vinda

Akwaaba

3RD INTERNATIONAL CONFERENCE ON VIRTUAL REALITY
15-16 NOVEMBER 2021, SANLIURFA, TURKEY

Harran University
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December 2021

Editors:

Dr. Dursun Akaslan
Dr. Ramesh Chander Sharma

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Foreword

We have been very pleased to have the opportunity to arrange the 3rd edition of the International Conference on Virtual Reality. International Conference on Virtual Reality (VR) started in 2019 to bring together leading and industrial researchers, scientist, engineers, practitioners and students from universities, research institutes, industries and organizations all around the world to exchange their latest research ideas, methods, findings and to share their experiences.

Virtual Reality (VR) let us our dreams become true. Today, technologies at an unprecedented pace in our century enable us to experience the past, present and future using virtual reality. It is true that virtual reality has been around for more than a half century. However, only recent related hardware and software has reached the required maturity level for delivering the feeling of reality.

We hope that this conference will have a tangible effect on the future development of virtual reality, augmented reality and other related technologies.

Thank you again for contributing to this conference

Dr. Dursun AKASLAN and Dr. Ramesh Chander Sharma
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(17:00-17:20)

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Assoc. Prof. Dr. Dursun Akaslan
(17:20-17:35)

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Prof. Dr. Amol Padwad
(17:40-17:45)

Goodbye Speech by the Rector of Harran University
Prof. Dr. Mehmet Sabri CELIK
(17:40-17:45)

SESSION CHAIR
Prof. Dr. Ramesh C. Sharma

Abstracts

Augmented Reality and Tourism

Kezia H. Mkwizu[1]

Abstract: Tourism is facing travel restrictions and lockdowns due to the Coronavirus disease 2019 (COVID-19) global pandemic. Efforts to re-open tourism include the use of technologies to complement tourists' experiences. Tourists' experiences can be enhanced by Augmented Reality (AR) that merges the virtual and real worlds through the application of mobile phones or tablets. Past scholars have recommended the scope in the study of AR to be expanded for further understanding of its application and usage in tourism. In addition, existing literature projects the rise in the importance of AR. Therefore, this paper aimed at exploring AR and tourism with a focus on AR technologies and tourists' experiences. Using literature review approach and Scholarly Personal Narrative (SPN), the findings revealed that national parks such as Mikumi National Park in Tanzania stand to benefit from AR technology usage to enhance tourists' experiences in different attractions within the park. To advance the use of AR technologies in national parks by tourism stakeholders, it is crucial for future studies to further explore the concepts of AR technologies and tourists' experiences using qualitative and quantitative methods.

Keywords: Augmented Reality, Tourism

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Perceptually Based Approaches Towards Enhanced 3D Vision and Virtual Reality

Ufuk Celikcan[1]

Abstract: Despite the remarkable progress in VR, serious challenges remain to make extended sessions of high-quality VR experienced with head-mounted displays (HMDs) thoroughly comfortable. 3D stereo imagery can cause discomfort and eye fatigue because of poor stereo rendering settings leading to extreme disparities and vergence-accommodation conflicts. Consumer-level HMDs enforce strict measures on the stereoscopic parameters to circumvent these issues, often leading to unimpressive VR with shallow depth feeling. Furthermore, viewers immersed in virtual environments with modern VR setups are still prone to experience cybersickness. In this talk, I will focus on our research where we study these challenges from a visual perception standpoint and propose ways of remedying them accordingly

Keywords: Stereo Images

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Virtual Reality: The Landscape of Education and Training

Irshad Hussain[1]

Abstract: The Information and Communication Technologies (ICTs) have taken over all fields of human activity including education and training. The ever innovations and advancements in ICTs are adding to the benefits and usage particularly in education and training. Virtual reality is one of the advanced application or use of the advanced ICTs. It creates real like situation having extensive benefits –training of the pilots when they have to learn "*how to escape in case of the crash of an airplane" and training of surgeons in "critical surgical operation like brain and heart surgery*". The literature affirms unprecedented benefits and usage of virtual reality in education and training like learning of geometry, problem solving, medical education, aviation & navigation etc. Virtual Reality has a great potential to be used to enable and facilitate communication, access to innovative learning resources through 3-D representation, simulation and modelling in virtual world

Keywords: Virtual Reality, Simulation, Modeling, Medical Education, Information and Communication Technologies

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Enhancing Public Speaking Skills through Virtual Reality

Hamid Mohammad Azimi[1]

Abstract: Difficulties in speech and usage of verbal and nonverbal communication, which defines as communication disorders causes important barriers to routine life activities and generally needs continuous improvement. Public speaking anxiety is regularly ranks among the top five most common phobias of any kind. Virtual reality could be a useful tool for practicing public speaking. VR technologies reproduce social interaction situations that are challenging to create within the clinic in real life, individually proper and secure environments. VirtualSpeech is a VR tutorial app/software that provides clients to simulate public speaking in difference situations. Using a VR headset, the user is fully engaged in the virtual situation in which he / she wants to practice his / her public speech, job interview, meeting room, press conference or hall. The software records and gives feedback on crucial skills necessary in speeches likewise eliminating filler words, speed of voice and eye contact. Virtual Speech is a sample of how Virtual Reality technology could equip clients with real life situations with capacity to increase on the abilities gained in the game, through applying the reactions provided and having vast opportunities to use those skills. This presentation is a literature review of SAD, PSA, and VR, which will focus on VirtualSpeech application and its feature

Keywords: Public Speaking Anxiety, Virtual Reality, Virtual Speech Application

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Innovations in Medical Imaging Applications with Extended Reality: The Recent and Future Impacts on Healthcare Education

Emin Ibili[1]

Abstract: Extended Reality (XR) is an umbrella term for all existing reality concepts and the reality concepts that will emerge later. In this study, the potentials of use of XR in terms of health education are discussed in seven categories. Thanks to the natural interaction feature of XR, students have the opportunity to learn in the real environment by doing and practicing. XR also provides the opportunity to receive practical training in a real environment as much as they need by using natural interaction methods. It is a difficult process for the students to visualize the data such as medical images in their minds. Thanks to XR, digital objects can be viewed from all angles, which makes it easier for students to visualize 3D structures in their minds. Therefore, XR environments support spatial learning. One of the uses of XR in health sciences is to create cognitive relaxation. The fact that The Food and Drug Administration (FDA) first authorized the marketing of a virtual reality system for Chronic Pain Reduction, highlights the potential for future use of this technology. Transforming and displaying analytical data into meaningful data using artificial intelligence algorithms is important for both medical education and clinical decision support systems. One of the applications that XR will be used frequently in health sciences in the following years is AR applications such as Spatial or Metaverse. Today, thanks to Spatial AR environments, it has become possible for users to connect from different places and come together in the same environment

Keywords: Extended Reality, Healthcare, Education

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Augmented Reality and Virtual Reality: Opportunities for Developing Countries in Achieving Sustainable Quality Education

Simon-Peter Kafui Aheto[1]

Abstract: Information, Communication and Technologies (ICTs) remain a critical driving force in transforming the educational landscape around the world. However, apart from the old age problems of inequalities in terms of teaching and learning resources, personnel, electricity and right learning environments, many learners remain unconnected to the very ICT tools that could transform the teaching and learning environment. More than 3.7 billion people are digitally unconnected (World Economic Forum, 2021) and this could negatively impact on the achievement of the Sustainable Development Goal 4-Quality Education. Despite the challenges, Augmented Reality and Virtual Reality could be used to bridge the gap between the well resourced educational environments and the low or no resourced educational environments to support sustainable teaching and learning among learners. There are few success stories of how the introduction of Augmented Reality and Virtual Reality in developing countries helped improve the quality of education irrespective of the numerous challenges. It is worth focusing on the lessons learnt from the introduction of these technologies. The aim of this paper is to draw from examples on how Augmented Reality and Virtual Reality were successfully deployed and contributed to Sustainable Development Goal 4-Quality Education within some developing countries such as Ghana, Nigeria and Kenya. These lessons could have an overarching positive impact on policy development and the deployment of Open, Flexible and Distance Education.

Keywords: Augmented Reality, Distance Education, learners, Quality Education, Sustainable Development, teaching and learning and Virtual Reality

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Augmented reality and destinations in Africa: An ABCDE approach

Kezia H. Mkwizu[1]

Abstract: The effects of COVID-19 pandemic include reduced and unpredictable movements to destinations by tourists due to travel bans and lockdowns. Besides, technologies concerned with real and virtual worlds and in particular Augmented Reality (AR) using mobile phones are revolutionizing how tourists can enhance their experiences of destinations. In tourism, Africa has the potential to attract more tourists due to its attractions endowed with unique historical, cultural, natural and archaeological values as well as outstanding geoparks that are great heritage not only for the continent but also the world at large. However, there are few studies that have connected AR and destinations in Africa. This study applies Access, Better, Connect, Disintermediate and Educate (ABCDE) theory to explore AR and destinations. Findings reveal opportunities of AR in relation to destinations. Hence, the practical implication is for authorities to advance the use of AR to sustain tourism for destinations in Africa.

Keywords: Augmented Reality, Destinations, Aftica, ABCDE Approach

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The Quality of MOOCs: Diving Deeper into Students Experiences

Aarti Yadav[1]

Abstract: The online courses offered under OE4BW project as open education resources aims to achieve sustainable development goals and contribute towards building equitable society. The courses are offered as open education resources and the OE4BW project encourages creation of quality open access content. Open licensing addresses the socio-economic barriers faced by students in India by adopting principles of equity and equality and excellence. The courses offered under OE4BW mentoring programme are free of cost with a purpose to increase the reach of education to masses. Developers consider it as a learning opportunity and a way to give back to society. Knowledge about the experiences of consumers is significant in improving the services and therefore, an understanding of students' experiences and creation of course components in accordance with students' feedback increases student engagement and ensures success of course. The study will discuss the experiences of students regarding online courses offered under OE4BW.The experiences shared by student about different aspects of course such as course content, assessment, course platform and overall course quality help the MOOC creators to design engaging and effective MOOC. The present study is based on the participants' views on online courses offered in India. It aims to create an understanding of student satisfaction towards course content, openness, accessibility, degree of interaction and assessment strategies. The results will play a significant role in shaping future online courses by presenting strengths and limitations of courses to course developers. The study will present useful data for developers to be further utilized in developing engaging learning experience and also dealing with the other challenges of MOOC creation such as low enrolment, dropout ratio collaboration with other experts and course quality assurance.

Keywords: Student's Experiences, MOOC, OER, OER4BW

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Distance Education inclines Collaborative Learning: Virtual Tools to Real World

Mandeep Kaur[1]

Abstract: Trending tools carry the learning sector under its shade outturns to provide education in remote areas using collaborative learning techniques. This paper basically tries to cover the tools and the information relating to virtual technology that leads to imparting education at distances collaboratively. The rapid growth of modern tools plummets the traditional modes of learning. Such a scenario pushes the educators to train themselves as per the novel needs by virtue to implement collaborative learning in distance classrooms. Several significant features try to limelight under this discussion paper emphasize the collaborative learning using virtual tools that have the potential to revolutionize online training programs to satisfy students with their learning experience.

Keywords: Digital Classrooms, Virtual Reality, Collaborative Learning

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Gaining 21st century skills through Virtual Reality: Learning with Social Gaming Platforms

Nil Goksel[1] and Kardiye Kobak[2]

Abstract: Virtual reality applications developed in response to technology-oriented education demand of the 21st century make learning simulation environments more attractive, enabling learners to participate in various educational immersive activities individually or in groups. In this connection, three-dimensional (3D) virtual worlds can be regarded as one of many types of Virtual Learning Environments (VLEs) based on learning experiences that foster students' interest, participation, imagination and interaction. Roblox for instance, as a user-created multiplayer virtual platform, is claimed to be the largest online platform with millions of participants in which users can design games within the system. Roblox, in which child users under the age of 13 spend 51.5 hours per month is stated to have increased the number of active users. Due to the Covid-19 epidemic, the number of users has reached 164 million across the world. Despite many risks and dangers that virtual games pose on children, these immersive games may also have positive contribution like meeting people from different regions and cultures, developing feelings of empathy, gaining problem-solving skills, providing collaborative learning, inclining to help each other with shared experiences, and improving foreign language skills in both online and in real world milieus. With the digital age, critical thinking and problem-solving skills are more needed to access, search, analyze, store and manage information. In this regard, it is thought that these actions, which are also expressed as 21st century skills, might be gained with 3D virtual games/worlds like Roblox. In this connection, this review article focuses on 3D game elements in their simulative nature and explores how a more creative and interactive learning is achieved within Roblox. The article will also offer recommendations on how to further develop the game educationally and make a more complete pedagogical use based on current uses and current trends in virtual education.

Keywords: Virtual Reality, COVID-19, 3D Virtual Games, Virtual Learning Environments, Social Gaming Platforms

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Virtual Reality in Open and Distance Education

Manju Pandey[1]

Abstract: Virtual reality technology as a new kind of remote education media technology with its powerful teaching advantages and potential is bound to vigorously promote the informatization development process of distant education. This paper makes exploration on technical solution and realisation methods of virtual reality technology for distance learning. Virtual reality provides a different way to see the information and knowledge in e-learning or distant education. It also provides immersion which is an enhancement experience for learning from a distance.

Keywords: Virtual Reality, e-Learning, Distance Education

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Mobile Language Learning with Augmented Reality

Ayse Taskiran[1]

Abstract: Augmented Reality (AR) stands out as a technology that offers a high level of interaction experience to the user by blending both virtual and reality simultaneously. It has been emphasized by the studies that AR has many-sided contributions to the teaching and learning processes and that learning materials enriched with AR have qualities that evoke interest, encourage participation, and increase motivation. AR applications play an important role in developing the imagination and creativity of the student with the original learning environment they create. Most importantly, AR applications provide a personalized education environment as they offer students the opportunity to progress at their own pace. In the literature review, it is seen that AR technology is frequently used and effective in fields such as physics, mathematics, medicine, chemistry, architecture, and special education in education. However, it has been observed that there are a very limited number of studies examining its use and effect in foreign language teaching. These studies showed positive results for academic achievement at high school and higher education levels in reading, writing, listening, speaking, grammar, and vocabulary learning. The aim of this review is to shed light on the literature on the use of AR in education by focusing on relevant studies, their tangible findings, implications, and suggestions for the use of AR technology in foreign language learning processes within the framework of mobile learning

Keywords: Augmented Reality, Mobile Learning, Foreign Langugae Learning, Digital Learning Materials

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Developing Competencies of Medical Doctors using Virtual Reality in an ODL Continuing Education Programme

Ruchika Kuba[1] and Mythili Gowthaman[2]

Abstract: Virtual reality is finding its way into medical education and we perceive it to play a major role in the coming years. With an increasing public awareness of the patient's rights, medico legal problems associated with errors in medical practice and medical negligence, it is imperative that medical training should be first conducted through simulations and virtual patients rather than on actual patients. Immersive VR can be used for surgical skill trainings. It must however be understood that a virtual training can never replace the basic training or training for perfection of competencies. It can however be used as a complementary training or continuing education due to its advantages. In specific situations Interactive VR and gamifications may be the only option, for example creating scenarios of medical emergencies and medical disasters on a large scale which will not only provide real life like situation for preparing medical commanders and leaders but also confront the medical students with the challenges faced with such situations where immediate and appropriate actions would be required. Developing competencies as part of continuing medical education (CME) and lifelong learning of in-service medical doctors is best possible through open and distance learning (ODL) mode due to the advantages of flexibility in study with respect to time and place and a common curriculum and assessment system followed by certification which ensures competency in the successful candidates. School of Health Sciences (SOHS) of Indira Gandhi National Open University (IGNOU) has been offering CME programmes since the past 25 years through its structured and customized self-learning material, synchronous and synchronous multiple media and tie up with well-equipped medical and health institutions for providing learner support including practical facilities to enhance skills. Based on the research work related to virtual reality and artificial intelligence in education especially medical education, this paper attempts to incorporate VR, AR and AI on the three aspects of ODL that is self-learning materials, learner support system and measuring achievement of learning outcomes using formative and summative assessments in one of the practical courses of IGNOU"S PG diploma programme in geriatric medicine (PGDGM) as a case study. In the proposal, AI algorithm will be used to provide customised VR and AR inbuilt self-learning materials which enhance the deep learning of the learners, based on the competencies of the individual learners and their areas of interest or skills required at work place. Virtual interaction incorporates using machine learning techniques can be used to simulate the teachers presence when required. AI technique can be further used to measure the learning outcomes at any stage of the learning. This framework will help ODL functionaries to incorporate VR, AR and AI in CME medical programmes through ODL using blended approach.

Keywords: Geriatric, Open and Distance Learning, Virtual Reality, Artificial Intelligence, Augmented Reality, Algorithm

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Investigating the Attitudes of School Students towards Virtual Reality Environment

Yeasmin Sultana[1] and Mohammad Asif[2]

Abstract: Due to the outbreak of COVID-19, the educational system across the world has tremendously been affected. To mitigate the impact of the pandemic, educational institutes had to remodel and reimagine the way teaching and learning have happened so far. As a result, at a very short time, educational institutes had to adapt the educational process for exclusively online teaching and learning. So, against such a backdrop it has become very important to investigate the perceptions of the students about virtual learning environment which is being increasingly adopted by educational institutes during this ongoing pandemic period. In this present study, 120 students were selected purposively to study their attitude towards virtual learning environment using open ended questionnaire and from those 10 students were interviewed to explore the challenges being faced by the students. Mixed method design had been adopted. This research has been conducted in 2021 on class IX and X students of KVS who continued their learning through online mode for at least one year. The students revealed positive attitude towards online learning however expressed various challenges like network issues, lack of proper gadgets, comprehension issues, etc.

Keywords: Attitude, School Students, Virtual Learning Environment

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Augmented Reality as a Performance Enhancement Technology in Primary Education: A Systematic Review

Runu Mani Das[1] and Madhusudan J. V.[2]

Abstract: The recent researches generated the idea that Augmented Reality has changed the teaching and learning experiences tremendously. Many studies have been conducted to build the rapport of using Augmented Reality applications in education to make education joyful and fruitful. However, these studies have analyzed and discussed very little about recently developed Augmented Reality Applications to enhance the performance of primary education children. In this context, the investigator seeks to investigate the recently developed applications of Augmented Reality to enhance students' performance in primary school. This paper presents a systematic review of the present knowledge and information by analyzing recent studies. Mainly 14 studies related to the topic have been chosen to analyze the data which were published from 2016 to 2021. The results show that Augmented Reality Applications have the effective use in primary education which enhances learners' language skills, alphabet learning, enhance performance in natural science, etc. The observation and results signify that Augmented Reality Applications enhances motivation, interest, academic performance of the learner. This review seeks to provide a researcher with practical guidance and suggestions on how to enhance the subject knowledge of the students by applying recently developed Augmented Reality Applications. This study also gives insight on the improvement of academic skill and learner's performance by using Augmented Reality Applications in Primary Education.

Keywords: Augmented Reality, Augmented Reality Application, Primary Education, Systematic Review

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Augmented Reality: Turnover a New Leaf in Teacher Education

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Abstract: In this fast changing society, the needs of students have also changed. Present generation is growing up with technology that is why they think and learn in a different manner. They also want the access of Education in the same way. So use of technology helps in making the learning of modern students more natural. Augmented reality is contributing positive changes in this field. This combination of augmented reality with education can enhance and reshape the experiences and effectiveness of teaching learning process. With the evolution of technology the gap between digital natives and digital immigrants is widening day by day. Therefore it is the need of the hour that teachers know about the technology which makes the classroom more lively and helps the students to acquire necessary skills to succeed in life. No doubt AR makes the learning more engaging but there are various pitfalls in it like lack of trained teacher educators, lack of resources, teaching models etc. Despite of all the challenges, Augmented Reality is making education practices extraordinary and interactive. So now is the time for teacher educators to prepare the teachers who make most of the augmented reality in education and achieve its real goal.

Keywords: Virtual Reality, Augmented Reality, Education, Skills, Teaching Experience

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Linguistic Simulations in VR to Enhance Communication Skills

Parveen Sharma[1]

Abstract: In this 3rd decade of the 21st-Century VUCA World, information and communication are the most sought after commodities. To train people in the skills of Communication and Information Management, we need to impart sustainable Communication Skills in a language. The trending technologies of the day are AI, VR, AR and simulations. It is the call of the day to leverage these advancements in the area of competence enhancement, most particularly in linguistic and communicative skills. This presentation discusses the scope and significance of Communication Skills and shall present a possible integration of VR and AI in the area of linguistic simulations. It will also suggest integration strategy for the English Learning classroom in the non-English nations.

Keywords: Linguistic Simulations, Virtual Reality, Communication Skills

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Augmented Reality Based Cooperative Learning

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Abstract: Research on computer supported cooperative learning is going on from past years. In this decade of advancements, we are witnessing major changes in computer designing and graphics. Augmented reality (AR) & Virtual reality (VR) applications are emerging to support cooperative and collaborative work. In the present scenario, learning content developed and delivered by using these applications is focused on three-D imaging & improving interactions among learners. It is pertinent to mention that cooperative aspect is not fully taken into consideration. With the passage of time with more advanced research in this field, Interactive, cooperative and collaborative learning in AR and VR are emerging in coming years. We need to explore potentials of AR advancements to use cooperative learning-based learning environment for effective learning at different levels. Time & Distance limitations to organise cooperative learning groups can be removed by using AR & VR technologies. Games can be designed with provision of different elements of cooperative learning (Positive interdependence, individual accountability, promotive interaction, group processing and interpersonal and small group skills. Different apps based on AR environments provide satisfaction to learners during the learning process. New features in AR games to be effective at fostering cooperation. These games can be used to present varied problems, a store of tools to solve these problems. It can also provide structured experience to promote cooperation among students. Nowadays students with a single touch can access a world of rich learning. It includes embedded videos, interactive 3D objects and many more. Augmented reality technologies have the provisions to make teaching learning process more interactive. One can play with objects, interact with it to know more details in an interesting way. Virtual spaces can be created for interaction across the world. Through virtual space, different cooperative learning strategies like JIGSAW and STAD can be implemented in a more effective way. So, Virtual reality offers new avenues for remote cooperative learning. We can organise cooperative learning groups among learners from different locations of the world.

Keywords: Cooperative Learning Pedagogy, Augmented Reality, Interaction, JIGSAW Technique, STAD Technique

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Concepts of Virtual Reality

Preeti Dubey[1]

Abstract: Virtual Reality (VR) is the next largest stepping stone in technological innovation, which can be applied to every field. It is an upcoming research area, as it has a big potential for improvement. Virtual reality is a more intuitive way of interaction and enhances every field area to which it is applied. Initially, it was applied to gaming, but now it is applicable every other sphere like education, architecture, interior design, tourism, flight simulators, medicine, entertainment and more. The idea is to present the basic concepts of VR, followed by brief history, the application areas with a special focus on how VR can be helpful to people with disabilities and finally the future and research aspect of VR is discussed.

Keywords: Virtual Reality, Augmented Reality, Education, Teaching, Skills

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Use of Virtual Reality to Design 21st Century Smart Education

Mahesh H. Koltame[1]

Abstract: The nature of the 21st-century world is complex, dynamic, digital interconnected. Now virtual reality is a reality of 21st-century life. 21st century learners are very smart; these smart learners are demanding smart education. In short, we can say smart education is in need of time and the term smart education cannot be complete without Virtual reality. Smart education is a model of learning based on digital means and learning skills. There are 4 components of smart education first Smart learner, learners who are able to learn new things themselves critically and collaboratively through digital means. Second is Smart learning facilitator, Teachers who know the educational value of technology and they are able to innovatively adapt and use digital tools and modalities to facilitate students' learning. Third is Smart teaching-learning process, Individualized, flexible, self-paced, interactive, collaborative, visual and virtual experienced cantered teaching-learning process are called smart teaching-learning process. Fourth component is Smart classrooms and campuses, beyond the four walls, physical or virtual classrooms and campuses equipped with digital devices and high-speed internet, provide space for their innovative use, learning, sharing and collaboration. Virtual reality facilitates smart education at its various components like it enrich the learning experience, facilitate continues individualized assessment, it supports teacher to visualize complex content, processes, and operations, it also enriches self-learning learning resources.

Keywords: Virtual Reality, Smart Education, Smart Learner, Smart Learning Process, Smart Facilitation, Smart Classroom

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Experiences of Student-Teachers in the Pandemic Times: Issues and Challenges Raised and Resolved during School Experience Programme

Meenakshi Chawla[1] and Satveer S. Barwal[2]

Abstract: The purpose of this small scale study was to examine the perceptions of student- teachers regarding online teaching during the School Experience Programme in the COVID-19 times. The sample of the study was administered a questionnaire (google form) and focussed group discussion was also organised. The findings revealed the challenges which student-teachers faced in relation to integration of Educational technology tools and virtual reality during their online teaching as a part of School Experience Programme 2020-21. Their ways of addressing those challenges were also qualitatively analysed as a part of this study. The study suggested further research and policy level intervention in order to ensure more inclusive, interactive and creative engagement during online teaching at all levels of school education in the changing scenario.

Keywords: Virtual Reality, Student-Teachers, Online Teaching, School Experience Programme

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Unmanned Aerial Based 3D City Model for Virtual Reality

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Abstract: Acquiring real-world objects in 3D has been useful for many applications such as the digital game industry, cultural heritage, urban planning, construction, and virtual reality. Roads, trees and the earth are essential objects for an effective 3D city model that can be used especially in virtual reality. Therefore, modeling of these objects is necessary for a realistic model. It is possible to produce these objects depending on computer technologies and data collection methods. In this study, the application results to produce a 3D city model containing the city objects using UAV photogrammetry are presented. In this context, the 3D model of engineering faculty of Harran University was produced using aerial photographs obtained by UAV was transferred to the VR environment and its usability was examined.

Keywords: UAV, Photogrammetry, 3D city modelling, VR

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Full papers

Displaying Infrastructure Data with Augmented Reality Technology in Field Works

Mehmet Emin Dolas[1] and Mustafa Ulukavak[2]

Abstract: Urbanization, which took place in parallel with technological developments, has increased rapidly throughout the world. In order to increase the welfare level of the societies living in the cities, infrastructural studies were given importance while designing the cities. In this process, it ensures that infrastructure services such as electricity, drinking water, sewerage, natural gas, telecommunication and internet services are offered for the benefit of people. In order to provide infrastructure services in a healthy way, it is important to follow the infrastructure inventories and to carry out regular maintenance and repairs in addition to urban planning. In terms of performing infrastructure services, ensuring that existing infrastructure data is displayed during field studies will increase efficient work. In the study we have done, the visualization of the water and sewerage infrastructure has been made in an augmented reality environment. With the pilot study carried out in Şanlıurfa, Karaköprü District Maşuk Region, it was aimed to increase efficiency in infrastructure services.

Keywords: Infrastructure, Data, Augmented Reality, Field Studies, Efficiency

1. Introduction

From past to present, people have contributed to the advancement of technology by transferring the knowledge they have learned and applied to future generations. With the increase in technological developments, we witness that our lives are changing very quickly. In the age of technology, people can easily access the data they want to reach and can easily analyze the data they reach. Today, in parallel with the spread of mobile phones, wearable technologies and internet of things technologies, an incredible data cloud has emerged. Today, when we do not have a data problem, it has become important to be able to use data at the right time and in the right place. Augmented reality (AR) technology plans to make our lives easier by presenting the data we need in real time and in the physical world (Azuma & Klinker, 2011).

In our social life, we are constantly interacting with the world and objects. Augmented reality technology increases our interaction with the real world and objects in our lives. AR is a technology that enables computer-generated sound and images to be used in the real world (Arth et al. 2015). This technology gives us an advantage by presenting images that we cannot see in the physical world under normal conditions.

Augmented reality technology has become used in many sectors such as marketing, construction, architecture, museums, medicine and education. Marketing techniques have been developed by increasing the interaction of customers with augmented reality applications in the field of marketing. Performing construction controls with the help of augmented reality technology in the construction industry will prevent cost and time loss (Behzadan & Vineet, 2009). In the education sector, the application of augmented reality has paved the way for a more permanent and fluent education application (Azuma, 1997).

As a result of the developments in mobile communication technology, there have been developments in mobile augmented reality applications (Arol, 2014). The development of the network infrastructure in mobile communication equipment, the improvement of location sensitivities and the improvement of the image quality of mobile cameras have made it possible to benefit more from mobile augmented reality technologies (Ortman & Swedlund 2012). It is known that mobile communication technology was not as common as it is today when augmented reality technology first emerged.

With the increase in urbanization, the creation of sustainable and livable cities has gained importance. When designing cities, they should be designed with the quality of life of future generations in mind (Ekin & Çabuk, 2011). It is important that infrastructure and superstructure projects are designed without forgetting that they directly affect people's quality of life.

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Technical infrastructure services provide to meet the important needs of people such as drinking water, natural gas, internet, telecommunication and electricity (Bayraktar, 2019). It is known that these infrastructure services are indispensable for human life. Efforts are being made by the relevant institutions and organizations to make the infrastructure services available uninterruptedly. It is important to prevent accidents that may occur during excavation works by conducting excavations in a controlled manner. In our country, infrastructure coordination centers were established with the "Regulation on Metropolitan Municipalities Coordination Centers" published in the Resmi Gazete on 15.06.2006 in order to discipline and coordinate infrastructure works. Infrastructure coordination center has aimed to prevent material and moral damages that may arise during excavation works by issuing licenses for excavations. Aykome units provide coordination between all companies operating in the city and related organizations.

The most important point in the fulfillment of infrastructure services is to ensure the continuity of the service. Infrastructure services have gained an indispensable value today. Accidents occur during excavations, especially since the inventory of the underground infrastructure in the excavated area is not known clearly during the excavations (Schmalstieg et al., 2014). Accidents cause loss of time and cost. The existence of an infrastructure inventory by the institutions, organizations or individuals carrying out excavations can prevent possible accidents.

In this study, it is aimed to display the infrastructure data in a coordinated way with augmented reality technology and to use it in the studies to be done in the field. With the use of augmented reality technology in field studies, it will be possible to have information about the underground working in the field easily.

2. Literature

Sherman and Craig (2003) emphasized the effective use of virtual reality as a communication tool. They talked about the necessary components for the design of virtual reality applications and talked about why virtual reality technology is needed and the areas that can be used in the future. As a result of the cheaper software development costs in parallel with technological developments, virtual reality technology has been used as a communication tool in many sectors.

Keskin and Yılmaz (2005) stated that it is important to design and implement the infrastructure information system, which is included in the city information system, by authorized institutions and organizations in order to provide infrastructure services in a healthy way. Researchers examined drinking water and sewerage services from infrastructure services in terms of infrastructure information system. They explained the importance of the infrastructure information system so that local governments can leave a healthy infrastructure service to future generations and that infrastructure services can be carried out in a planned manner without loss of cost.

In the examinations on augmented reality, Tekin (2019), has been observed that location-based augmented reality applications are relatively less among mobile augmented reality applications. He has worked to display infrastructure data in a location-based augmented reality application. In the study, in which water and wastewater lines in Yıldız Technical University Davutpaşa Campus were used, geographical data were arranged with the help of Autocad and Netcad and transferred to the Mapbox map service. Android-based application designed with unity 3d. In the designed application, it has been revealed that the position sensitivity in the display of linear data is not at the desired level. The application designed using open source software is open to development. When the studies on augmented reality are examined, it is thought that augmented reality is still open to development and will be mentioned very often in the future.

Bayraktar (2019) stated that the need for technical infrastructure has increased with the increase in urban populations and that more importance should be given to technical infrastructure over time. Occupational accidents that will occur in technical infrastructure works may cause loss of life as well as cost and time loss. The researcher, who mentioned the accessibility and accuracy of the data in the studies to be done, aimed to establish an infrastructure information system in the infrastructure coordination center with the infrastructure data. The researcher emphasized the diversity of the companies providing technical infrastructure services and the differences in the data of these companies, as well as the problems experienced in the accuracy of the data, and emphasized that the infrastructure information system should be created with the data of all companies and

institutions with high accuracy data. In the study, geographic information systems technology was examined and geographic information systems standards were mentioned, and the importance of infrastructure information system for Trabzon Metropolitan Municipality Aykome directorate was stated.

Uluğ (2020) stated that museums need to renew themselves over time and stated that innovations have emerged in museums in the light of new technological developments. Stating that the promotion and protection of works is the most important issue in museology, the researcher stated the advantages that augmented reality applications can offer at this point. Examining the mobile augmented reality application of the Sakıp SABANCI Museum, the researcher made suggestions about what should be considered when designing augmented reality applications in the museum industry.

3. Methodology

In the study, a region located in the Seyrantepe neighborhood of Karaköprü district of Şanlıurfa was chosen as the study area. An android-based mobile augmented reality application was prepared by using the data of drinking water and sewerage networks in our study area (Figure 1).

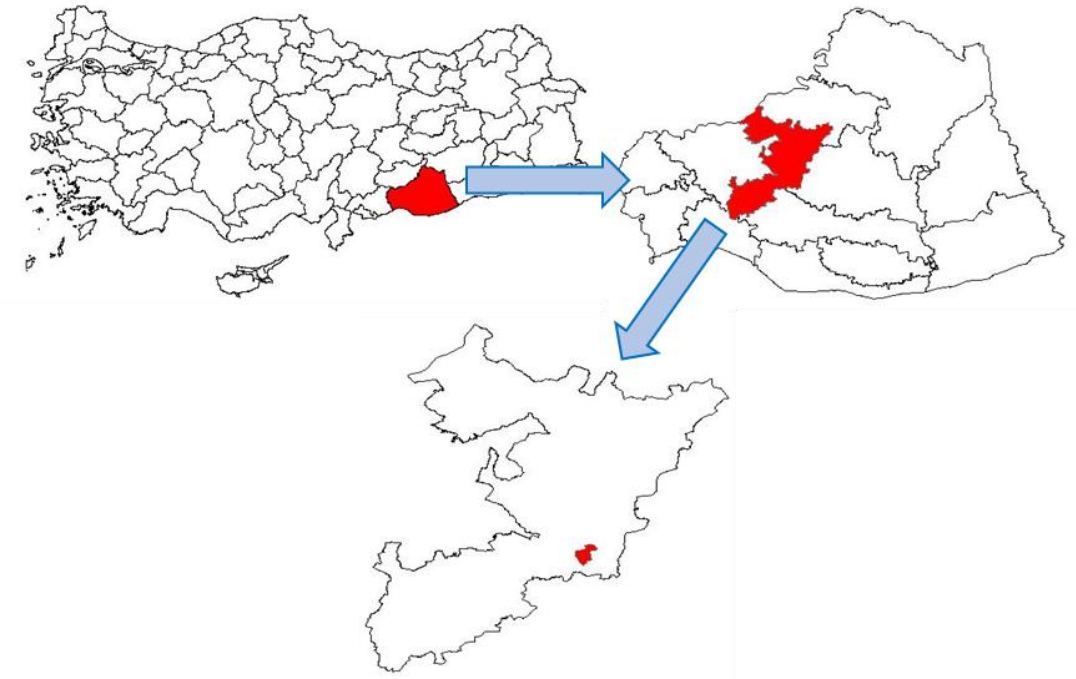

Figure 1. Study Area

3.1. Platforms Used

Unity Platform was used for the AR application we made. Unity provides simulations and video games development for computers, consoles and mobile devices. Our application is designed with the help of C# programming language through Unity Platform. Mapbox Unity SDK, developed by Mapbox, contributes to the use of the data saved in Mapbox on the Unity Platform, via web service. Through the World Alignment kit included in the Mapbox Unity SDK, augmented reality application on the Unity Platform has been enabled. With the World Alignment kit, it enables the visualization of the personalized geographical data in Mapbox Studio on the Unity Platform with the support of web services, and the display of physical world-scale geographic data. By means of Arcore software, location determination of the ground and access to spatial information are provided. Since ARCore software supports Android 7.0 (level 24) and higher, the minimum Android version is 7.0 (level 24). The application prepared accordingly will be able to be installed on all devices with Android operating system compatible with ARCore. In our study, the Redmi Note 8 (2017) device produced by Xiaomi was used as a test device.

3.2. Preparation of Data

The data of drinking water and sewerage networks in our study area were in .ncz file format. It has been used by converting the data to geojson format to be used as a web service with the help of geographic information systems platforms. The prepared data was transferred to Mapbox Studio to be published over the Mapbox web service. The data is published as a service through the tile_set_editor via Mapbox Studio.

3.3. Designing the Mobile Application

Unity Software version 2018.3.1 was used in the design process of the mobile AR application. A new project was created in Unity Software and this project was organized as an Android-based mobile application (Figure 2).

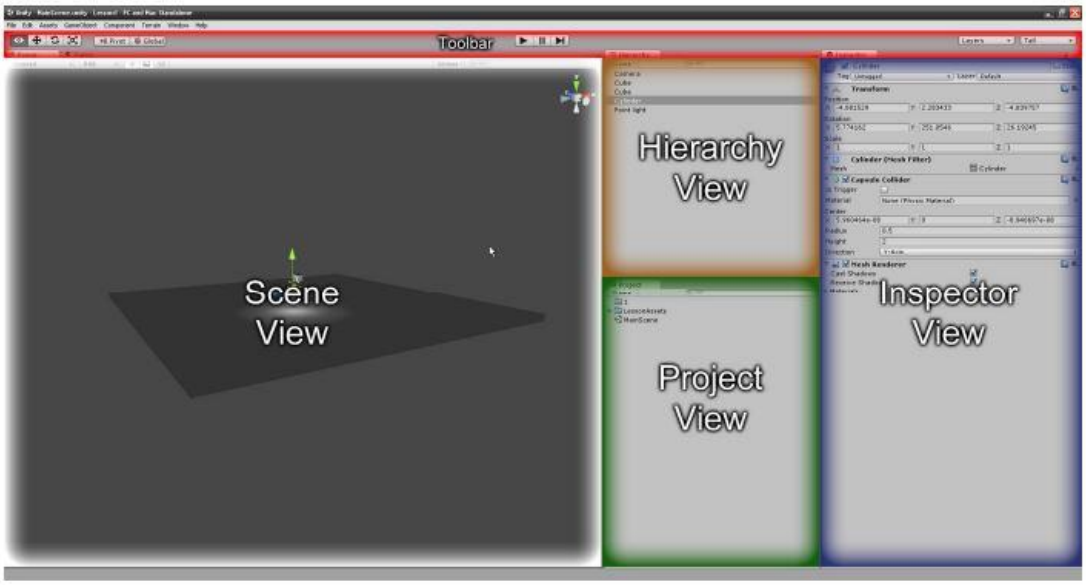

Figure 2. Unity Workbench (MapBox, 2021)

- Scene Panel: It provides 3D vision of the playground.
- Hierarchy Panel: It is the panel where all objects in the scene are listed.
- Inspector Panel: It is the panel that contains detailed information about the selected objects.
- Project Panel: All resource files that you can use in your game are located here.

In order to use the geographical data in Unity environment, the geographical data are arranged via Mapbox Studio and published as tile_set and style so that they can be used in Unity over the webservice. Editing of geographic data via Mapbox Studio is also possible (Figure 3).

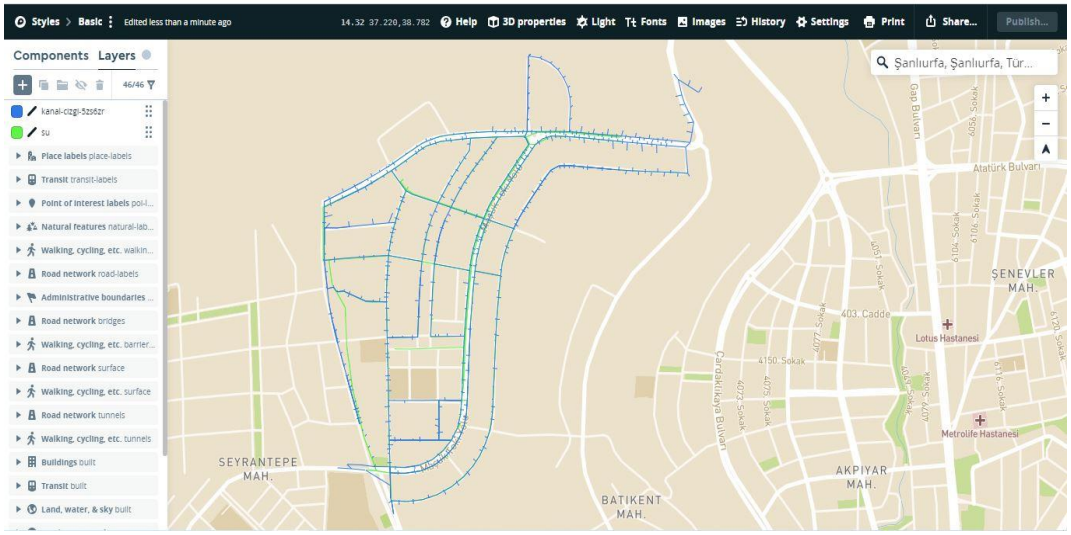

Figure 3. Screenshot of Mapbox Studio

Unity SDK was designed by Mapbox to easily transfer geographic data to Unity Platform and to design location-based mobile applications. When Mapbox Unity SDK is opened in Unity, many sample applications appear. A World Scale AR sample has been prepared by Mapbox for AR applications on a world scale. While designing the application for this study, Mapbox Unity SDK version 2.1.0 was used.

The application started to be designed by importing Mapbox Unity SDK 2.1.0, which was produced by Mapbox, to the Unity Platform. The Mapbox Unity SDK transferred to the Unity environment contributes to the design of location-based games and augmented reality applications (Figure 4).

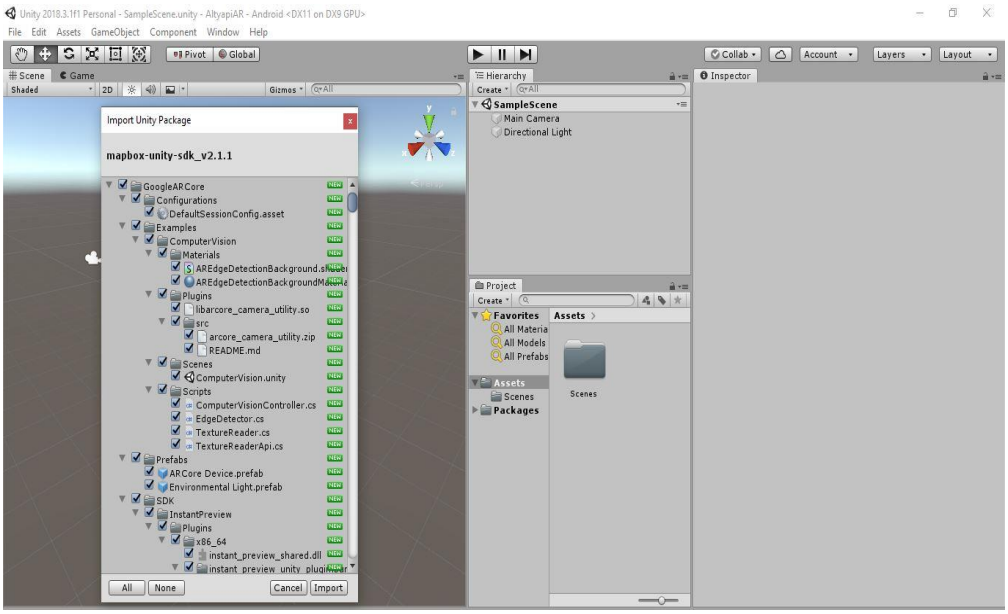

Figure 4. Screenshot of Mapbox Unity SDK

In the application created using Mapbox Unity SDK, there are 5 game_objects taken from the Mapbox SDK. A personalized app has been designed by Mapbox using these game_objects that enable the visualization of geographic data and conversion into AR app. In Mapbox World_Alignment_Kit;

AR_Root: The Unity Interface Prefab for building cross-platform AR apps.
Map_Camera: A top-down view of the map, used to view gps traces, AR position, and the current map alignment. View in play mode with the Map Checkbox.
AR_Aligned_Map: The map, aligned to AR Root using your devices location services. Renders orange debug buildings by default.
Debug_Canvas: A detailed debug log of location services and AR activity viewable by pressing the 'LOG' icon in play mode and on devices. This is included as a unity UI element to make debugging easier on-location.
Location_Provider: Provides GPS data to the map, and spoofs data for testing in the editor.
is located (Dansav, 2021).

These services provided by Mapbox can be used free of charge until a certain use, while charges are made for additional uses. In the application we have designed, care has been taken to use free software. Since the Mapbox Unity SDK is imported into the Unity environment, an access token information is requested. Mapbox users can create tokens in their Mapbox accounts for the application they will design for themselves and can access statistical information about these tokens (Figure 5).

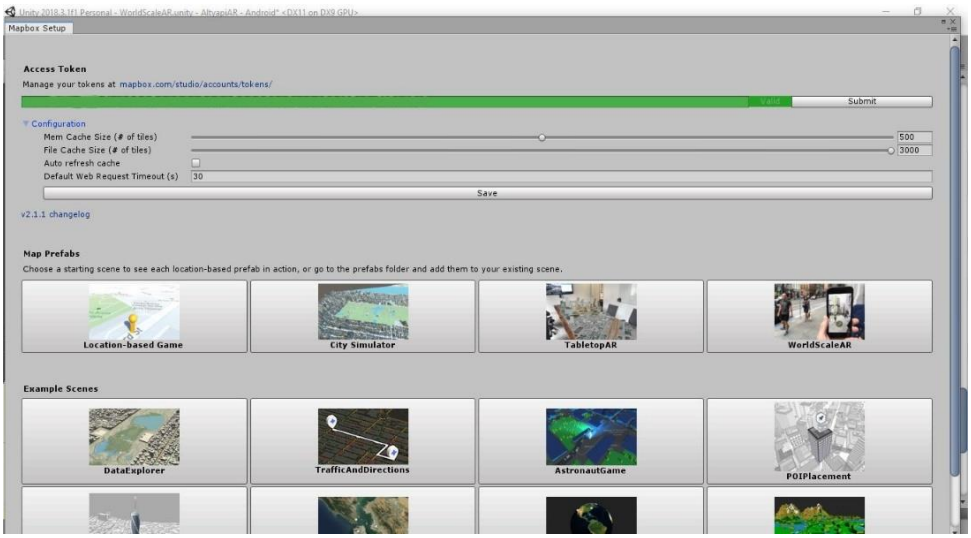

Figure 5: Mapbox Unity SDK

While designing applications via Unity software, it is possible to visualize with desired icons by uploading images in .png format to the buttons on the main screen. While designing our application, care was taken to make an understandable design by using images suitable for the buttons on the main screen (Figure 6).

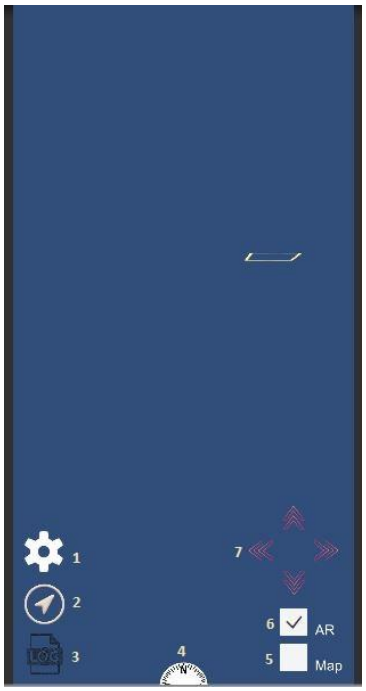

Figure 6: Main Screen Design of AR Application

By using 7 buttons in the home screen design, I enabled operations on the application with the help of these buttons. Buttons we have created;

1. The button I have shown as the Settings icon allows manual adjustments of the direction of the data displayed in the augmented reality environment where the positional sensitivities are insufficient. When this button is pressed, direction buttons 7 are opened and manual adjustments are made with the help of direction buttons.
2. With the help of the button I have shown with the GPS icon, in case the user using the application is on the move, it provides the data to be updated again according to the GPS location in case the updating of the data is insufficient due to the location sensitivity. With the help of this button, the data visible on the floor is renewed and displayed again.
3. Button 3, which have shown with the LOG icon, is the place where the GPS records are kept. It allows us to see GPS sensitivities and actual GPS readings.
4. Compass contributes to the direction determination of the user using the application.
5. With the help of the button, which we have expressed as Map, a map with roads and important buildings is displayed on the screen, as well as our geographical data. This map was prepared in Mapbox Studio with the help of Mapbox Basemaps.
6. The button we refer to as AR enables the use of the augmented reality platform, where the phone's camera is on and geographical data is placed on the phone's screen according to their location.
7. With the help of these buttons with direction arrows, manual adjustments that we have mentioned in button 1 is provided.

It is possible to make adjustment on the unity platform regarding the appearance of the geographical data on the application, which we have enabled to be displayed in unity through the Mapbox Web Service. AR_Aligned_Map object is used for all arrangements related to geographical data. The visualization of 3 different data related to the visualization of geographical data in Unity has been arranged. The part we refer to as Image provides the visualization of the map with our geographical data, roads and important buildings. With the help of the Terrain part, land surface modeling is provided. With the help of Map Layers, the data to be displayed in augmented reality are arranged.

The AR_Aligned_Map object, for which we have made map and augmented reality arrangements, uses tileset and studio data from Mapbox studio. An ID is created for each data we create in Mapbox Studio. It is possible to make adjustment by entering the ID information in the Unity environment (Figure 7).

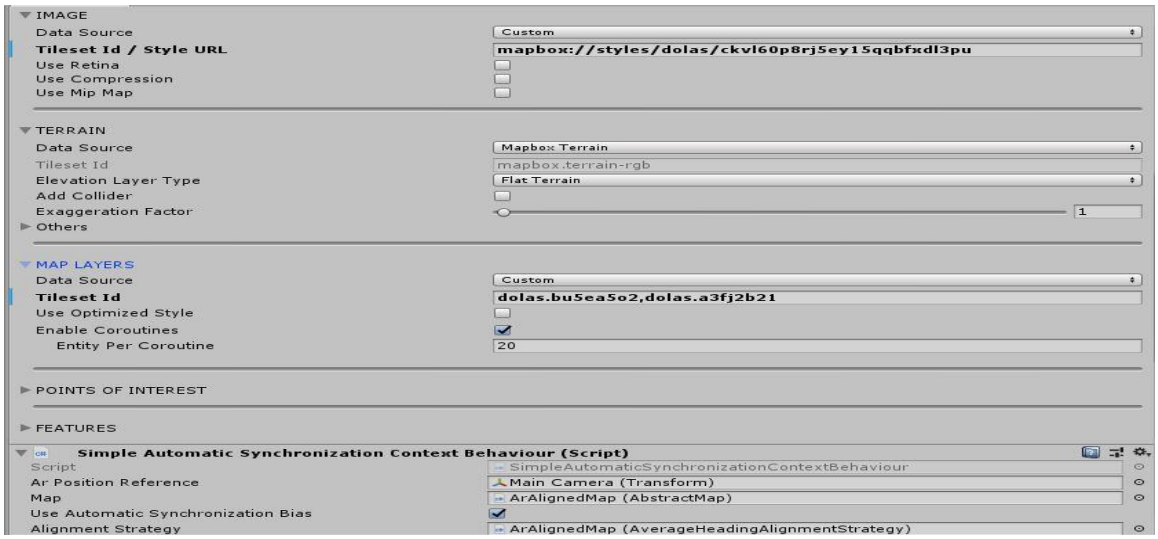

Figure 7: AR_Aligned_Map Object

In the AR_Aligned_Map object we have two geographic data layers that we have set up in map layers; drinking water data and sewage data. After our geographical data layers are opened in unity with their id information, the visuality of this data is adjusted from the data layer section. With Mapbox Geographic Services, the visualization of the data opened in unity on the unity platform has also been made possible (Figure 8).

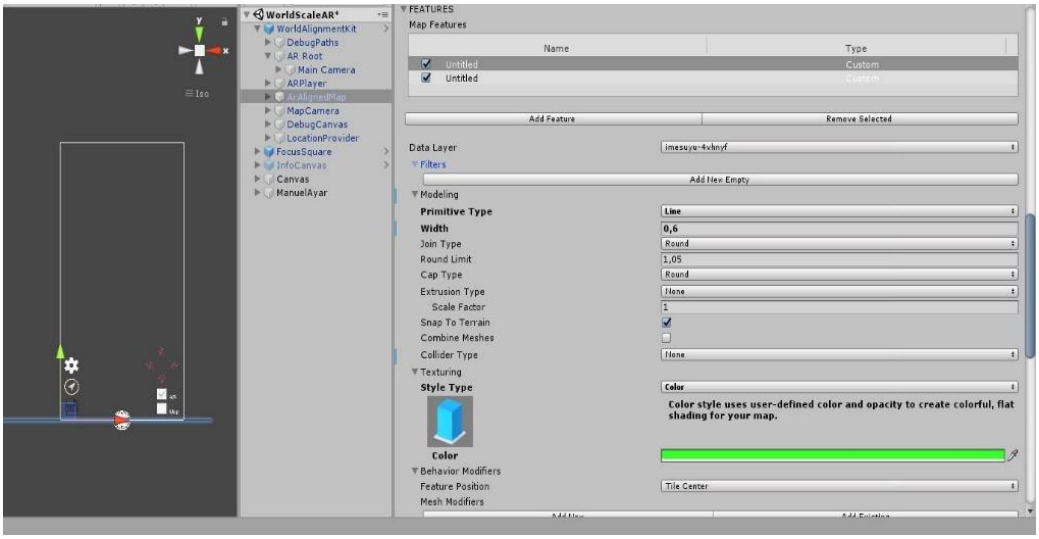

Figure 8: Screenshot of Map Features

In the application we have designed, synchronization of geographical data is provided automatically. In the tests we have done with the geographical data that we have created the visualization; direction problems have been encountered in the linear geographical data. We have added manual adjustment feature for editing the direction related problems. We made functional definitions for the buttons by making changes in the codes on the AR_Controller in order to manually edit the data with the help of buttons (Figure 9).

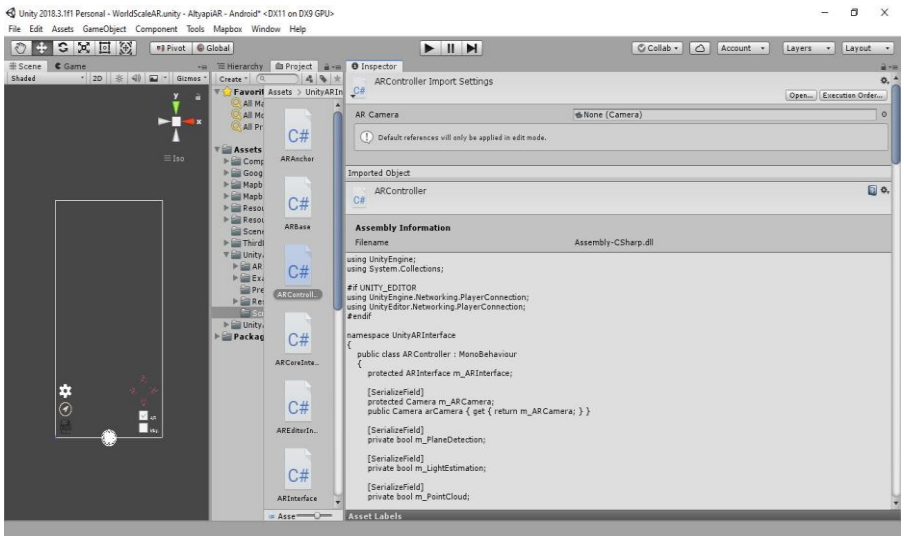

Figure 9: AR_Controller

On mobile phones, it takes time to regain GPS accuracy after users move. In the application we designed, a function was added to update the map with the help of a GPS button. In the first tests we made, it was observed that the data on the map could not be precisely positioned after moving for a while using the application. Functional features have been added to the GPS button by making adjustment in AR_Aligned_Map_Object (Figure 10).

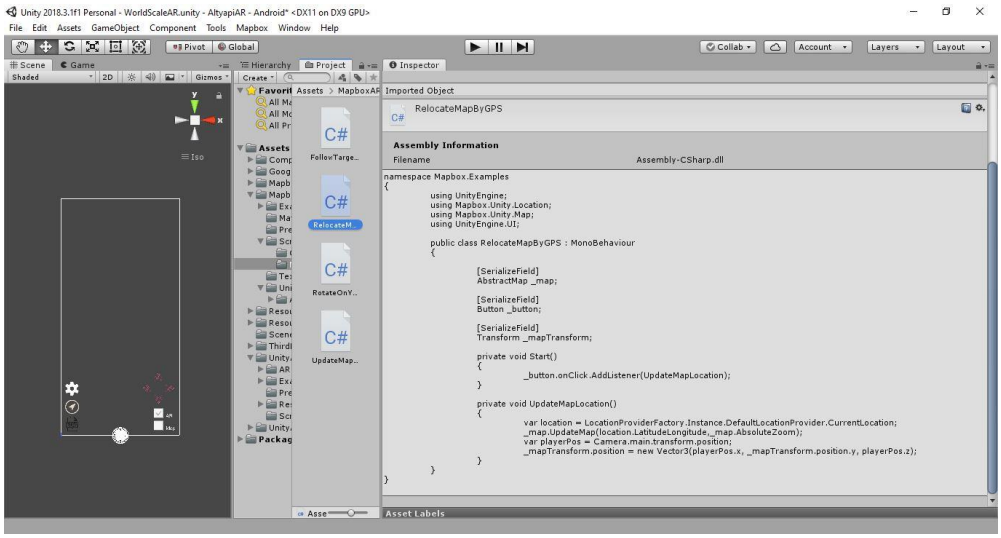

Figure 10: Settings of GPS Button

We designed the AR application, which we created by making the necessary arrangements through the Unity platform, to work in harmony with Android operating system 7.0 and above mobile devices. In our application, which also includes Google ARCORE support, the infrastructure data is visualized in an augmented reality environment.

4. Findings

In the AR application we have designed, linear geographic data belonging to infrastructure networks are used. We have seen that the direction of linear data cannot be precisely positioned in mobile AR applications. It has been observed that positioning in AR applications where point data is used is more sensitive than linear data.

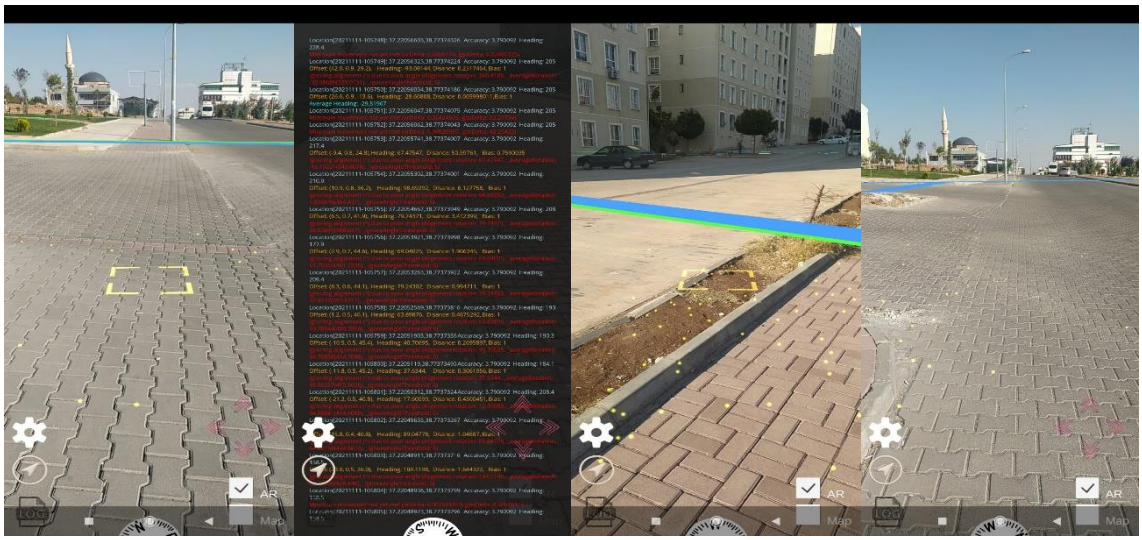

Figure 11: Screenshots of Mobile AR Application

In mobile applications designed for more precise positioning of linear data, manual adjustment buttons can be added to the data that provide movement feature. In mobile AR applications, which will be designed with the help of manual adjustment buttons, known fixed points are needed in the work area for precise positioning of lines on the real world. With the help of known fixed points, it is possible to position the lines according to the points.

5. Discussion

Augmented reality technology will develop further with the improvements made on software and hardware. Location-based augmented reality applications are affected by spatial sensitivities so that spatial data can be precisely placed on the real world. In augmented reality applications prepared using geographical data, applications can be prepared more frequently with point data. It has been observed that the directions of the lines cannot be used precisely with the use of linear data in AR applications, where spatial sensitivities are observed to be better in point data. AR applications designed with linear data may need to be adjusted manually.

6. Conclusion

In order to expand the mobile application, we have designed, it is necessary to eliminate the direction problems in linear data. It is possible to eliminate this problem, which is frequently encountered in the design process of AR applications, by using additional hardware. By adding manual adjustment buttons in AR applications designed for use on mobile devices, direction corrections can be made with the help of these buttons. Fixed points known in the field are required for fine tuning manually. Ensuring that fixed points known in the field are displayed with point symbols in augmented reality applications will facilitate manual adjustments. Although it is easy to use such a method in a region that covers a few streets in terms of area, much more fixed reference points will be needed in a study that will cover many streets.

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Use of Virtual Reality, Mixed Reality, and Augmented Reality in Sports: A Survey of Indian Coaches

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Abstract: The present study explores the implementation dynamics of ICT via virtual reality, mixed reality, and augmented reality in sports by Indian coaches. The major objectives of the study were to find out the status of the application of ICT in exercise and sport science in terms of athletes training, efficient training methods, periodization, use of assistive devices, use of wearable devices, coaches continuous professional development, motor learning pedagogy, individualized instructions, advocacy of Olympic values, counseling of athletes, marketing, about experience of audiences (broadcasting, merchandising, etc.), technical and tactical aspects, data management including data gathering; data processing and data visualization. Twenty-five coaches were randomly selected as sample. A survey method was adopted to conduct the study. The Google form was used for the collection of the data. Data was analyzed by using frequency counts and the percentage method. Overall findings revealed the true status of implementation of ICT via virtual reality, mixed reality, and augmented reality in sports by Indian coaches. This paper has implications for coaches, the sports authority of India, the government sports department, educational professionals, as well as learners.

Keywords: Virtual Reality, Mixed Reality, Augmented Reality, Coaches

1. Introduction

Over the period of time the curiosity of human being has innovative pedagogy for effective learning. The use of online learning and teaching has been challenging especially with the traditional way of working. Information and Communication Technologies (ICT) are needed in sports in the present time. The ICT helps in coaching and in motivating players. Especially, the time-motion analysis system is used for the improvement of athletes' performance. Besides this, activities monitoring, locomotion abilities demand such technology. It also helps in the analysis of sport-specific actions, athletes' preparation, injury prevention, and technical preparation (Hirsh, 2018).

During lockdown due to covid-19 and in new normal with a certain time to time restrictions, "online" mode of interaction for learning, teaching, meetings, and conferences has been very popular. Even in sports, a blended model of online and offline approaches is used frequently by coaches. Keeping in view the involvement of online use, the future of immersive technologies is going to be significant and prominent in sports. It gives flexibility and independence to users. The stakeholders can access information with real-time experiences. It is economic and supports learning, coaching, and viewing. Their advantage includes supplementary support and engagement for learner and teacher, wide-coverage, access beyond physical boundaries, flipping classroom, timely feedback, and progress. The thought of digital use in learning and examination of its mechanism is extensively argued (Chen & Wellman, 2004; Companie, 2001; Cooper, 2002; Dewan & Riggins, 2005; Norris, 2001; Singh, 2010; Kumar & Kumara, 2018).

When it comes to the use of technology, a global positioning system (GPS) is used by coaches, physicians, and trainers to monitor sports performance-related factors in real-time. GPS combined with accelerometers help objectively record both physical activities conducted at different times of the day and individual positions (on the field) in a team (Seshadri et al., 2017). Sharma (2021) argued that artificial intelligence is the most promising technology in education. In smart learning, quality outcomes are achieved with minimum efforts by the use of digital devices and the internet of things. It is the necessity of modern-day learning goals. The learning outcomes are achieved efficiently with help of these digital initiatives. A smart learning environment includes the utilization and availability of digital devices. It aims to read, write, fast pace learning, and skills to adapt to the digital world. India's National Education Policy (NEP) 2020 stressed upon the use of digital technology empowerment of society for generating knowledge. The aim is to make education affordable and reachable and enhance the gross enrollment ratio (GER) in the educational sector and sports are an integral part of it.

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1.1. Virtual Reality, Augmented Reality, and Mixed Reality in Sports

In virtual reality (VR) the user is immersed in the environment or surroundings through computer-generated panorama and objects. It emerged as real and makes the user feel in that particular environment. In other words, the virtual reality is reality that is near to reality and feels the imaginary (virtual) world. This virtual experience is possible with head-mounted box/gear. Virtual reality is utilized for training in many sports including performance measurement, technique analysis, designing and developing of clothing/equipment etc. Virtual Reality may be non-immersive, semi immersive, or fully immersive.

Sports may be revolutionized with the use of Augmented Reality. With this, one brings the outer environment/objects with the natural environment at home. Joshi (2019) expressed that the use of augmented reality in sports is for athletes, coaches, and spectators. It helps in performance analytics for players, coaches, and training including scouting of opponent teams. It is also used for better judgments by match officials, and the Hawk-eye system is the best example of it and used in tennis, badminton, soccer, and volleyball. Apart from above, AR solutions may be used for marketing, broadcasting, injury prevention, and rehabilitation. The significance of AR for sport application through technology-based approaches have been accepted in past (Bozyer, 2015) including analyzing and visualizing in real-time game situations (Ishii, 1999).

As a Mixed Reality, the virtual and augmented reality are revolutionizing sports. It can be used for talent identifications, team selections, virtual stadium visits, and better decision-making in officiating, feedback for coaches and athletes, and experience among spectators.

1.2. Objectives

The major objective of the study was to find out the status of the application of ICT especially the use of virtual reality, mixed reality, and augmented reality in sports by Indian coaches in exercise and sport science including athletes training.

2. Method

Twenty-five Indian coaches were randomly selected as the sample from different games/ sports specializations i.e. Basketball-4, Volleyball-4, Fencing-3, Athletics-2, Boxing-2, Cricket-2, Badminton-1, Tennis-1, Gymnastics-1, Weightlifting-1, Judo-1, Rowing/Kayaking canoeing, Wushu-1, and Cycling-1. There were 22 male and 3 female coaches from state/ union territory (UT) of Haryana-9, Delhi-1, Punjab- 3, Uttarakhand-1, Himachal Pradesh-4, Chandigarh-4, Madhya Pradesh-1, Maharashtra-1, and Uttar Pradesh-1. The coaching experience of the respondent was as 2 responses from above 20 years experience, 7 responses from 15-20 years experience, 6 responses from 10-15 years experience, 4 responses from 5-10 years experience, 5 responses from 1-5 years experience, and 1 response from experience less than 1 year. A survey method was adopted to conduct the study. The Google form was used for the collection of the data. The data for the study was collected in September/October 2021. A self-designed questionnaire containing 12 questions and vetted by scholars from the sports and physical education field was used for getting responses. An online survey was prepared to collect the required information related to the use of virtual reality, mixed reality, and augmented reality in sports. A simple percentage method was used for data analysis.

3. Findings

The responses were collected from qualified coaches working in different Indian sports departments. The analysis of data revealed the exact picture of the use of virtual reality, mixed reality, and augmented reality among Indian coaches and associated findings as follows:

3.1. Application of ICT in Sports

The use of Information Communication Technology (ICT) in sports brings together science and sport. It helps in concentration, understanding, make meaningful and effective learning experiences. When the question was asked from coaches *"Do you implement ICT in sports?"* 76% responded yes whereas 24% stated that they don't use ICT in sports.

3.2. Use of Technology for Training

Technology is transforming sports training experiencing by real time tracking performances, correcting athlete's patterns of motion, prevention of injuries. When asked "Which technology you use for athletes' training?" 12% stated virtual reality, 64% responded mixed reality, 4% said augmented reality, and 20% responded that they don't use technology for athletes' training.

3.3. Training for Immersive Technology

Continuous professional training is basic in coaching for pedagogy, multi-level coaching, and performance assessment. The use of immersive technology needs proper training for better application. The respondent coaches were asked that *"Have you ever received training for use of Virtual Reality, Mixed Reality and Augmented Reality in Sports?"* and in response, 72% said yes and 28% replied no.

3.4. Immersive Technology for Periodization

Periodization is the organized preparation of sportsperson for sports tournaments/ competition, sports training, and recovery/ transition phase. When coaches were asked the question *"Have you ever used Virtual Reality, Mixed Reality, and Augmented Reality for periodization?"* 72% admitted the use of immersive technology for periodization whereas 28 % denied such use.

3.5. Use of Assistive Devices

Assistive devices apply assistive technology, which is modified or customized use of piece, equipment, or product, to increase, maintain, or improve functional capabilities of athletes. When coaches were asked, *"Do you use assistive devices in sports training?"* 88% respond yes and 12% said no.

3.6. Use of Wearable Devices

The uses of wearable devices are smartly done by athletes in training, coaches in decision making. When asked, *"Do you encourage the use of wearable devices for sports training and monitoring?"* 88% admitted the use of wearable devices and 12 % denied such use.

3.7. Technology for Motor Learning Pedagogy

The selection of approach of coaching or pedagogy is proportional to the degree of learning. Digital pedagogy is referred to as the utilization of digital technologies for curriculum transaction and promotion of learning. It includes the utilization of various methodologies of information communication technology (ICT) for learning through digital mode. It is collaborative effort technology along with teachers and students. The use of digital mode makes the learning environment more inclusive, flexible, and user friendly. In response to the question, *"Have you ever tried to experiment with ICT for motor learning pedagogy?"* 56% acknowledged the use of technology in motor learning pedagogy whereas and 44% don't use technology in the approach of coaching.

3.8. Immersive Technology for Olympic Values

Based on philosophy of the Olympism, there are three values that Olympic seek to develop among the participants and viewers. These are: striving for excellence, demonstrating respect, and celebrating friendship. When asked about coaches' opinion through the question *"What is your opinion about using Virtual Reality, Mixed Reality, and Augmented Reality for advocacy of Olympic Values?"* 96% respondents said it is useful whereas 4% replied that immersive technology is not useful for advocacy of Olympic values.

3.9. Immersive Technology for Counseling of Athletes

A counselor in sport helps in visualizing or doing particular sporting action and give the athlete confidence to complete the motor action or sporting action successfully. Immersive technology gives such space to athletes and associated coaches with them. When asked *"What is your opinion about using Virtual Reality, Mixed Reality, and Augmented Reality for counseling of athletes?* all respondents replied that immersive technology is effective.

3.10. Immersive Technology and Experience of Audience

Spectators and fans are the backbones of any sport. The popularity of sports is due to the involvement of spectators and fans. Whether professional or amateur sports, we find them everywhere. When asked *"What is your opinion about using Virtual Reality, Mixed Reality, and Augmented Reality for the experience of audiences (broadcasting, merchandising)/"*100% of coaches said it's effective.

3.11. Knowledge about Virtual Reality, Mixed Reality, and Augmented Reality

Digital knowledge and competence is one's capability to operate digital instruments and software including various technologies in daily use. It is a prerequisite for use of immersive technology. When asked *"Do you know about Virtual Reality, Mixed Reality, and Augmented Reality?"* 92% of coaches said yes they have knowledge of immersive technology and 8% denied such knowledge.

3.12. Use of Device for Data

The mode of operating data plays an important role and the selection of digital devices is important. A digital device is an electronic gadget that can receive, store, and process digital information in sports. in response to the question "which devicedo you use for data management, data gathering, data processing, and data visualization?" it was noticed that 40% of coaches use the mobile phones, 12% use desktops, 36% use laptops, 4% use diary for data management, data gathering, data processing, and data visualization. It is surprising to note that no one uses the tablet.

4. Recommendations

The data analysis highlights the trends, implications, and future research directions for use of virtual reality, mixed reality, and augmented reality in sports. Therefore following is recommended:

1. It is recommended that Govt. shall provide the necessary support, infrastructure, gadgets, user-friendly software, and training for continuous professional development of coaches and the best use of immersive technology in sports.
2. It is also recommended that the most effective form of immersive technology in sports must be used including the development of repositories and providing financial support for coaches for required gadgets.
3. Virtual reality, mixed reality, and augmented reality must be the part of coaches preparation academic courses in sports.

5. Conclusion

Without any illusion, immersive technology is promising in sports. National Education Policy 2020 in India also emphasised for use of technology for learning and teaching and the same is applicable for coaching in sports. It has five components/elements that include information, communication, and collaboration via a digital platform, problem-solving attitude, safety and awareness, and production of content. The result of this result shows that the potential use of virtual reality, mixed reality and augmented reality in sports may be useful for players for clear motor action learning, coaches for better coaching points, improved lesson planning, and better viewership, including broadcasting, and merchandising. This paper has implications for coaches, players, the sports authority of India, government sports departments, educational professionals, as well as learners.

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Virtual Reality and Rural Women in Legal Education: Immersive and Experiential Learning

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Abstract: The digital push for online education acquired an urgency over the past one and a half years as the Pandemic struck India. This phase ushered us into a new era. The paradigm shift of life is the new reality which emerged in this scenario. The vested realities of the virtual environment have different connotations for people depending the situation, status and setbacks in their life. This paper is an analysis of the issues and challenges faced in providing legal education to women students through online mode in the rural part of Haryana, a north Indian state also known for its agrarian identity and deep-rooted patriarchy. The authors are currently teaching at a women's university located at village Khanpur Kalan which is a part of the Sonipat district of Haryana. The university, established in 2006, also happens to be the first state funded university which is a women's university in the whole of north India. Online learning is a challenge in itself as it requires a fundamental shift in the model of education which has been constructed around the logic of face-to-face classroom interaction amongst the learners. On top of it the reality of the Pandemic brought an additional factor resulting in almost a reversal of the many leverages which educating women needed in the given context. In the domain of legal education for women, it is observed that both parents and students in the region continue to opt for law as their preferred destination while applying for a university course despite the changed scenario, the real constraints were faced in an inadequate response to the situation from the working of the state governed higher education system. The changed scenario has been spelled as the 'new normal' and yet an approach mirroring the conventional working of the university education provided the yardstick. Even a new education policy which was already in the pipe-line and did not stress much upon dealing with the onset of covid scenario, got pushed through such turbulent times while the circle of critical assessment and debate on it became narrow with obvious reasons related to the widespread health crisis. The university provided an advocacy ground for introducing such broad-based policy documents of state while crucial and immediate matters concerning adaption with the suddenly changed realities, including a compulsive shift towards online learning as well as the impending crisis in health and well being of the university community, awaited their turn. Legal education of women students has been another such zone which awaits requisite attention for want of autonomous standing of the centres of higher learning attending to this task, especially during the present scenario. The paper is an experiential and analytical account of a virtual reality in these terms which enabled rural women to explore new vistas and opportunities of learning. The paper is aimed to assess the extent and impact of use of online applications by women in legal education.

Keywords: Virtual, Digital, Rural, Application, Legal, Environment, Women, Impact

1. Introduction

Public Health Crisis and the Pandemic- COVID-19 threshed the people around the world to go locked and even panic spread around to breathe in open air. It went closed the offices, schools and universities. Learning, though is constant phenomenon and there is no point of time when the most intelligent creature on this Earth ''A Human" would be stopped taking lessons unless he declined to the new learnings himself. The curiosity and desperate human race always keep on exploring new ideas and innovations. This is so, human civilizations survive all disasters, pandemics in History and ridding the challenges with ages and time. COVID-19 is one of the unprecedented situations we people experienced in our life. Digital push and online education acquired an urgency. On outbreak of Covid-19 in Dec. 2019 in China, it spread all over the world compelling to impose restrictions all around. There were restrictions on arrival and departure internationally and sequenlae it was followed by long lockouts inside the states. Amidst fear of spreading infections and risks, Higher Education Body very appropriately closed the educational institutions and very shortly

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managed to track the teaching learning Passage. The ways for teachers and for the learners underwent a drastic change. The methods shifted to online mode everywhere.
India was no exception to this. Market analysts took no time to read the demand of time and very soon it was open with various applications to serve the needs of the education sector. There was ample choice to the students and teachers of schools and universities for online teaching and the virtual mode emerged as a new normal in teaching. Measuring the experiences and differences made from the Virtual Reality in the field of education necessitates the comparison of Post and Pre Covid times.

2. Teaching Learning before and after the Pandemic

Traditional education in ancient times was not offered to all the children. Gurukul system prevailed in this time. There was a divide based on caste and religion. In modern times, caste and religion bar disappeared in education but the teaching methods remained more or less the same. Direct teaching, offline mode where scholar and the teacher both are found most important. Higher Education System in India took initiatives, issued grants to promote use of Online Teaching methods like MOOCS but it could not set the trends in state and rural educational Institutions owing to certain reasons. UGC started promoting Swayam Courses on the same line as MOOCS and self Paced courses as well. But technology couldn't reach to the roots of education system until it happened in the COVID-19 phase. All sudden the offline mode got replaced by online mode and virtual reality became the truth of teaching learning system.

It is very pertinent to ascertain and find whether the change is a mere natural outcome of transition during the pandemic or is leading towards swift transformation in Indian education system. There remains no doubt after two years of living in Covid time that virtual platforms has become an agent of paradigm shift for teaching-learning. It was indispensable to adapt to the practices useful in teaching learning process and initially, the emergent situation left us with no choice. Virtual Reality in Indian Education system which initially was accepted as coercively, later adopted by the people as a convenient mode to which they rely as an immersive mechanism.

The students in metro and big cities were akeen to online methods of teaching learning but it's a different feeling and more a challenge to take for rural students as well as teachers. Before the complete online shift, the digital push is said as observatory or experiential, I took to collect the responses from the students and faculty on this point from my institution which is established in a rural backdrop with limited resources. It was a common feeling that majority of students and teachers lack skills and are unaware about technical knowhow, applications and their uses. Teachers are seen less interested in continuing with online teaching as a preferred mode once the situation is back to the normal.

3. Institutional framework and standards of Legal Education In India

Legal Education, as a dynamic, professional and inter disciplinary field has been on tough frame during Covid stressed closures in the institutions. Brief introduction is shared below.

- Regulatory Framework: BCI and UGC are the regulatory bodies which provide all the guidelines and regulations to maintain its standards.

- Institutional Framework: our institution which a state owned university depends for its funds on state and UGC mainly. Efficient network system and frequency strength is continually in demand by its stake holders which creates doubts, reluctance and impediments in use of online mode.

- Academic Framework: Legal Education insists to impart profession skills through moot courts, client counseling, hone mediation techniques of its students. Students in our institutions are expected to participate in all such activities which, till the outbreak of COVID, held in offline mode.

4. Challenges in Legal education for rural girls students

Expectations Of Girl's And Parent's In Legal Education In Rural University – the students and parents expectations and approaches are much different while taking admissions in women institutes especially joining in a rural background.This is an Engendered profession- Legal education in villages are not a preferred stream and treated as

more suitable for males. In a rural University, academic and Infrastructural standards become a big challenge during covid time for both the reasons. Poor network facility, lack of awareness about applications for better learning and teaching in rural universities and urgency to switch to online mode escalated the difficulties of rural women in a already engendered profession.

Global developments and impetus to deep down the challenges and explore the opportunities has been observed as having played significant control over the situation during the pandemic. Impacts of Global Changes and Developments can be seen in Rural University also. Change is inevitable and global changes and developments get to influence rural women in legal education as well though the change is not rapid. Girls students learnt and trying to explore the huge benefits of accessing online platforms, e content, applications and self paced courses, MOOCS created by Indian as well as Foreign Universities. The interest of the students is observed as increasing compared to the teachers in virtual platform.

It is not denied and refuted in the process that technological advancement and accessibility influenced the extent of reliance over virtual mode of teaching. In the beginning, online Shift was not taken easy either by faculty or the students but very soon it replaced the traditional method of teaching. The feeling in accepting new ideas and innovations has never been easy and so the position in Online Legal Education. The idea and availability of Edex, webex, Udemy, Rcampus, Learnopia, Peer to Peer university is still very uncommon for our women students in legal education.

It is worth mention to include an account of perspectives and approaches of the stake holders in education field to justify the observations shared in this paper. A few scholars could make it successfully enrolled through webex or edex to study with institutions which was not in their reach in offline mode. They ably overcome the barriers so far in their way to connect to the foreign universities and teachers there. This is observed as a remarkable and landmark change.

5. Preferences and possibilities with Applications In Virtual Mode Of Teaching:

- Broad and Purpose Specific Options – There are some applications which I as a faculty and my colleagues are not aware and dare to use. I am sure these can render my lectures, training sessions, practical and competitions more convenient to handle and also desirable in Legal education. Although some students not majority of them are more comfortable in making best use of such applications better than others including the teachers.

- Either the lectures, seminars, debates, quizzes or the moot courts or even the practicals, most popular and relied applications by our teachers and students are Google Meet and Zoom

Virtual reality has emerged as a tool especially for the rural women in legal education and going to transcend change in Rural Universities for all the time to come. Virtual Reality which initially was a challenge in legal education and seen as engineer's and computer software's paradise introduced itself as an agent of transition to transformation. It can be said as a means of abridging gaps in teaching learning during the Pandemic. Virtual Reality is a New Era- the digital push is never going to be reversed and then urgency will usher a new era in world of education.

It has established itself as a teacher student reconnect during the difficult time. Technology is not simple and easy to choose and go with and the education fraternity even in small and rural institutions is bind to take over the trends ahead and to the next level though facing adversaries of some sorts.

There are no societal and economic barriers in using Virtual Reality and the future prospects point that there are No Escape Ways to it and very essential for legal education to ensue globalization even for rural students. It has no abrasions for the reason of exploration of new horizons and international standards which are now recognized in local corridors only with help of Virtual Reality and its tools. This has helped to redefine the knowledge sources. Improvised Standards of teaching and learning are expected.

MOOCS and self Paced Courses gained popularity in the Corona period because virtual platforms rendered the accessibility at the most simpler level for its users and participants. There will be more foreign collaborations and Tie Ups with the use of continuous Virtual Platforms. Territorial Impediments in Education will not hamper the growth of ambitious learners and a committed teacher.
Virtual reality opened new Vistas to the entire world especially to our young girls in Legal Education despite its rural backdrops.

6. Observations and Suggestions

- Rural Women in Legal Education observed and experienced a new world. Welcoming her to embrace the change and progress, suggestions are submitted to start the concerns, debates and discussions over the requirements of the institutions, stake holders seeking promissory involvement and participation of controlling agents in this direction.

- It is the responsibility of the Higher Education Institutions and the State for Enabling Young rural Girls to use Innovative Tools and Technology; and various educational applications.

- Investments are required focusing the newly emerged issues and problems like better networking in institutions and facilities which support continual use of online mode and to enhance reliance over virtual reality.

- Training of associated staff-faculty and students is also a fundamental requirement. Motivation to both, the faculty and students is important for active and preferred participation in future to extend the advantages of virtual platforms to the young girls in legal educations and anywhere.

- Sharing of e-Resources is important. BCI and HED (Higher Education Department) can take initiatives to increase the practices in legal education of creating and involving more use of e resources. The online search of judgments, recent legal developments and case comments should be available in free domain at least in rural universities with girls in legal education.

- (The author/s are motivated and guided by the real experiences while writing this paper. The views shared in it are a collection of their observations they had during this period in the process of teaching the women students and most of these women students come from rural background. Authors make reservations to the place of institution they are working at and the paper is a reflection of territorial accounts of the region.)

Transformative Approaches in Teaching-Learning Process: Virtual Reality and Higher Education in India

Shalini Attri[1] and Kiran Lamba[2]

Abstract: The 20th century has seen the amplification and revolutionizing of e-learning. Earlier there has been reluctance among the educationist regarding the integration of technology in teaching-learning pedagogy. But 21st-century paradigm shifts due to the covid -19 pandemic in teaching tools have made learning more effective through virtual mode. Virtual reality is characterized by three core ideas: immersion, interaction, and involvement. The synchronous learning platform on e-space is more structured, organized and there is also real-time communication among teachers and students. There has been a rise in collaborative work and space, improvement in learning material, cost-effective services are also available. Artificial Intelligence is being used for tutoring and teaching. Learning e-space in India includes webinars, MOOCs, online degrees, virtual training programs, and workshops, etc. Virtual platforms like zoom, google classroom, google-meet, Microsoft teams have replaced the traditional classroom with virtual space has improvised the teaching methods and process. The evaluation and assessment process too has become more transparent and objective. The present research emphasizes on the existing virtual reality in higher education in India. The paper is divided into two parts. The first part of the paper will focus on certain signposts regarding virtual reality and its impact on higher education concerning New Education Policy 2020 introduced in India. The second part will discuss how virtual teaching-learning has caused an uprising alteration and how virtual reality applications if applied to BPS Women University located in rural terrain of Haryana would empower the girl students.

Keywords: Virtual Reality, New Education Policy, Technology, Teaching-learning Process, Higher Education

1. Introduction

Teachers are the forerunners of learning, knowledge and have the capacity to acquire new skills which they further impart to their students. Teaching is an interactive and comprehensive process that requires an instructional process and teaching comprises of three stages pre-teaching, teaching, and post-teaching which include planning, execution, and evaluation. The technology revolution has allowed us to rethink the design of physical learning space, especially in the education system. The ICT-based teaching-learning has now shifted towards virtual reality as an alternative and constructivist form of learning supporting a variety of learners including special students. There is thus a need to understand the effect of Virtual Reality, and its status in Higher education in India with a special focus on NEP 2020. Ivan Suthland (1965) one of the pioneers of Virtual Reality while elaborating on the notion of virtual reality accentuates to "make the virtual world in the window appear as actual, sound factual, feel real further responding credibly to the viewer's action". Similarly, C. Cruz and Neira (1993) defined Virtual Reality as "immersive, interactive, multisensory, viewer cantered, three-dimensional computer-generated environments and the combination of technologies required to build these environments". Virtual reality is an extended family of technology having mediated experiences that has multiple degrees of combinations of reality with virtual instruments (Hu-Au and Lee, 2018). This notion in education concentrates on the integration of technology in the teaching-learning process in such a manner that the learner takes virtual as real and learning becomes real time acquisition. In contemporary times, Virtual Reality has immense importance in various fields including education. It allows knowledge-building effectiveness in student development and enhances improved teaching methods. An inter-changeable term with cyberspace or artificial reality, virtual reality is said to be immersive in nature.

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2. Application of Virtual Reality in Teaching-Learning Process

Virtual Reality is applicable in various fields like training in sports, physical coaching, driving license training, military, and space training, flight simulations, and understanding of natural sciences. According to Pantelidis (1993) students engaged in virtual reality programs cannot be just observers. They need to actively participate thus making the class as learner-centred class further including the participators in the action. The high-order interactions and individualizations generate deep interest among students. Hence, virtual reality gives an innovative and novel experience that is both enjoyable and informative. Virtual reality in historical studies offers virtual tours to ancient and historical monuments, archaeological sites thus providing a real-time learning experience giving students actual revelation and understanding of the subjects. David Traub proposed the idea of virtual reality "History class Room" where the learners are permitted to design, construct, and interact with dynamic historic microsystems (Traub, 1991). In management studies, it provides an understanding of real buying-selling and in-company experience in an experiential manner. The engineers make 3-D models to explain their concepts which give students an insight into actual space and machine learning. Stuart and Thomas (1991) elucidate that physics classroom usage makes the students create alternate worlds that augment their ability to think beyond. Similarly, Language acquisition is very much required in the globalized world.

In languages, there is the enhancement of four skills through virtual reality applications which further develops the communication, presentation, and public speaking skills of the learners. The e-learning virtual speech course allows the students to choose their peers giving them more acquaintance to conversational practices. For example, the teaching of language and literature requires a collaborative approach. Virtual Reality will enhance the language skill of the students from rural areas. New Education Policy 2020 of India describes communication skills as life skills further recommending that this skill should be imparted to students in the initial years of teaching. The policy also focusses on multilingualism. Because language learning takes place in the natural environment, the learners can practice listening and speaking of any language and can be multilingual. Immersion is a significant for language learning. The Mondly virtual reality application works on Google's virtual reality platforms- Cardboard and Daydream- and through dialogue recognition and voice chatbot, itgives a sense of real immersion and learning. Similarly, Immerse Me is another VR-based platform that offers nine languages and enhances speaking skills. Virtual speech application augments listening and speaking skills for Business communication and prepare learners for job interviews, meetings, etc. It has voice analysis technology that catches the speed of voice giving feedback on how to speak with clarity. Altspace VR is a digital representation of you that provides a virtual platform for interaction. Similarly, Virtual field trips through google expedition, technical training in fields like the military or the medical industry, Internships, collaborative and distance learning bridge the gap between educators and learners. The educators can transcend into the virtual world and can guide the students. The use of hologram technology is another example that enables expert professors to deliver lectures across the world in different languages simultaneously which again provides access to the best education all over the world.

3. New Education Policy 2020 and Virtual Reality

"Technology will impact education in multiple ways, only some of which can be foreseen at present. New technologies involving artificial intelligence, machine learning, blockchains, smart boards, handheld computing devices, adaptive computer testing for student development, and other forms of educational software and hardware will not just change what students learn in the classroom but how they learn, and thus these areas and beyond will require extensive research both on the technological as well as educational fronts." (NEP 2020, p.56)

India has been a pioneer in the digital revolution but still in higher education technology is primarily ICT-based. Learning e-space in India includes webinars, MOOCs, online degrees, virtual training programs, and workshops, etc. Virtual platforms like zoom meetings, google classroom, and googlemeet, Microsoft teams have replaced traditional

classrooms with virtual space and have improvised the teaching-learning methods and processes. Virtual reality is at its infancy stage in India and India being the youngest nation makes virtual reality an important aid to digitally empower youth by imparting skills and providing them with opportunities for international learning. According to University Grant Commission, a regulatory body on higher education in India, the teaching-learning process elucidates on five aspects: "Public/Private Partnership in higher education, Governance of higher education, Access and equity in higher education, Export of higher education, and Policy planning for higher education" (UGC, 2003). India approved its first education policy of the 21st century as the New Education Policy 2020 to address the development imperative of emerging nation. As there is a paradigm shift during the last decade in the knowledge landscape due to the rise of artificial intelligence, machine learning, and big data, there is a need to equip our young minds with modern world technologies. New Education Policy 2020 makes some provision for the application of these technologies in the education sector of India and provides a road map to Virtual Reality that concentrates on:

- Digital India Campaign: It is a program of the Indian government that started in 2015 to improve digital connectivity for all citizens of India. According to NEP 2020, this digitization of India would make it a knowledge and information economy. Further, this implementation will improve the education process and outcomes thus forming a two-way relationship between technology and education.

- Promotion of Research on New Technologies in Educational Fronts: The policy stresses on new technologies like artificial intelligence, machine learning blockchains, smart classrooms, adaptive computer testing for student development where require extensive research.

- Creation of the National Educational Alliance for Technology (NEAT): It suggests that India will establish an independent body, National Educational Alliance for Technology, to enhance technology usage for education, evaluation, planning, administration, etc. NEAT will link a continuous influx of data gathered from visionaries and experts in educational technology working at initial levels. To create an academic body of information, the association will organize manifold regional and national conferences, seminars to collect views from the practitioners, scholars, and industrialists thus promoting research through technology.

- Development of Variety of Educational Software: There will be development of many educational softwares which will be made accessible to education sector stakeholders in India. These softwares will be available in all Indian languages for varied and multiple users which includes students with special needs and in distant areas.

- Technological Interventions: It also gives thrust to technological interventions for upgrading of teaching-learning and evaluation method, supports teacher professional development, promotes educational access, planning and organization while concentrating on the admission attendance and assessment process.

- Disruptive Technologies: It emphasizes on emerging technologies that can transform the Indian education system. To prepare the students for high order competition, the Indian education system should adapt to the rapid changes to remove the excessive theoretical burden and rote learning in education system.

- AI and NRF: National Research Foundation (NRF) will start research projects in AI (artificial intelligence) like fundamental research in the domains of new technology and their assessment with regard to socio-economic impact.

- Role of Universities: As per the policy the universities will mainly conduct research in these disruptive technologies while creating initial materials and courses in the domain. The maturing of new technology will make the educational institution use these technologies in teaching and skilling efforts. All universities

mandatorily will offer Ph.D. and Master Programmes like Machine learning and Artificial Intelligence will be disseminated on online platforms like SWAYAM.

- Awareness about Disruptive Technologies: The major hindrance in the path of the introduction to these advanced technologies in the Indian education system is lack of awareness. The learners and educators are unable to understand the use, importance, and effects of these disruptive technologies. Hence, NEP 2020 suggests that for matters related to these technologies, and awareness is mandatory to have informed public consent. It is thus proposed that at the school level a special discussion on these technologies must be included as part of current affairs and ethical issues.

- Data handling and Data protection: The policy prescribes that there is a need to lay stress on ethical issues related to the development and deployment of these technologies for Data handling and Data Protection.

- Prioritized Areas: The new technologies will change teacher's and learner's way of thinking as well as imparting of education. The NEP identified some areas where the attention will be on using VR, AI, and Machine learning like clean renewable energy, environment preservation, sustainable agriculture, and water conservation, etc.

4. Empowerment of Rural Girls through Virtual Reality

"The V-Gen teaching approach relies on instructor creativity. The most important step is developing a commitment to the value of the approach, followed by some thought devoted to ways to best blend technology with the traditional classroom practices. Thinking about these issues has made us better teachers. Students come out of our classes with a better understanding of organizational concepts and especially the relationships that tie them together because we have implemented teaching styles that are more commensurate with their learning style". (Proserpio & Gioia, 2007, p.79)
Hence use of technology for the rural girl students must be very effective for student empowerment. Bhagat Phool Singh Mahila Vishwavidyalaya is situated in rural surroundings and is an added advantage for rural girls who otherwise are not able to pursue their higher studies due to social and economic constraints. The university provides a platform to these rural girls and empowers them through education. Introduction of Virtual Reality blended teaching pedagogy and use of technology in the teaching-learning process can change the complete system of knowledge delivery to the students at the university.

- Virtual reality if applied for teaching at BPS Women University will make the girl students digitally empowered. By using immersive technology in the classrooms, there can be a better understanding of subjects. It will also make the teaching-learning process interesting through the use of technology. The students at BPS Women University were asked about their responses on learning through visuals, and they acknowledged that the level of learning was high through visual understanding of content. Thus VR can be an effective method.

- The exercises like virtual tours when conducted for these students will give them exposure to the outside world which otherwise is a rare thing for them.

- The application of VR will also help teachers and keep them motivated to teach and use advanced technology in their teaching methods.

- Many students have language difficulty as they are from a rural background and due to language barriers, they are unable to access quality reading material and they also lose job opportunities because of poor

communication skills. Virtual reality application would be an effective tool to overcome these barriers thus achieving higher learning outcomes.

- The University is located in a remote rural area, hence through the help of technology University can reach up to the best institutes of the world thus expanding the capabilities and horizons of rural girls who are unable to get an education due to various locational, social, and economic disadvantages.

- An experiment on the teaching of Saint Joan by Bernard Shaw based on the life of French nationalist Joan of Arc was conducted on students of MA Integrated program, Department of English, BPS Women University. They were given a Virtual Tour of the Museum of Joan of Arc from France. It was found that the students had immersive experience and actual understanding of the text Saint Joan.

5. Conclusion

Virtual reality thus is particularly advantageous for students in far-off areas, where there is less availability of teachers or resources. Teaching and learning through virtual reality involve immersion, interaction, and involvement thus providing collaborative space and various assessment methods. In India, there is a need for research in the domain of virtual reality and its socio-economic impact. It is further suggested to train a teacher to develop an understanding and adaptability of VR. As a novel technology, virtual reality promotes an inaccessible environment, spatial memory allowing learners to create interactions, and is a more student-centered model that is experiential, discovery-based and has cognitive approach and constructivism pedagogies. The student-centered pedagogies will provide compatible teaching material that promotes reflective and dialogic thinking. The emphasis should be laid on raising awareness among the stakeholders in the education sectors to make virtual reality- a reality in the Indian education system and specific programs should be conducted to promote the use of virtual reality in Higher education institutes. Virtual reality applications and its usage can make teaching-learning process more inclusive as it would accommodate the needs of special students.

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Issues of Digital Divide among Teacher Educators

Yogesh Chander[1]

Abstract: The paper peeps to highlight the issues faced by teacher educators in Indian higher education institutions. The responses were collected from teacher working educators. The issues revealed various inequalities and vulnerabilities, digital divide, internet-connectivity, time-management, etiquettes for online-learning, motivational issues, online-distractions, pedagogical problems, teacher' skills for teaching from distance, communication gap, effective arrangements, evaluation and criticism issues, platform availability for online teaching, electricity supply, availability of resources, deceitful practices, curricular amendments, learners' dedication, teaching-quality, cognitive-health, indecision from exam branches, agreements of MOOC course, etc. The solutions for the above issues are in advance global solidarity to end current levels of inequality to remove attitudinal, administrative along with architectural barriers and needs serious attention on the part of service providers and policymakers during the pandemic time and its high time for intelligent collective action. This paper has implications for government, international organizations, civil societies, educational professionals, as well as teacher educators, learners, and all stakeholders at various levels.

Keywords: Digital Divide, Teacher Educator, Inequalities, Vulnurabilities

1. Introduction

India as a country had a rich culture of education for centuries, but new normal demands channelization of demographic dividend, sustainable development, responsible production and utilization of critical thinking, self-learning, and technology-based learning. India is home to over a billion people (Cassen, 2016). Today's working demand digital competence i.e. one's capability to operate digital instruments and software including various technologies in daily use. Presently, we have a data facility of cloud computing, where the practice of using the internet via remote servers, information is stored, managed, and thereafter data is processed. Nowadays digital technology has emerged as a flexible and popular learning platform especially for students, teachers, and freelance learners. India's National Education Policy (NEP) 2020 highlighted the transformation of the country through digital empowerment in society and making this nation the knowledge economy. The quality besides access and equity in education aim is to make education affordable and reachable. In this era of digital learning, the processing of information is from distant places and it gives flexibility and independence to users. The stakeholders can access information from any place, where one has an internet connection. It is economic and supports learning. Their advantage includes supplementary support and engagement for learner and teacher, wide-coverage, access beyond physical boundaries, flipping classroom, feedback, and instant progress.

The teacher is the axis of the whole education system. The societal outcomes in whatever way are the product of the quality of teacher teaching in the education system. They play important role in every mission and responsibility. Therefore teacher education, in-service, and pre-service must be professionally equipped with quality. Those who are the best brains must be identified, trained, and placed in educational institutions. After placement, one knows the students better and creates new learning environments. Consequently, important developments are experienced both in teacher education and in the classroom practices of the teacher. There are provisions of training by the Ministry of Education and non-governmental organizations in order to ensure their professional development for successful teachers who have entered the profession.

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1.1. Digital Divide

Information and Communication Technology (ICT) is one of the important driving forces for modern civilization (Singh, 2010). Digital learning encompasses the various areas of the education sector and presents cutting-edge advances in this field. State of the Education Report for India (2021) remarked that access to the internet in schools is 19 percent in all over India. On 17-Feb-2021 India today published the survey conducted by Learning Spiral revealed that more than 50% of Indian students in both rural and urban areas don't have access to the internet. There exists a digital divide in our country. There is a gap between beneficiaries from digital technology and those who don't have access. The underprivileged section has the disadvantage in many ways such they are to get digital-information, free participation, and desired skills. The idea of the digital divides and analyses of its components are widely discussed by scholars (Chen & Wellman, 2004; Companie, 2001; Cooper, 2002; Dewan & Riggins, 2005; Norris, 2001; Singh, 2010; Kumar & Kumara, 2018).

1.2. Teacher Educators

Teacher education also referred as teacher training aims to the professional development of pre-service and in-service teachers. It refers to the inculcation of knowledge, attitudes, behaviors, and necessary skills required in classroom teaching. The faculty members who are engaged in training the prospective teachers are called teacher trainers or teacher educators.

1.3. Objectives

The research had the following objectives:

i. To find out the status of the digital divide among teacher educators working in Indian higher education institutions. More specifically, the research was planned to find out issues of distance learning and the digital divide.
ii. To make recommendations to the Govt., in the light of the present study, for the effective implementation of online teaching and learning among teacher educators and to minimise the digital divide.

2. Methodology

The survey method was used to conduct the study. The sample of 40 teacher educators was collected through Google form containing twenty-four questions. The sample consists of 4 Professors (9.1%), 3 Associate Professors (6.8%), and 37 Assistant Professors (84.1%) from various departments/ colleges of Osmania University, Bhagat Phool Singh Mahila Vishwavidyalaya, Vidyasagar University, Chaudhary Ranbir Singh University, Panjab University, Delhi University, Rashtrasant Tukadoji Maharaj Nagpur University, Goa University, Hemvati Nandan Bahuguna Garhwal University, National Council of Educational Research and Training, (Central Institute of Educational Technology), Kurukshetra University, Maharshi Dayanand University, Central Sanskrit University - Vedavyas Campus, Central Sanskrit University - Lucknow Campus, Himachal Pradesh University, University of Jammu, Jain Vishva Bharati Institute, Lakshmibai National Institute of Physical Education, erstwhile Lakshmibai National University of Physical Education, Tamil Nadu Teachers Education University, and Guru Jambheshwar University. The data for the study was collected in September/October 2021. A self-designed questionnaire vetted by scholars from the education field. The issues of the digital divide among teacher educators were prepared to collect the required information. A simple percentage method was used for data analysis.

3. Findings

The responses were collected from teacher educators working in Indian higher education institutions. The issues revealed the various inequalities and vulnerabilities including digital divides and related findings as follows:

3.1. Internet Connectivity

Internet connectivity for learning in education is key considerations for advancing sustainable development. Access to a good Internet connection is required for collecting information, generating knowledge, and educational resources. Teacher educators use online materials to have better communication with students. In this case, it was found that 75% (33) teacher educators have good internet connectivity, whereas 25% (11) feel that there is poor internet connectivity at the teaching place.

3.2. Time Management with Domestic Responsibilities

The effectiveness in managing time permits teacher educators to complete the maximum tasks in the minimum time/period. It results in stresses reduction, a sense of achievement, and the same act as motivation. Smart time managers have time for sports, hobbies, friends, and family members and they have better executive functions. When teacher educators were asked about their feeling about time management issues along with domestic responsibilities during online learning 56.8% (25), admitted that they were having domestic responsibilities and 43.2% (19) denied such responsibilities.

3.3. Online Learning Etiquette

All teacher education institutions are working virtually and now online classes are part of daily routine. Online Classroom Etiquette is a whole new ball game compared to face to face mode of teaching. It is interesting to note that 90.9% (40) admitted that they are aware of online learning etiquettes (dress-up, camera placement, lights, communication, etc?) whereas 9.1% (04) said that they don't have such etiquettes.

3.4. Motivation

Motivation is a key factor in the learning and teaching process. The motivating style of the teacher revolves around learning activities without any interruptions. The level of motivation during online classes was low in 2.3% (01), medium in 56.8% (25), and high in 40.9% (18) among teacher educators.

3.5. Online Distractions

It has been observed that there are lots of online distractions that divert attention from a desired area of focus. There is a variety of online activities and applications that diverts attention. As per The Hindu e-newspaper dated November 17, 2016, the list of such online distractions includes Facebook, YouTube, Facebook Applications, Twitter, Amazon, Netflix, Flickr, Reddit and Blogger, etc. 72.7% (32) respondents feel online distractions and 27.3% (12) found no distractions.

3.6. Pedagogy

The selection of appropriate pedagogy is an important step in teaching. It has the potential to advance the quality among teacher educators 'and help learners to grasp better and facilitate the way they like to learn. When asked about

the satisfaction of pedagogy used for content delivery, 72.7% (32) percent responded that they are satisfied and 27.3% (12) responded that they are not.

3.7. Distance Teaching Skills

The skills of teaching keep students engaged through hard and soft skills. Through these skills teachers, educators seek the attention of learners. Few teaching skills are natural/ innate to some, whereas few required developments with practice. When asked about skills of teacher educators for skills in distance teaching 79.5% (35) admitted that they are skilled and 20.5% (09) stated that they are not skilled for distance teaching?

3.8. Level of Communication

Probably in the broader view, the most important soft skill needed for teacher educators is communication. It's beyond instructing students on course content. When asked about the level of communication from students and teachers, 63.6% (28) teacher educators remarked that it was effective whereas 36.4% (16) said it was non-effective.

3.9. Parallel Virtual Assignments

Especially during covid-19, it was observed that people joined parallel virtual assignments, including seminars, workshops, extension lectures, and different virtual events, etc. 68.2% (30) teacher educators remarked that they did not attend any parallel virtual events and 31.8% (14) admitted that they joined such events.

3.10. Institutional Initiative

Learning through distance mode needs institutional support, supply, and establishment of necessary infrastructure. It was asked in the online form that whether your institution took the innovative initiative for online assessment and feedback as compared to traditional practices. In response, 47.7% (21) acknowledged the institution's initiative for online assessment and feedback, 27.3% (12) replied maybe an option and 25% (11) replied that institution didn't take innovative initiatives for online assessment and feedback as compared to traditional practices.

3.11. Uploading Answer Sheets

There will be growth in technology and new inventions will take place with time. This growth in technology is a sign of progress in our society. Improvement in technology can't replace teacher educators in higher education institutions. Therefore continuous professional development of these teachers is necessarily needed and the same is applied to learners. Due to lack of digital skills, 88.6 % (39) of teacher educators said that students felt difficulty while uploading answer sheets and 11.4% (05) reported no difficulty.

3.12. First-Generation E-Learner

The first-generation e-learner is a teacher educator whose parent(s) did not use e-technology. There are various techno-academic challenges faced by first-generation learners. It was a mixed view and 72.7% (32) were first-generation e-learners and 27.3% (12) were already friendly with technology.

3.13. Electricity Issues

The Hindu (June 03, 2021) remarked that there is power outages, network issues hitting online classes. Recurring power outages and Internet connectivity is the biggest hurdle for teacher educators teaching online classes, especially

in rural areas. Battery drain in smartphone and other e-gadgets need a recharge from time to time. When asked about such electricity issues while charging e-gadgets, 59.1% (26) admitted that there are electricity issues and 40.9% (18) have not faced such issues.

3.14. E-Gadgets Availability

E-learning has never been adopted and accepted as real learning or the formal mode of education before covid-19. Therefore, the availability of e-gadgets are the foremost requirement for teaching from distance mode. In response to e-gadgets availability at home, 59.1% (26) have mobile phones, 11.4% (05) have tablet, 70.5% (31) have laptop, and 18.2% (08) have desktop with them.

3.15. Equipment for Online Teaching

Infrastructure for online learning accommodates changing student needs, technologies, and curricula. When asked about university-level intervention for online teaching, 81.8% (36) admitted that there was no equipment provided by the concerned higher education institutions. Whereas, 18.2% (08) respondents admitted the institutional support for equipment.

3.16. Cheating

The assessment whether formative or summative determines that educational goals are being met. Assessment affects decisions about grades, placement, advancement, instructional needs, curriculum, and, in some cases, funding. But due to the pandemic online examinations were conducted. It was alarming that 81.8% (36) teachers admitted that cheating is prevalent and 18.2% (08) denied it.

3.17. Curricular Amendments

Upgradation and redesign of the higher education curriculum of pedagogy and curricular amendments as per the demands of time is the necessity in a highly demanding world. Especially teaching-learning from distance mode needs modification in assessment methods as compared to face-to-face mode of learning. It was reported by 56.8% (25) respondents that no new designs of the curriculum were implemented for online teaching, whereas 43.2% (19) respondents admitted that new designs of curriculum was implemented for online teaching

3.18. Open Educational Resources

Due to the covid-19 pandemic, all education ministries of most developing and developed countries have suggested moving to teach and learn online. In the new normal, probably we need to practice physical distancing and do some partial work online and the Open Educational Resources (OER). During the survey, 68.2% (30) of teacher educators admitted that they have access to open educational resources (OER), and 31.8% (14) denied access to OER.

3.19. Learner's Commitment

In the contemporary world, learning is a complex blend of skills, competencies, and committed will. Especially, when asked about learners' commitment during online learning 61.4% (27) teacher educators think that learners are not committed to learning and 38.6% (17) responded that learners are committed.

3.20. Quality of learning

Indian National Educational Policy 2020 has five pillars or cardinal principles i.e. access, equity, quality, affordability, accountability. Education especially teacher education in India has rot learning, lack of employability, and skill development due to the low quality. Regarding the quality of online learning as compared to face-to-face mode, 77.3% (34) teacher educators admitted that there is the worse quality of education and only 22.7% (10) responded that quality is better.

3.21. Depression and Mental Health

For many teacher educators, virtual/ online classes caused mental health and related disorders including depression. When asked that about depression and mental health issues during online education 54.4% (24) respondents said that they felt depression and mental health issues and 45.5% (20) have no such problems.

3.22. Examination Schedules

The prosperity of a country squarely rests on the quality and excellence of higher education. Keeping in view the quality education, the comprehensive plan for reforms particularly in the examination system in higher education is the demand of the hour. The validity, reliability, and objectivity of the existing evaluation system need regular amendments on examination-related practices. Similarly, the examination schedule is also an important aspect of the examination process. During online examination, 54.5% (24) responded that examination schedules were uncertain and 45.5% (20) said it was certain.

3.23. Adoption of MOOC

Study Webs of Active–Learning for Young Aspiring Minds (SWAYAM) is a program started by the Government of India for achieving access, equity, and quality in the education sector through Massive Open Online Courses (MOOCS). The idea behind this program is to provide the best teaching/learning resources for all learners in the knowledge economy. University Grants Commission (Credit Framework for Online Learning Courses through Study Webs of Active Learning for Young Aspiring Minds) Regulations, 2021 have mandated that up to forty percent of the total courses in any program per semester, through the online credit course the higher education institution may be offered by MOOC courses on SWAYAM platform. When asked from teacher educators, whether any initiative was taken for adoption of MOOC courses at the department/ university level 34.1% (15) replied “yes”, 29.5% (13) indicated “no”, and 36.4% (16) remarked, “maybe.” Anjana and Kumari (2018) have suggested that in developing countries like India, MOOCs create opportunities to strengthen the education system.

4. Recommendations

Keeping in view the findings of the study, the following recommendations are made to minimise the issues of the digital divide among teacher educators:

i. The issue of the digital divide can be tackled by giving fast internet connectivity to all, providing space for online learning to avoid distractions, avoid parallel virtual engagements.

ii. It has been observed that the examination system needs complete overhauling so that first-generation e-learner doesn’t face issues while uploading answer sheets and avoid cheating.

iii. There is an urgent need to support teachers, provide uninterrupted internet facilities, gadgets required for online learning, redesign curriculum, and encouragement for open educational sources (OER).

iv. Motivational and counseling strategies must be used to enhance learners’ commitment, and improve quality, remove of depression or mental health issues, etc.

5. Conclusion

The issues of the digital divide among Indian teacher educators have various inequalities and vulnerabilities. The solutions for the above issues are in advance global solidarity to end current levels of inequality to remove attitudinal, administrative along with architectural barriers and needs serious attention on the part of service providers and policymakers during the pandemic time and its high time for intelligent collective action. Necessary amendments are needed in statutes, ordinances, rules, and regulations to adopt and incorporate the provisions of online learning and learning, development of necessary infrastructure with the blended model. Especially, assessment is an area where more research work is required and an alternate mode of evaluation is need of the hour. The achievement of NEP 2020 cardinal principles of access, equity, quality, affordability, accountability can be realized by taking maximum advantage of the digital technology and removal of digital divide. The survey recommends the concerted efforts on the part of stakeholders to implement the technology among teacher educators in letter and spirit. This paper has implications for government, international organizations, civil societies, educational professionals, as well as teacher educators, learners, and all stakeholders at various levels.

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Virtual Reality Space and Three-Dimensional Character Modelling

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Abstract: Throughout the history of humanity, technological development has affected the methods and techniques of designers to produce works, and the innovations brought by the period have led to the emergence of new forms of expression. This relationship based on the interaction between art, design and technology continues to show itself today. Especially with the development of computer technologies, designers have opened the door to a digital world where they can reveal their works. Design software working under developing hardware technologies and operating systems provided designers with digital versions of the tools they use in daily life. Thus, a partnership was formed in which technology directs the production of works, and the designer provides a vision for the new technological equipment to be revealed in the fields of design with the works produced. Virtual reality technologies, which gained a serious development momentum especially after the 2000s, have provided a new space for three-dimensional modeling for designers, thanks to the hardware they have created and the software that can work with this hardware. These technologies, which enable designers to work together and share their works online with their audiences in a realistic digital space, have become the limitless workshops and adaptable exhibition environments of the 21st century. The aim of the paper is to reveal with an academic approach, what kind of innovations the new medium, which emerged with virtual reality technologies, brought to the design field in 3D character modeling.

Keywords: Virtual Reality Technologies, Virtual Reality Art, Digital Art, 3D Modelling, Concept Design

1. Introduction

"In every moment of history, different forms of expression have emerged depending on the political characteristics of the period, their way of thinking and their tastes" (Freund, 2016, p. 7). Virtual reality technologies gained significant momentum after the 2000s, and thanks to the hardware and software that emerged in this field, the doors of a brand-new work production and presentation medium were opened for artists and designers. Big technology companies have started to make serious investments in virtual reality equipment, so a variety of virtual reality equipment has been offered to users. This hardware, which was created by the combination of optical, electronic and computer technologies, has turned into a new medium for artists and designers to produce works (Image 1).

Image 1. Designer working in Tilt Brush interface

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Virtual reality technologies have become one of the mediums used in art and design today, just as art and design have benefited from the technological possibilities of the period they are in from the past to the present. The digital tools offered to the artists by the design software used with these technologies made it possible to produce the works in a three-dimensional environment, similar to those in real life. “Social, cultural, political and technological changes have changed both the way images are produced and how they circulate and how we make sense of them” (Toffoletti, 2014, p. 23). Thanks to virtual reality hardware and software that can be used with internet technologies, this new digital environment has become not only a production space, but also a presentation and exhibition environment. The aim of the paper titled Virtual Reality Space and Three-Dimensional Character Modeling; To examine the development of virtual reality technologies and to deal with three-dimensional character modeling methods and techniques using virtual reality hardware and software with an academic approach.

2. Virtual Reality Technologies

The first emergence of virtual reality as an idea is based on writer Ray Bradbury's story ″The Veldt″ dated September 23, 1950, published in The Saturday Evening Post Magazine. American writer Ray Bradbury, in his story The Veldt, whose real name is The World the Children Made, published in 1950, shows the African images played by children in 3D, while talking about a system that can give senses such as sound and smell. Parents, who think that children's interest in the virtual African world has reached alarming levels, disappear after communicating their decision to eliminate this virtual world to their children. At the end of the story, African lions in the virtual world tear the two people apart. Children who continue to live in their virtual worlds are happy (Bradbury, 1950).

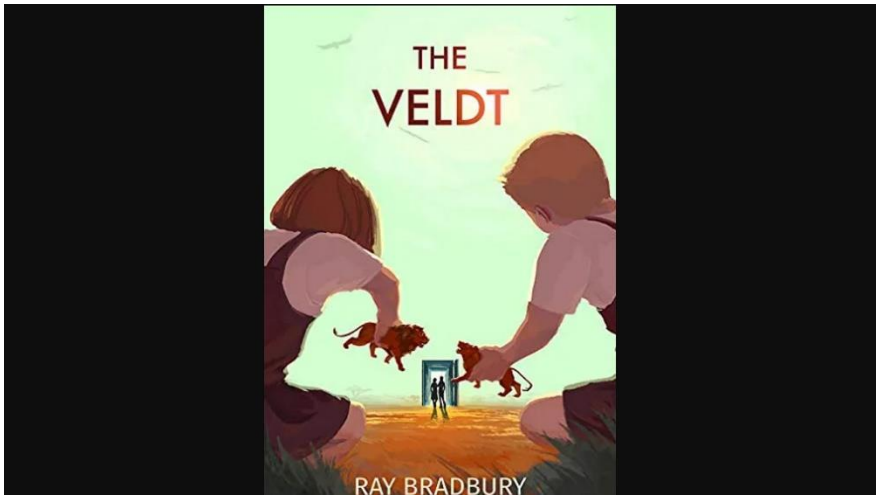

Image 2. The Veldt story illustration

Ray Bradbury is considered to be the creator of the concept of virtual reality with this extraordinary story. With this story of Ray Bradbury, the idea that we can enter virtual environments in the future by using technological equipment in 1950 is seen as a visionary perspective on the possible development of virtual reality technologies (Image 2). The first use of virtual reality as a technological device was realized with the device called ″Sensorama″ developed by Morton Heilig and Bob Sproull in 1957 (İlisulu, 2019, p. 33). The device named ″Sensorama″ aimed to realize the virtual reality experience by appealing to the senses of sight, hearing and smell of the viewers. The device, which displays a two-dimensional image in three dimensions with the illusion of depth, works with a stereoscopic principle (Image: 3).

Image 3. The Sensorama virtual reality device, which Morton Heilig first mentioned in 1955 article titled "Cinema of the Future".

Another example is the virtual reality headset “The Sword of Damocles” developed by Ivan Sutherland in 1966 (Image 4).

Image 4. Sword of Democles, the first computer-aided virtual reality system developed by Ivan Sutherland in 1966.

“Sword of Democles, which is the closest example of today's virtual reality helmets made until then, worked with the principle of providing the image transferred to the user over two small screens from a computer software” (Ferhat, 2016, p. 728). Since this device is too heavy, it can be used by hanging it down with a system in the ceiling. Another hardware from the recent past is Virtual Boy, which Nintendo company introduced to users in 1995 (Image 5). “This helmet aimed to create parallax depth perception by using computer-based image processing technologies of the date it was produced and transferred its user into a 3D digital environment” (Flanagan, 2011).

Image 5. Nintendo's virtual reality hardware called Virtual Boy.

Today's equipment is mostly offered with advanced DoF systems, electronic lenses, headphones and touch control devices. These hardware, with their resolution, image processing speed, key combinations and interface features, offer their users the opportunity to experience the virtual reality dimension through movies, games and design software (Image 6).

Image 6. Modern virtual reality helmet and touch control devices.

Today's technologies of Virtual Reality offer wearable "Haptic" equipment, apart from helmets, controllers and motion capture sensors. The concept of haptic refers to the tactile experience between virtual objects and the user's body. SenseGlove Nova is a wearable Virtual Reality glove (Image 7) that allows its users to feel shapes, forms, textures, impact and resistance in virtual reality.

Image 7. SenseGlove Nova virtual reality glove.

TactSuit X Series haptic vests, launched by BHaptics in 2021, aim to provide the user with the upper body touch feeling in a virtual reality environment (Image 8).

Image 8. TactSuit X haptic vest.

3. Adobe Medium Virtual Reality Design Software

The Virtual Reality medium for designers describes a 3D space that emerges with combinations of hardware and software. Adobe Medium software is one of the software that offers the digital tools and working environment in this 3D environment, where the designer can explore their designs from every angle and create detailed models by capturing their designs as if they were real (https://pc.tc/OY8J) (Image 9).

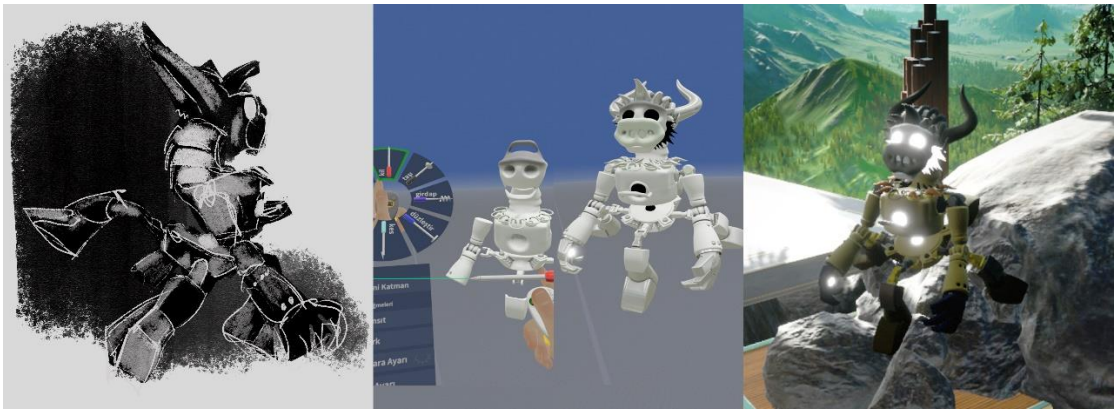

Image 9. Character design steps in Adobe Medium software.

The software interface, which provides intuitive use, offers a sensitive working environment where the designer can shape her ideas as wishes in an unlimited canvas with X, Y and Z axis (Image 10).

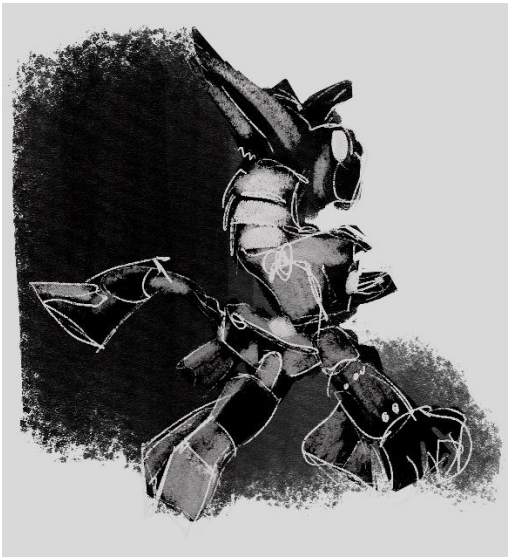

Image 10. Sketch image used for modelling.

Features such as shaping tools, elastic motion tool, stamp library and studio sharing in the software interface allow modeling by using the hardware's touch control devices (Image 11).

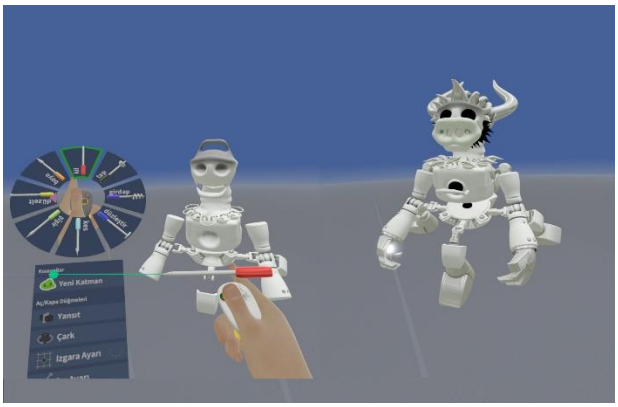

Image 11. Character modeling steps.

Thanks to the export option in the file panel of Adobe Medium software, the designs created in the software can be exported with raw, real-time and 3D printing options, and they can be edited in OBJ or FBX formats during this transfer (Image 12).

Image 12. Image showing the exported design being displayed in a virtual reality environment.

4. QUILL Virtual Reality Design Software

Another software, Quill VR, has an interface that allows us to make both 3D drawings and illustrations in virtual reality, and also enables us to create animated movies by activating our work (Image 13).

Image 13. Animated visuals designed in Quill software.

While designing the characters in Quill software, the characteristic reflections of the thoughts that make up the character were primarily expressed in the form of pattern sketches. Then, these drawings are transferred to the Quill software interface and made three-dimensional with the tools in the Paint Panel (Image 14).

Image 14. Sketch drawings before character modeling in Quill software.

Due to the nature of virtual reality software, thanks to the freedom of movement of the hand, intuitive working similar to real life can be used in the design process, and the detailing of the design with control devices can be performed within the interface panels (https://pc.tc/OY9h) (Image 15).

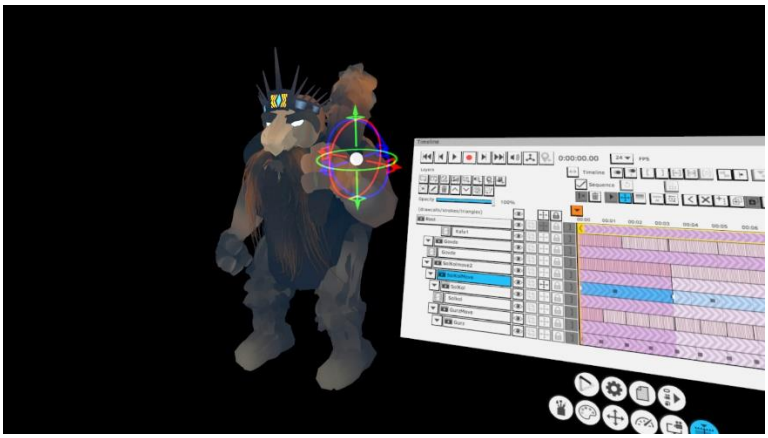

Image 15. Character modeled in Quill software.

After the modeling of the concepts is completed, the characters can be digitally painted and the rendering phase of the concept can be realized in real-time within the software. Thus, the digital painting process can be applied on the three-dimensional character (Image 16).

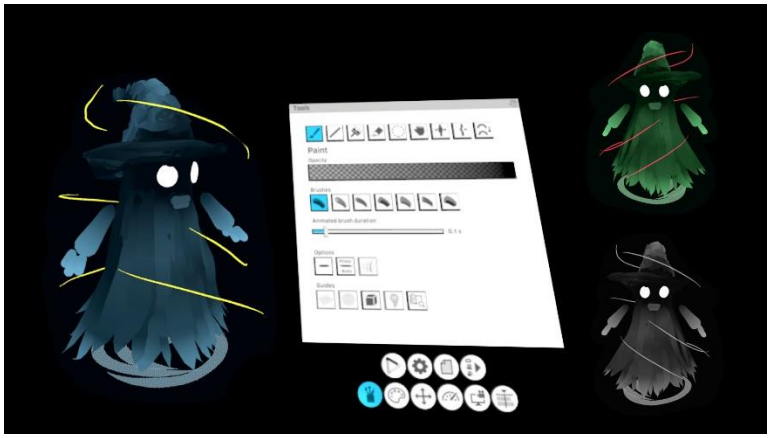

Image 16. Digital painting in Quill software.

5. GRAVITY SKETCH Virtual Reality Design Software

Gravity Sketch, another important design software of Virtual Reality, enables the implementation of Mesh, NURBS and SubD geometric modeling types in the virtual reality environment with its six different design tools (https://www.gravitysketch.com/) (Image 17).

Image 17. Character models in the Gravity Sketch interface.

It is an advanced character modeling software for designers with its unlimited layers, editable space and many digital tools such as image or video transfer into this space (Image 18)

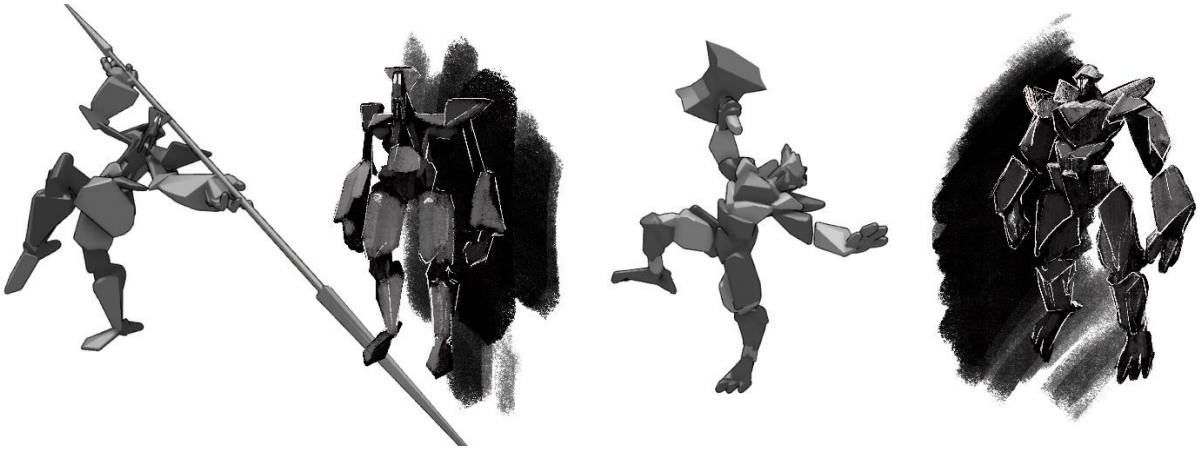

Image 18. Character sketch drawings and character models in Gravity Sketch scene.

Gravity Sketch, a real-time design software where sketches and drafts can be converted into detailed 3D models, makes it possible to view and manage designs on the desktop and integrate the software into the workflow using the cloud platform called LandingPad (Image 19).

Image 19. Characters modeled in Gravity Sketch software.

One of the most important advantages that the software offers to its users is the free sketch panels and tools included in it. These tools, in which the designer can quickly express the sketches drawn as 3D models, are the version of a technique similar to real-life free drawing exercises, created to be performed on a three-dimensional basis in a virtual environment (Image 20).

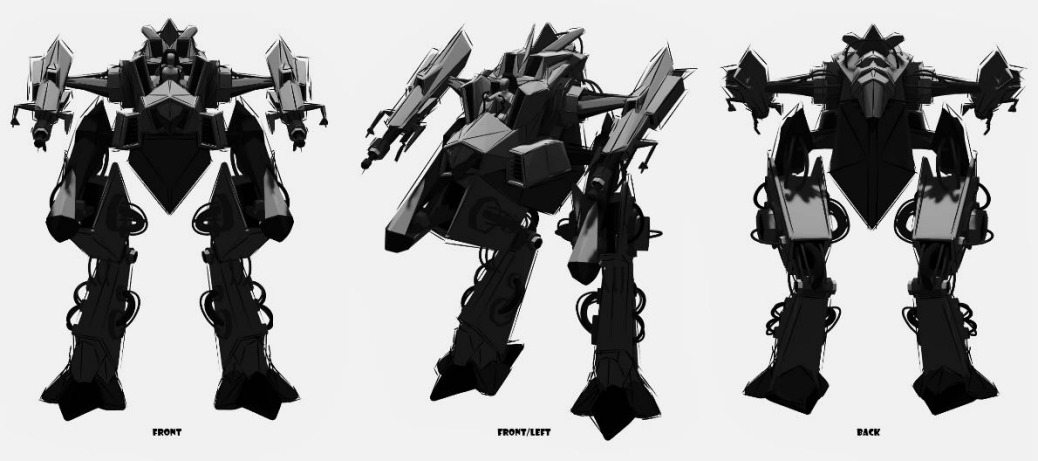

Image 20. View of the character modeled in Gravity Sketch software from 3 different angles.

In addition, the designs modeled in Gravity Sketch software can be exported with obj, fbx or iges extensions, and imported into desktop 3D modeling software, so that designs can be processed using the capabilities of the desktop software.

6. Conclusion

One of the most important advantages of Virtual Reality software for artists and designers is that they bring new solutions to the challenges of space and ergonomics. When a designer wants to design a character in the real world, he will need a workshop, tools and equipment to work, and a certain time period to travel the distance between his workshop and where he lives. After meeting these requirements, he will be able to reveal his design by touching his work in the three-dimensional space of the real environment, controlling the process and tools and using his senses while performing all these.

Here, the phrase "solution of spatial and ergonomic difficulties" is to present a simulation of all these possibilities to the designer while creating his work in virtual reality. In other words, it means that the designer can benefit from both the workshop, the equipment and the sensory opportunities while revealing his work, and at the same time, thanks to the advantages provided by the equipment, he can work whenever and wherever he wants, regardless of time and place.

The availability of new versions of design software in virtual reality, which are similar in terms of the symbolic structure of the interface and different in terms of the possibilities they offer to the designer, have transformed the works designed on the monitor surfaces, so that they have turned into works that can be experienced in a three-dimensional space, can be moved in, and can be adapted to the person.
This digital universe has given visual designers the opportunity to create their concepts in virtual reality software with digital tools, which they can use with real-world practices. The designers, who produce their works with these design software, have become able to apply the design processes based on augmented perception in virtual reality by combining the cultural accumulation of the past on visual design with the methods and techniques of today's technology.

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Role of Virtual Reality in Cultural Heritage, Hospitality and Tourism

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Abstract: Nowadays all the people are interested in creation of simulated environment. Virtual Reality is the latest, trending computer technology which is the process of creating a virtual environment with a device. Virtual Reality has come into existence in the mid 1990's. Virtual Reality in short called as VR. There are many areas where the Virtual Reality (VR) is commonly used. Some of them are: Entertainment, Cultural Heritage, Hospitality and Tourism. The point of this article is to make sense of importance of Virtual Reality (VR) in different sectors. This article enlightens the necessity of VR in some of the important areas.

Keywords: Virtual Reality, Cultural Heritage, Hospitality, Tourism

1. Introduction

The latest and trending technology named virtual reality come into existence in the year 1965 by Ivan Sutherland in which there is an illusion of virtual world but seems to be real. Virtual Reality is also called as 3D simulated environment. Virtual Reality resembles the real world but it is virtual. The main objective of Virtual Reality is to knock up an illusion of physical appearance in real world or imaginary world. It enables users who use VR headsets or glasses to have an interaction with a computer similar to the interaction with a computer in real world. Virtual reality involves the interaction of human with simulated environment by using some of the VR devices like VR glasses, VR helmets and VR headsets. Virtual Reality is of three types mainly. They are Non-Immersive, Fully-Immersive and Semi- Immersive.

2. Cultural Heritage

Cultural heritage is used to represent the lifestyle developed by a society. It includes space, values, traditions. Cultural heritage may be tangible or intangible. The main part in culture heritage is it consists of visible traces of one society, from ancient times until recent history. It represents the traditions, beliefs, and lifestyle as a part of human activity. There is a major development of different technologies that affects the multidisciplinary work on protection, management and promotion of culture heritage. Some of the opportunities are provided by ICTs for promotion, restoration and spread of cultural heritage. Interactive visualization of monuments/sculptures is enhanced by gaming industry which motivate users to visit places.

3. Virtual Reality in Cultural Heritage

Everyday life has a significant impact on the recent advances in Virtual Reality. Cultural heritage memorials are mainly apt for multifaceted. It is feasible to traverse virtually through an environment which is engendered by a system as a different reality, and to engross oneself into the past or in other effective environments without leaving the current real-life situation through VR (Addision, 2007) A virtual or imaginary environment will be created by using the latest available 3D technique. Dispensing of geometric atmosphere is not a virtual environment. Virtual tour of a place is done by using panoramic photography. Likewise, Virtual reality is growing up very faster by enhancing the experience of virtual tours to users and taking the review before virtual visit and after real visit (Arnold, 2005)

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4. Virtual Reality in Hospitality

Nowadays there are many sectors where implementations of modern Virtual Reality are gradually increasing. Some of them are businesses, entertainment-based. Virtual Reality provides the real like experience and provides some useful information. In the similar way Virtual Reality became the necessary part in hospitality industry. The main use of VR in hospitality is, it provides all the necessary information needed for a customer like having a full brief view of a hotel room before booking (Lam & Qu, 2007). Descriptions does not be trustworthy. so VR provides customers an offer to have a 360degree view of that hotel room. At first usage of VR in hospitality is not recognized properly but today there is a large difference in recognition of VR in hospitality. However, one of the applications of VR are as follows:

5. Virtual Hotel Tours

Virtual reality is usually used in hospitality sector for the establishment of virtual travel experiences by using 360 degree video technology. From VR, the viewer will encounter a virtual recreation of different aspects of travel like visiting some place and observing the surroundings. Virtual hotel tours are done by using this virtual hotel visit through VR technology. This provides the guests to have a brief overview of a hotel (Lam & Qu, 2007). Most of the websites of some hotels are allowing this latest VR feature inbuilt in it which allows viewers to have a clear look of a hotel room, or others parts of hotel, before they get accommodated in it (Shim & Lee, 2011). Hence the above virtual tours are best encountered with a Virtual Reality glasses or devices and by using 360 degree video technology there will be access to view the hotel room without access to a headset.

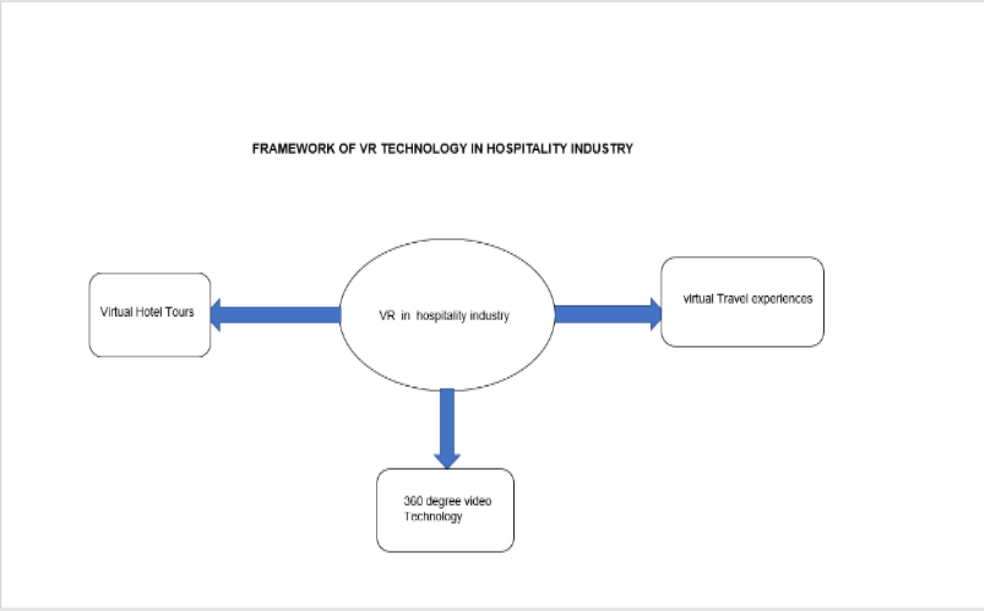

Figure 1. Model of VR in Hospitality

6. Virtual Reality in Tourism

Today VR technology is usually used in tourism industry. The main reason behind the enhancement of usage of VR is for marketing (Wang & Fesenmaier, 2002). Virtual Reality in tourism has the ability to trap tourism terminus in a rememberable and pleasurable way is a puissant marketing gadget. The main aim of VR is allowing the user to experience a new virtual world but seems to be real. Virtual reality in tourism has the calibre to place the viewer/customer at the main part of a page and makes it feasible for them to envisage themselves at that location.

6.1. Applıcatıons of VR in Tourism

It includes:

1. VR travel experiences
2. Hotel tour using Virtual Reality
3. Virtual tourism content for websites/social media

6.2. Benefıts of VR in Tourism

The benefits of virtual reality in tourism involves (Guttentag, 2010):

1. It enables the user to make success of their own will.
2. It creates a real experience of involvement.
3. It provides travel experiences to those who cannot travel.
4. It provides or engages the viewer in viewing the 360 degree view of a destination with high resolution (Guttentag, 2010):
5. It allows user to imagine themselves being placed at a travel destination.
6. It engages user for more time.

6.3. Virtual Reality Travel Experiences

It consists of VR headsets. VR headsets includes videos which generally referred to VR tourism. This VR headsets creates a feeling that being in the real place. It allows the user a real-life experience of visiting places and enjoying everything around themselves. These Virtual Reality headsets provide the 360 degree view of a place which allow the user a peculiar and rememberable moments or experience to the viewers (Williams & Hobson, 1995). There are a lot of travel agencies and travel companies which embraces VR technology and this companies are developing in a large scale. VR headsets need to be wore and to move in all directions to have a look at a place where we are not able or interested to go. The above VR, latest trending computer technology gives lots of experience to the users.

6.4. VR for Travel Agencies

One of the common uses of VR headset in tourism is by travel agencies. Most of the travel agencies shows the brochures and computer screens to the visitors. Instead of that travel agents can make the clients/visitors have a virtual experience (Williams & Hobson, 1995). It provides the user with an experience so that they won't forget. Most of the travelling companies have embraced the latest, trending VR technology and have used it to improve sales and to gain brand exposure.

6.5. VR Tourism in 360 Degree

360 VR journeying When many people have in mind that of VR they have in mind that of it as CGI (knowledge processing machine produced picturing), which is how it is used in the playing activity industry. However, there is a different form of virtual reality one experienced as 360 VR, or 360vr motion viewing record .360 VR gives all attention on the true earth rather than knowledge processing machine produced picturing (Williams & Hobson, 1995). This makes it make errorless for the journeying industry where it is important to let see users a true placing rather than a mockup or a simulation.

7. VR Headsets in Travel Industry

VR headsets in the journey industry VR headsets representatively make ready the true to likeness virtual reality 1 journey experience for the user. A VR headset uses expert software 2 which records of past moving the motion of the user's head. This lets the user to have a look for the journey place where one is going as they would in true living. currently, the number of people that own a VR headset is going higher at a quickly moving rate. This enhancement in VR headsets can largely be given to the playing activity market, where the technology is being pushed hard. in addition, all the Major on-line flat structures including Google, Facebook, and Amazon 3 are all giving heavily in VR headsets and VR what is in, giving undertaking a bright future for this space. VR made come into existence for headsets is very high in price to produce as it has need of the producing of stereoscopic 4 what is in and spatial sound (Sussman & Vanhegan, 2000). However, for those journey companies looking to be at the leading position of the technology, the price can be value it to let them to support out from the great number of persons and make ready an unrivalled experience to their clients (Kim, Lee & Hiemstra, 2004).

8. VR in Reseach

Our latest technology VR for scholastic research provide the contrivances to fabricate and administer distinct VR-based experiments. All the VR toolkits are motor-driven by Vizard. It accredits the researchers belong to any background to promptly develop their own simulated virtual environment (National Research Council, 1995). Attire yourself with the most advancement or forefront contrivances to delineate and exploit your VR experiment nowadays. The common perspective for use of VR in reality research is to compere the testing in an appropriate and equipped research amenity (VPL Research, 1989). This approach consists some of the pros usually, but there are many other ways. As the above process is specialized, there is another strategy that research can often be done online, either through local prerequisites or in some situations by imparting respondents with plug-in appurtenances they can use with their system for the scrutiny. This has distinct probable solicitation.

9. Future Challenges of VR in Cultural Herıtage, Hospitality and Tourism

Based on some calculations, we can say that VR is going to rock in future for continuous five years. Coming to cultural heritage, reconstruction of buildings or monuments can be done easily and exactly with the avail of virtual reality.
In the medicine sector, the future challenge of VR is to recover the patient. Some of the doctors may prescribe the patient to visit the simulated environment created by VR headsets or glasses which results in easy recovery of patient. Similar to use of VR in cultural heritage, VR in tourism sector have the same result If anyone interested in seeing the 360degree view of a monument which is unable to visit, then this technology is the most helpful in attaining his desire. This gives the real experience to the users.

List of some companies which are using VR technology:

- Google
- Microsoft
- Unity
- Samsung
- Magic Leap
- HTC VIVE

10. Conclusion

So, basically virtual reality is the latest, top trending technology in computers. VR is mainly used in cultural heritage to know the different cultures and all the heritage in vast countries. VR is also mainly used in hospitality to know the each and every process virtually make sense to be real but not as such and it is also helpful in being trustworthy by allowing the user to have a 360degree view of a hotel room the user need to accommodate. It is also mainly used in tourism which gives a brief review or view of places which are interested in. VR creates a virtual environment which gives a lot of experience to the users. Not only in cultural heritage, hospitality and tourism VR is applicable in many areas around the world.

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Application of Virtual Reality Technologies to Enhance Cultural Perspective in Modern Society

Pattabhi Keerthana[1], Adapa Chathurya[2], Pennada Siva Satya Prasad[3] and Manas Kumar Yogi[4]

Abstract: Day by day VR is emerging as an educational tool and technology tool for many sectors like education, hospitality, and many more sectors. So there is a need to talk about the cultural differences that come with it. How one can adapt to this Virtual Reality with open-mindedness. One of the cases they can say is Virtual Reality containing the use of audio which may contain the language used by the creator but coming to users there language may be different so this is one example where the language plays a main role to communicate, interact and establish a relationship with people. Hence the creator should keep this in mind and do the needful. Virtual Reality is being used in education especially in training like medicine etc. Virtual Reality helps the students to grasp the subject more effectively, As practical knowledge is more important, So virtual reality is fruitful in education. As now students are learning from VR and if the creators include about their culture then without knowingly there is a chance for the students to misunderstand the culture.

Keywords: Virtual Reality, Culture, Education, Technology

1. Introduction

While understanding the culture, it plays an important role in society. Culture is shared by members of a group likewise different groups have various cultures. One can know more about their culture while they are growing in childhood they unknowingly obey their culture but as they grow they know the real culture they are in. Culture tells a human how to talk, walk, think, behave hence culture plays an important role in one's life.

There is a saying that Culture is a lens through which one can view the world. The content creator may knowingly or unknowingly try to influence their culture in the content he is creating like Virtual Reality. So the when students practice or study using this Virtual Reality they face some cultural changes which they try to adopt them then that may become cultural in appropriation Hence content creators need to keep that in mind while creating the content.

1.1. General questions

- Generally the question that arise in our mind is
- To what extend does Virtual Reality effect the student?
- How does content creator should be aware of while creating the content?

2. Challenges of culture in VR

Virtual Reality being used in technology do not contain any attributes that may affect culture, society, or the public. Whereas Virtual Reality's main aim is to be used as a technology tool for practicing, mining, tourism, safety, and many more. But it can be realized that there are others factors that come up alongside cultural differences. This may include objects, symbols. Virtual Realitycan also be used in the community to pass the information just like tv and radio.One

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may think that using Virtual Reality as a technology tool will have cultural differences, but they should note that the tools they interact with often change the way they used to be. Which means they do influence our thinking.
Hence this issue should be considered seriously and try to produce tools that don't have cultural differences and helps the students or users to diverse their thoughts in culture. These may be the goals for some culturally diverse people. The technology included with cultural values and presumption is known as Cultural Amplifier which can numerically change the process of cognition of users.

One more point to be added to this discussion is that the person's or users' background may also affect the way they interact with virtual reality and based on the person's background each person has unique responses to virtual reality. Let us consider the mentioned case for more clarification. There are two groups one is a rural isolated Mexican village and the other is the civilized culture of the Mexican city. In research it is found that users have different emotional responses to interaction with Virtual Reality because the users may have different cultural and technological backgrounds. So we can suggest the user must be quick to learn new technologies in virtual reality to lessen the cross-cultural differences.

3. Positive impact of culture in VR

The other side of the coin was having different cultures in virtual reality help the students know the variety of cultures for example if we take language then the students will be learning the corresponding language which is included in the virtual reality which in turn provides knowledge to the student about a new language and helps them to increase there knowledge. Few scientists proved this correct by asking the student who uses virtual reality as an educational tool included different culture and they told knowing about a different culture and different language are very interesting. Hence they can say virtual reality is successful in making students to get a touch of diversity.

Hence they can say studying with virtual reality tools is very interesting at the same time student to get exposed to many different sectors he can broaden his thoughts by this and virtual reality helps to increase once communication skills and social skills that is if there are two persons of two different cultures, languages and they both are learning through virtual reality tool then if the culture involved is one of the person's culture he can help the other person to understand the culture used in virtual reality in this way two persons communicate each other hence they can increase their communication skills.

As virtual reality can recreate realistic situations which are very useful to create the stories present in holy books of different cultures which helps the new generations to understand more about their culture as everyone is unable to read holy books of their respective culture so the people with same culture or the people who want to learn the culture included in virtual reality can use this for religious practices. As there is more interaction and immersion present in virtual reality this is very useful to enrichen the religious-cultural practices.

Since most educators, learners are relying on virtual reality as there is no time for them to create content the content creator shouldn't misuse this and should keep cultural differences in mind and design the content.

Many researchers declare that VR learning can affect a lot in cultural knowledge that makes many people easily learn the foreign cultures. In 2008, Brien and Levy observed that the affordances of VR in language learning are playing a crucial role that impacts foreign cultures and provides an easy way to foreign language learners. So by using this virtual reality in language learning make people fast to learn a foreign language. The people who are learning the cultural experiences of the foreign countries become everyday learning with a native speaker. The researchers note that VR provides an interactive way to the language learners and provides a live experience.

Most of the reports said that students successfully learned the language by using virtual reality because virtual reality makes an interactive, new and meaningful experience throughout the learning process. Additionally, Virtual reality creates a virtual environment to collaborate and interact with peers to learn foreign cultures and languages. Students who want to learn can benefit more by using Virtual Reality.

Most of the people are enthusiastic to know foreign cultures. So many researchers have suggested that VR is also used to make an experience of artifacts, symbols, and cultural architectures. Virtual reality does not provide only a virtual environment to learn foreign languages but can also transmit cultural values. Due to this ability of VR, many religious scholars try to spread cultural practices by using this technology.

Virtual reality content is designed or created by third parties only. Third parties who designed the virtual reality content make sure that the content is resilientso that the end-users can customize it according to their cultures. It is the minimum requirement for virtual reality content designers to know their cultural biases.

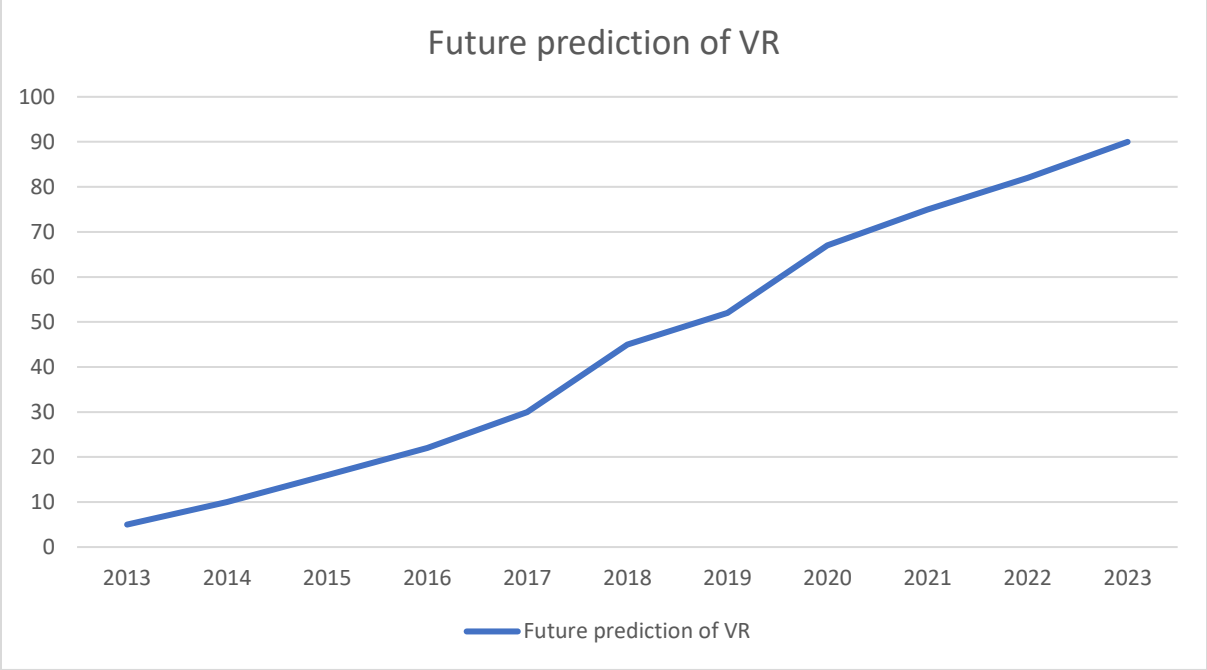

Figure 1. Future prediction of VR

4. Importance of VR in Cultural Bias

Several researchers had noticed that culture impacted VR in various ways. It becomes a powerful learning tool for users who want to learn a foreign language and their cultures to get better interaction. However, the researchers have noticed that VR is helpful in introducing the interactive environment of cultures. The main effect of VR is providing audio for language learning. This language defines their culture and gets the people to communicate with each other. This virtual environment provided by VR gives a clear knowledge of the cultures, religious symbols, politics, gestures, violences, and religious practices.

5. Conclusion

As a learning technology, Virtual Reality is increasing day by day. Many users can easily interact with these virtual environments to learn new languages and cultures. It creates a positive impact on language learners by including audio and visual effects. It makes the life of foreigners or tourists to communicate and interact with the new culture.

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Novel Perspectives of Security and Privacy Challenges in Virtual Reality Technologies

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Abstract: Virtual Reality era is making users smart day by day due to its limitless potential. Besides providing an immersive experience to the users, it has the robust aspect of providing medical inferences, emotional inferences also. Consequently VR needs huge amount of sensitive user information and direct interaction. In this paper we enumerate the risks involved from the security and privacy perspective while employing VR tools and show how the elements of risk involved in each VR tools can be minimized by modeling them as research challenge and discussing how privacy aware design principles can be incorporated during the manufacturing stage of such VR systems.

Keywords: Security, Privacy, Virtual Reality, Mixed Reality, Immersive

1. Introduction

As creating virtual reality headways are embraced by proficient work environments, including medical administrations components, for getting ready and various purposes, affiliations need to carefully consider the protection and security perils they present. Virtual reality wraps PC developments that reproduce conditions and license customers to work together in those conditions. While the protect and flying organizations have utilized virtual reality propels for flight entertainment getting ready and various purposes, virtual reality things are moreover ending up being logically well known with purchasers for gaming, similarly concerning planning and enlightening ventures in the medical consideration region. As these new progressions are being hustled to feature, the reasonable protection and security examinations are not being clung to or zeroed in on.

Expected protection and security concerns consolidate the risks of breaks inferring improperly guaranteed individual information that purchasers and various customers submit to the makers of virtual reality gear and related programming applications as a part of thing selection and portion measures. However, another risk is the hacking of records and other private information while the things are being utilized. You genuinely don't have even the remotest clue what it is that you might give, that might be recorded, and about you [such as] your geolocation that might be used for advancing purposes without your consent. Portion and individual information submitted to advancement and application dealers from inside the virtual reality stages could in like manner potentially be gotten to by developers, he says. We don't have even the remotest clue what is 'adequate,' to the extent security" with creating virtual reality things.

Augmented reality (AR) and virtual reality (VR) are firmly related however not the equivalent. Augmented reality improves or 'increases' this present reality by adding digital components – visual, hear-able, or tactile – to a certifiable view. Perhaps the most renowned instances of AR in late year was the well-known game Pokémon Go. On the other hand, as opposed to adding to the current world, virtual reality establishes its own digital climate. Virtual reality is normally capable through an interface, like a headset or goggles, rather than watching content on a screen. Mixed reality (MR) is like AR yet goes further by projecting 3D digital substance that is spatially mindful and responsive. With MR, clients can collaborate with and control both physical and virtual things and conditions – for instance, a virtual ball may skip off a genuine table or divider. The umbrella term for VR, AR, and MR is expanded reality (XR). The worldwide market for XR equipment, programming, and administrations is developing every year. Be that as it may, the quick ascent of these innovations has likewise left a few buyers thinking about what privacy and security issues they raise.

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2. Literature

VR dangers to clients fall extensively into three classifications: information assortment and surmising; actual damages; and control and infringement of vivid encounters. VR frameworks gather haptic along with camera data as input which could be utilized to construe or even treat medical conditions, improve reproductions, and drive benefits. Such data might be gathered in any event, when the client accepts the framework is off, as numerous headsets are "consistently on", empowering designers to acquire information without the clients' information. This information may then be offered to outsiders or be spilled through known weaknesses, which might have results, for example, adjusting the quality and estimating of labor and products promoted to clients. At long last, researchers estimate that virtual reality informal organizations will make a 'worldwide town' with more grounded talk and association than is accessible in current interpersonal organizations. While upgraded local area is an incredible expected advantage of VR, it likewise builds the danger of clients offering individual and delicate data to obscure and untrusted outsiders or being badgering. VR likewise empowers virtual violations (e.g., actual assaults on virtual characters, taking of digital products), which earlier work has found create compelling enthusiastic responses like certifiable wrongdoings. To secure against these dangers, early work has investigated safeguards for VR, including particular authentication frameworks for 3D conditions. While there has been no orderly investigation of dangers in VR, we call attention to comparable worries in AR as recorded above for VR, as well as raising worries about yield security: the uprightness of the clients' virtual experience.

While true research influences are probably not going to happen in virtual reality, virtual symbol portrayals of clients might become bystanders to different clients' encounters in VR. At long last, popular research work investigates strategies for fine-grained previsioning in AR, including the turn of events and assessment of "privacy goggles" that can assist clients with picturing the active information that AR frameworks can gather about them. The creators of this earlier AR work accentuate the significance of tending to AR dangers ahead of schedule, before issues happen ; we contend that the equivalent can be said to describe dangers in VR—particularly given that the more vivid feature attributes of the VR experience propels remarkably unique mental dangers as portrayed previously. A critical part to recognizing and focusing on the relief of VR dangers, and creating enactment and strategy assurances for VR clients, is understanding clients' and engineers' interests. Just one piece of earlier work, as far as anyone is concerned, has investigated client privacy and security discernments around VR: many researchers have. gathered online remarks regarding significant digital glasses and extra head-mounted gadgets (which incorporated few VR headsets) from gatherings, web-based media, and different sites.

3. Challenges with VR Systems for providing High degree of Security and Privacy

3.1. AR Challenges

One of the greatest saw risks of augmented reality concerns privacy. A client's privacy is in danger since AR innovations can perceive what the client is doing. AR gathers a ton of data regarding who the client is and what they are doing – to a lot more noteworthy degree than, for instance, web-based media organizations or different types of innovation. This brings up concerns and issues:

- In the event that programmers access a gadget, the possible loss of privacy is colossal.
- How do AR organizations use and secure the data they have accumulated from clients?
- Where do organizations store augmented reality information – locally on the gadget or in the cloud? In the event that the data is shipped off a cloud, is it encoded?
- Do AR organizations share this information with outsiders? Provided that this is true, how would they utilize it?

3.2. Content may be unreliable

AR programs work with the increase cycle, yet the substance is made and conveyed by outsider merchants and applications. This brings up the issue of instability as AR is a generally new space, and validated substance age and transmission instruments are as yet advancing. Modern programmers could substitute a client's AR for one of their own, deceptive individuals or giving bogus data. Different digital dangers can make the substance questionable regardless of whether the source is bona fide. These incorporate mocking, sniffing, and information control.

3.3. Social Engineering Attacks

Due to the possible aspect of untrustworthiness of content, augmented reality frameworks can be a successful apparatus for beguiling clients as a component of social designing assaults. For instance, programmers could misshape clients' impression of reality through counterfeit signs or shows to lead them into performing activities that advantage the programmers.

3.4. Malware

AR programmers can insert noxious substance into applications by means of promoting. Clueless clients might tap on advertisements that lead to prisoner sites or malware-tainted AR workers that house untrustworthy visuals – subverting AR security.

3.5. Theft of network credentials

Lawbreakers might take network qualifications off wearable gadgets running Android. For retailers who utilize augmented reality and virtual reality shopping applications, hacking could be a digital danger. Numerous clients as of now have their card subtleties and portable installment arrangements previously recorded in their client profiles. Programmers might access these and drain accounts quietly since versatile installment is a particularly consistent technique.

3.6. Denial of service

Another potential AR security assault is forswearing of administration. A model may include clients who depend on AR for work unexpectedly being cut off from the data stream they are getting. This would be particularly disturbing for experts utilizing the innovation to complete errands in basic circumstances, where not approaching data could have genuine outcomes. One model may be a specialist unexpectedly losing admittance to fundamental constant data on their AR glasses, or a driver out of nowhere neglecting to focus out and about in light of the fact that their AR windshield transforms into a dark screen.

3.7. Man-in-the-middle attacks

Organization aggressors can tune in on the interchanges between the AR program and the AR supplier, AR channel proprietors, and outsider workers. This can prompt man-in-the-center assaults.

3.8. Attacks related to Ransomware:

Programmers might access a client's augmented reality gadget and record their conduct and associations in the AR climate. Afterward, they might take steps to deliver these accounts freely except if the client pays a payment. This

could be humiliating or troubling for people who would prefer not to see their gaming and other AR communications disclosed.

3.9. Physical Harm

One of the main AR security weaknesses for wearable AR gadgets is actual harm. A few wearables are more tough than others, however all gadgets have actual weaknesses. Keeping them useful and secure – for instance, by not allowing somebody to wander off with a headset that can be handily lost or taken – is a fundamental part of wellbeing.

4. Future Directions

4.1. Cooperation with researchers can improve privacy and security aspects

Due to the introduction of mobile devices, new avenues for companies to gather information from; they're not generally restricted to web users browsing habits or interactions with user interfaces are developing day by day. Presently, they can follow users and even get feeds from smartphone cameras. Researchers have found that the smart wearables have given them access to a universe of data and IoT has gotten state of the art capabilities to induce high degree of sense arounf the complex environments.
These are insights companies never approached – something they couldn't want anything more than to use and adapt. The test presently will be to secure that information like some other personal information they gather – be transparent with regards to how they intend to store, process and mine such an information, and if and how they intend to share such information with outsiders. Be that as it may, users must be wary of the services they choose and how the information gathered would be handled.

4. 2. Exclusiveness in threat Model of Users

Our outcomes feature a solid occupation of local area for developers as well as for users. During our research study the users we met depicted the VR people group as close to nothing, select, and subsequently: safe. They had few worries regarding the security, privacy, or incitement later on anyway they were not at present worried considering the way that the local area was "pleasant" and "individuals aren't really like that." While the friendly thought of the customer local area causes users to have a sense of safety, such exclusivity has a downside: absence of assortment. Absence of assortment among development "innovators" is a known issue and fuels the computerized separation: assuming no "innovators" from specific gatherings of individuals are accessible, concerns these gatherings have may not be distinguished or watched out for, applications of the advancement that are essential to these gatherings may not be made, and these gatherings don't have a powerhouse to expand gathering of the advancement locally.

4.3. Support for Native Design

Also, the entire MR pipeline getting ready (of detection, transformation, and rendering as displayed) is getting executed by the real software entities and in an amazingly robust manner. They actually would need permission to recognizing UI to execute modules for detection, and to yield interfaces for rendering. At the point when given approval, AR applications, without a doubt, have endless permission related to those entities and their useful data. Neighborhood, working system level assistance for detection and rendering can give an entry control structure to ensure security and assurance of customer data. The studies have found that multiple level reflections have been proposed to "reveal just the data expected to [third-party] applications".

4.4. Guideline of Virtual Reality applications

Furthermore, the current VR gadgets and stages presently provide an engaging insight on what type of utilities those future gadgets will offer. Given the capacities of these gadgets, both in identifying and rendering, there are various worries on security and assurance that have been raised and should be tended to. For sure, real weaknesses have viably been uncovered especially on the various accessible MR applications For instance. Obviously, there is a prerequisite for rule, irrespective of the rule been applied on a smart gadgets or stages, or in a greater scope through a much severe standing and trust-based climate of utilizations.

5. Conclusion

This paper discusses the open issues which affect the latent security and privacy problems for a VR system user. We have scrutinized the aspects where privacy of user can be compromised and using the threat model, we have presented novel vision regarding mitigation of such threats. The privacy aware design of AR, VR, MR systems will eventually help the users gaining trust in such smart environments. Our paper will serve as a medium to increase the awareness among the VR users on how to experience the immersive environment without revealing sensitive information to a certain degree. This paper will also act as a quick review guide for VR System designers who want to work on the security and privacy dimensions of a VR ecosystem.

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A Content Analysis of Virtual Reality in Hospitality and Future Research Directions

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Abstract: Adoption of Virtual reality (VR) technology by hospitality industry is limited. Scholars have called for analysis on use of VR in hospitality settings. The literature analysing the impact of VR on tourism has focused on destinations, museums, heritage sites and theme parks. However, little empirical research has analysed the effectiveness of VR in the hotel industry. Some of the tourism sub sectors of social gaming, vacation industry education, destination site marketing, and ethnic heritage have adopted VR in different ways. However, there is limited systematic knowledge synthesized from academic research on VR in hospitality; the intersection of VR and research, the research methodologies and etymology of VR research in hospitality, and the evolving contexts of research of VR in hospitality. This paper aims to address these research gaps by undertaking a systematic literature review and synthesizing the research on VR in hospitality existing in published literature. This paper will build the foundation for future research by mapping existing findings and identifying research gaps in the theoretical basis and methodological approaches. To achieve the purposes of this study, the authors adopted content analysis methodology to examine the nature of service innovation. Given the paucity of available research on VR in the hospitality content, this content analysis adds to the prevailing literature by drawing attention to existing themes and critically examining important topics. The existing literature on research on VR in hospitality is predominantly limited to examining the effectiveness of consumer behavioral intentions by comparative analysis of the use of devices and content. Research on VR in hospitality is hence at stage of infancy with over 90% of the selected empirical studies published in 2019, 2020 and 2021. Almost all studies were conducted with college/University students with non-probabilistic, convenience methods of sampling and experimental/quasi experimental research design which creates the possibility of selective bias. Conclusions are drawn and future research directions are identified.

Keywords: Consumer, Hospitality, Hotel, Technology, Virtual Reality

1. Introduction

Virtual Reality can provide multi-sensory and authentic experiences in virtual environment of a Hotel's facilities which can be advantageous to Hotels and their consumers. VR can deliver cognitively involved and immersive experience of a Hotels environment to consumers which can stimulate their mental imagery and allow them to "travel" or get immersed into varied environments accompanied by sounds or stimulations by using a VR headset. The experience provided by VR is more profound than 2D or 3D and has a broader range of sensory stimulations ie vision, sound, and the proprioceptor-based sensations (sensation of falling, moving and looking around), ((Brakus et al., 2009; Sanchez-Vives & Slater, 2005). In context of hotel product, potential customers can have a deeper, sensory and emotional experience of the servicescape and facilities of the hotel in advance, through immersive VR visuals which can enhance the consumption experience by triggering cognitive, affective, sensory, attitudinal, and behavioral experience dimensions leading to higher level of receptiveness and immersion. (De Gauquier et al., 2018) Very few hotels have adopted VR till date. Some examples are as follows: Mariott International use of VR for marketing, product development, promoting the brand and enhancing the guest (Adamson, 2015); deployment of VR for brand strategy by Best Western Hotels & Resorts; promotion of "power shower" experience through VR video by Holiday Inn Express(Alister, 2017); use of VR Bluprint tool for better understanding of process of hotel design by Carlson Rezidor Hotel Group; providing hotel virtual tour as component of online communication mix by Shangri-La Hotels and Resorts and Atlantis Dubai. Scholars have called for further research into use of VR in hospitality settings (Wei, 2019). Prior research on use of VR in tourism has been focussed on museums (e.g. Errichiello et al., 2019), heritage locations (e.g. Marasco et al., 2018), tourist attractions (e.g. Tussyadiah et al., 2018) and theme parks (e.g. Wei et al., 2019). Studies into empirical evaluation of effectiveness of VR in the hotel industry have been undertaken by very few researchers like Bogicevic et al., (2019). Camilleri (2018) argues that accommodation is a central component of any travel or tourism decision, and tourist attractions like museums and heritage sites are ancillary products.

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Selection of a hotel entails higher perceived risk and uncertainty since tourist experiences of hotels are usually longer, entail higher financial outlay and involve more activities than other products, (Sun, 2014). The information search stage is of higher significance and value added to the overall journey as compared to other activities since the hotel experience is dominated by instrumental value vis a vis activities like sightseeing which pre-dominantly deliver hedonic value(Prebensen & Rosengren, 2016). VR has been used by various subsectors of Tourism such as Tourism education, destination sites marketing, gamification of tourist experiences, and museum and heritage sites experiences. However, a systematic review of knowledge created from empirical research on VR in hospitality is inaccessible in literature. This study aims to investigate the scope of use of VR in hospitality, theoretical perspectives and methodological approaches adopted by researchers and the emerging contexts for VR in hospitality research.

1.1. Purpose of the Study

This paper aims to identify the research gaps through a systematic literature review on use of VR in hospitality and categorize the empirical research undertaken till date to lay the groundwork for future research.

1.2. Research Questions

The research questions that this study therefore aims to address are:

1. Which are the contexts of research of VR in hospitality?
2. Which are the forms of VR which have been investigated in hospitality research?
3. What re the etymological perspectives and research methodologies used by scholars to research VR in hotels?
4. Which research gaps in VR hotel context need to be addressed?

2. Methodology

Articles for review were selected through a systematic method which is explicit and replicable (Pickering & Byrne, 2013). Articles were initially searched through keywords “augmented reality" or "virtual reality" or "virtual world" or "virtual environment" in combination with “Hotel”, “Hospitality”, from the titles, keywords and abstracts of indexed articles with Google scholar search engine which includes articles from indexed databases of Elsevier, Wiley, Taylor and Francis, Emerald, Sage, Routledge, IGI global and Inder science. Only articles from journals relevant to ‘hospitality’ and “VR” were listed. Due to the emerging nature of VR in hospitality research, search was not limited to a time span to allow for a more comprehensive mapping of the theme. Results of the literature search are outlined in Figure 1.0. The authors employed content analysis method to achieve the aims of the study. Through content analysis patterns can be discovered and established in existing research and theories. (Kolbe and Burnett, 1991). Due to the scarce number of published research on VR in hospitality context, content analysis enables researcher to contribute to the extant literature by drawing research attention critical evaluation of important topics. Table 1.0 is a summary of the 9 articles on use of VR and AR in hospitality which were published in peer-reviewed journals (listed in Table 2.0). Records were extracted through initial search of indexed databases (n = 345), removal of duplicates (n =34), screening for inclusion criteria and exclusion of articles which did not meet the criteria (n = 296). Full-text articles were assessed for eligibility (n = 15) and excluded based on valid reasons (n = 6). Eligible studies which met the criteria were included for this study (n = 9). Most articles were published by International Journal of Hospitality Management (IJHM), (33%) and Journal of Hospitality and Tourism Research (22.22 %). One each was published by other journals (Table 2.0).

Table 1.0 Summary of articles selected for review

Authors	Year	Sampling Method	Research Design	Theoretical Model	Data Analytic Technique	Constructs	Outcomes
Orús, C., Ibáñez-Sánchez, S., & Flavián, C.	2021	convenience sample of 206 college students, Spain	lab Experiment	NA	MANCOVA	Visual appeal; presence	Intention to book hotel
G. Zeng, et al.	2020	university Students with online hotel booking experiences, China	Experimental design with hotel websites	Dual coding theory	between subjects ANOVA	sense of presence, Immersion, perceived usefulness	visit intentions
Bogicevic, V., Liu, S.Q., Seo, S., Kandampully, J., Rudd, N.A.	2021	US consumers experienced with extended stay hotels.	hotel-themed virtual reality app with content of the hotel ie 360-degree images.	Trait technology innovativeness	one-way ANOVA, PROCESS MACRO	Technology Innovativeness (moderator) ;Perceived coolness; Self brand connection	hotel brand visit intentions
Lee, O., & Oh, J.-E.	2007	S korea university students	Experiment/51 responses Linear regression		regression	psychological anxiety	perceived psychological releif
Israel, K., Zerres, C., & Tscheulin, D. K.	2019	University students and non - students in Germany	laboratory experiment/Questionnaire	Embodiment-Presence-Interactivity Cube	PLS 3.0 SEM	Curiosity, Perceived enjoyment, perceived usefulness, Telepresence	intention to recommend;
Bogicevic, V., Seo, S., Kandampully, J.A., Liu, S.Q., Rudd, N.A.	2019	students, faculty, and staff in , USA		—mental imagery and sense of presence	SEM	Mental imagery; sense of presence; experience	Tourist brand experience
Leung, X.Y., Lyu, J., Bai, B.	2020	University students, China	2*2 experimental design	perceptual load theory and elaboration likelihood model	SEM		Ad recognition and attitude, brand attitude, intention to purchase.
McLean, G., & Barhorst, J. B.	2021	University/ UK	experiment and Questionnaire			Authentic Experience; Mental Imagery processing; mental Imagery quality ;	visit intention; satisfaction; intention to revisit
Slevitch, L., Chandrasekera, T., & Sealy, M. D.	2020	University students, USA	A quasi-experimental study 2D and VR formats	cognitive load theory (CLT)	non parametric	2D vs VR	cognitive load, Responses (affective, attitudinal, behavioral)

Table 2.0 Journals

Journal	Frequency
International Journal of Hospitality Management,	3
Journal of Hospitality and Tourism research	2
Cyber Psychology & Behavior	1
Annals of Tourism Research	1
Journal of Hospitality and Tourism Technology	1
Journal of Travel research	1

The customer journey map is the conceptual approach adopted for this review study. VR technologies can be used for creating marketing experiences for hotels (Buhalis et al., 2019) and applied for engaging consumers during their consumption process (Bec et al., 2019; Flavián et al., 2019a) and producing value added experience. In the pre-purchase stage, VR can provide a visual and immersive experience to potential customers (Neuburger et al., 2018), which can alleviate perceived uncertainty and perceived risk associated with buying the hotel product (Bogicevic et al., 2019). In the experience stage, VR can provide information about tourist attractions and activities for pre viewing and decision making or as a form of escapism for guests (Errichiello et al., 2019). Guests can record 360-degree videos of their experience in the hotel experience which can be shared as VR pre experience with other potential guests and also for reliving the experience in the post experience stage.

3. Findings and Discussion

The review of select articles shows that literature on VR in hospitality is dominated by studies on effectiveness of VR devices, applications and visuals in influencing consumer behavioural intentions. For example, Israel., (2019), in their study, compared VR headsets and head-mounted displays (HMD) effectiveness (Israel et al., 2019); while other studies compared impact of VR HMD with other devices on potential guests hotel purchase or visit intentions (Bogicevic, Liu et al., 2021; Bogicevic, Seo, Kandampully, Liu, and Rudd, 2019; Flavi´an et al., 2020; Leung, Lyu, and Bai, 2020; with smartphone based virtual reality systems (SBVRs), (Israel et al., 2019). one study evaluates integrated impact of VR and textual online reviews on hotel booking intentions (Zeng, Cao, Lin, and Xiao, 2020). Thus, research on VR in hospitality is mostly limited to the pre-purchase stage of the customer journey and evaluation of the effectiveness of devices and psychological and emotional experiences (for exp., perceived enjoyment, mental imagery, perceived coolness, perceived usefulness, sense of presence) in determining hotel booking/visit/revisit intentions and/or brand engagement.

Research on VR in hospitality is at stage of infancy with over 90% empirical studies published in 2019, 2020 and 2021. Almost all studies are conducted with college/University students with non-probabilistic, convenience methods of sampling and experimental/quasi experimental research design. Almost all studies employ an experimental research design and collect responses through questionnaires (except for study by which are then analysed through Structural equation modelling using Smart PLS or AMOS software. Most of the studies have adopted a multi-theoretic approach by combining constructs (perceived ease of use and perceived usefulness) from consumer technology adoption models (TAM; Davis, 1989; UTAUT2; Venkatesh et al. 2012;) with psychological, cognitive, affective and behavioural constructs from cognitive neuroscience (Mental imagery, Curiosity, Tele presence, Authentic Experience; Quality of mental Imagery , Cognitive Processing of Mental Imagery; Psychology (psychological anxiety, Perceived enjoyment, Immersion, perceived coolness, Self brand connection; sense of presence; tele presence); personality trait(Technology Innovativeness as a “moderator”); Technology embodiment (theory of technological mediation ;Ihde, 1990); behaviour (online reviews); Motivation (curiosity) which are empirically evaluated as direct and indirect precursors of consumer outcomes of Behavioral intentions of hotel booking, intention to recommend), visit intention; satisfaction with hotel appearance; revisit intentions in VR mediated environment.

One study by Leung et al, addresses the comparative impact of 3D and 2D devices on advertising recognition and attitude, brand attitude, and purchase intention. However Israel et al., (2019) in their study have used the Embodiment-Presence-Interactivity Cube (EPI Cube by Flavián et al., 2019) which positions AR-VR technologies on a continuum and envisions a three dimensional model for constructing service products and experiences using immersive technologies like VR/AR. Definition of VR in academic literature varies with the technologies, conceptual approach, and theoretical perspective (Gibson & O’Rawe, 2017). Steuer (1992) defined VR as a “simulated environment in which a perceiver experiences telepresence”. Telepresence is determined by vividness and interactivity and occurs when the sense of presence is experienced by a user in the VR-presented environment. Guttentag (2010) defined VR as “the use of a computer-generated 3D environment that one can navigate and possibly interact with, resulting in real-time simulation of one or more of the user’s five senses”. User control is a key attribute of VR. Guttentag (2010) pointed that “navigation,” “immersion,” and “interaction” were key definitional attributes of VR. According to Wiltshier and Clarke (2015), “the essential feature of VR is ability to navigate and interact with the VR environment”. However Yung and Khoo-Lattimore (2019) warned about the inconsistency in definitions in existing VR research. However, Steuer’s (1992) definition of VR is most commonly used in empirical studies reviewed.

4. Conclusions and future research directions

The consumer journey and decision making theoretic framework has been adopted in almost all selected articles and the studies are mostly focussed on the pre-experience or pre-purchase stage of the CDM. The extant literature has ignored the effectiveness of different preview styles and technologies across the different stages of the consumer purchase journey barring one study which was on post purchase stage of customer journey by Mclean, (2021).
Some of the research questions for future research on VR in Hospitality are:

- What are the drivers of consumer BI, customer loyalty and revisit intentions in the consumption and post consumption stage
- How do senses of sound, hearing, taste, smell, and touch interact with visual sense in VR and what are the related consumer outcomes in Hotel consumption context?
- What are the emotional, social and relationship dimensions of customer experience in technology mediated environment of VR and AR.
- What are the socio-demographic and psychological factors which moderate consumer experience in VR and AR mediated environment while consuming hospitality services?
- What are the potential applications of VR in Hotels?
- Are the integrated realities i.e. AR and VR perceived similarly?
- How do the perceived realities influence the customer's experience?
- What are the users' dominant responses (emotional, cognitive,sensorial) in VR/AR
- How does VR/AR drive customer behaviour for example loyalty intentions?
- What factors will drive VR and AR adoption?
- Do VR and AR complement or substitute real experiences? How does VR affect real hotel experience?
- Alternative theoretical approaches can be considered for example (Flow theory, Mihaly Csikszentmihalyi, 1970), service experience theories (S_D logic-Vargo and Lusch, 2008; Consumption experience (Holbrook and Hirschman, 1982) for generating consumer insights.
- Future studies with alternate devices (for example wearables, embedded devices), technology mediated environments of AR and MR, and varied applications for exp. Gamification could contribute to better understanding of consumer behaviour and use of VR in hospitality context.

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ELT Teachers' Perceptions Regarding the Use of Augmented Reality in English Language Teaching

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Abstract: With its advantage of enhanced academic achievement, improved performance, increased motivation and in a multimedia-enriched, interactive authentic language learning environment, Augmented reality (AR) has been lately used in English language teaching (ELT) to teach both four skills, vocabulary and grammar. Compared to other types of technologies such as computers and the internet, AR can be considered as a new kind of technology for ELT teachers to be known and made use of while teaching in ELT. However, to use it pedagogically effectively and technically efficiently, teachers should be equipped well with how to integrate it into their lessons. The present study aimed to find out the perceptions of ELT teachers related to the use of AR in ELT. It was designed as a mixed-method study and conducted with eleven Turkish ELT teachers. The data were collected through a questionnaire prepared by the researchers. The quantitative data were analyzed with descriptive statistics, while the qualitative data were content analyzed. According to the findings of the present study, six of the participants were found to be aware of the use of AR in education and/or ELT. None of the participants reported having received any pre-service and in-service training about the use of AR in education, so all of them wanted to participate in any prospective in-service training on the use of AR in ELT. The findings of the study also indicated that five participants knew what AR was, and seven participants considered AR as beneficial for ELT. The findings were discussed, pedagogical implications of the study were mentioned, and suggestions for further research were made.

Keywords: Augmented Reality, English Language Teaching, ELT Teachers, Perceptions

1. Introduction

Latest developments in computer and information technologies have correspondingly required to make arrangements in teaching materials to meet the needs of today's learners who are recognized to be highly technology addicted. In fact, not only these individuals' interests towards and needs of technology but also the facilities that these technologies enable attract teachers as well. Technology use in education has great benefits to the process of teaching and learning such as increased achievement, performance, concentration and motivation, but also it facilitates teaching of some issues and concepts. One of these technologies which attract teachers and learners is Augmented Reality (AR), which offers new opportunities to enrich and brings attraction to our learning environments. AR is a technology in which computer-generated three-dimensional virtual objects are simultaneously integrated into real life (Azuma, 1997).

According to Billinghurst, Kato, and Poupyrev (2001), AR allows users to interact directly with 3D virtual objects in the real world with the aid of a handheld computer, computer monitor or a head-mounted display device. For creating a mixed reality environment, AR makes use of image recognition technology by using virtual and real objects as if they are together in the same physical environment. Thus, any information in the real environment could be enriched with the addition of virtual images. Although AR technology has been proven by various studies to be effective for acquisition (Altmeyer et al., 2020; Lampropoulos et al., 2020), learning (Son, 2021), and academic achievement (Afnan et al., 202; Ibáñez et al., 2020), it should be kept in mind that learning environments should be structured and designed in accordance with the use of this technology as it is an inevitable fact that this technology will change the learning environments greatly in the future.

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1.1. Use of Augmented Reality in Foreign Language Teaching

Augmented Reality technology is also used in language teaching and learning. It enables EFL learners to study innovative multimedia-enriched learning and practice and allows their interaction with the virtual information within physical settings (Chen et al., 2020). Thus, language learners can study four skills, vocabulary, grammar, and pronunciation in a more interactive and enriched language learning environment. They can visualize new vocabulary through it, interact with these words, and hear their pronunciation (Chen et al., 2018; Lee et al., 2017; Lee et al., 2019; Nugraha et al., 2019) and improve their grammar in a meaningful context (Aguirregoitia Martínez et al., 2017). Learners can listen to reading passages via an AR application in the target language (Dünser & Hornecker, 2007) and practice writing in language teaching (Boonbrahm et al., 2015). According to Solak and Çakır (2015), the correlation between the motivation and academic achievement of the students in a language classroom supported by AR technology. Santos et al. (2016) found that this technology augments retention of vocabulary and improves student attention and satisfaction.

There are AR-based educational games as well developed for practising language skills such as Spanish like the game 'Mentira' (Holden & Sykes, 2011). With this game, one can get together with other players and individuals who speak Spanish as their mother tongue simulated in a Spanish-speaking environment. There is also a LangAR application that encourages real-time contextual vocabulary learning with augmented reality technology (Goodwin-Jones, 2016). The use of AR with its advantages offers great opportunities to language learners with audio, video, animation, and 3D images-based learning environments, which facilitates learning English in an authentic context. It also supports teachers' work while teaching abstract concepts, some issues that would not always be possible to teach in the classroom.

1.2. Attitudes towards the Use of Augmented Reality in Foreign Language Teaching

Being an attractive and motivating learning experience, students develop positive perceptions and attitudes towards learning within an AR-enriched learning environment. As for language learning, this technology provides a multimedia-enriched language learning and practice environment for learners. Gündoğmuş et al. (2016) found in their study that the attitudes of the students learning English through an AR application towards the application were positive. Also, they did not feel uncomfortable during the lessons, enjoyed the lessons, and intended to use this technology in the future for other lessons and subjects because it attracted their attention and increased their motivation (Gündoğmuş et al., 2016). This finding was supported with other studies in the literature (Allagui, 2021: Chen et al., 2020). Similarly, Taşkıran (2019) found that the EFL learners had positive attitudes towards the use of the AR-based learning materials in their English language classes.

The present study aimed to find out the perceptions of the Turkish ELT teachers related to the use of AR technology in ELT by answering the research questions below:

1. Have the Turkish ELT teachers heard of the use of AR technology in education?
2. Have the Turkish ELT teachers heard of the use of AR technology in ELT?
3. Have the Turkish ELT teachers used AR technology to teach English in their English language classes?
4. Have the Turkish ELT teachers received any pre-service training about how to use AR technology in ELT?
5. Have the Turkish ELT teachers received any in-service training about how to use AR technology in ELT?
6. Do the Turkish ELT teachers want to take an in-service course about the use of AR technology in ELT?
7. What do the Turkish ELT teachers know about AR technology?
8. What do the Turkish ELT teachers think about the use of AR technology in education?
9. What do the Turkish ELT teachers think about the use of AR technology in ELT?

2. Methodology

2.1. Research Design

The present study employed mixed methods research because it utilized quantitative and qualitative research approaches as Creswell (2009) explained that mixed-methods research uses quantitative and qualitative research approaches together.

2.2. Participants

Eleven Turkish ELT teachers (4 males and 7 females) who worked in a Turkish university participated in the present research. Their ages were between 26 and 46, and the lengths of their teaching experience ranged from one year to 20 years.

2.3. Data Collection Tool

The data were collected through a questionnaire which was developed by the researchers and was composed of three sections. The first section included three demographic questions about the ages, genders, years of teaching experiences of the participants. The second section included six closed-ended questions.

The closed-ended questions asked about:

a) whether the participants have heard of the use of AR technology in education,
b) whether the participants have heard of the use of AR technology in ELT,
c) whether the participants have used AR technology to teach English in their English language classes,
d) whether the participants have received any pre-service training about how to use AR technology in ELT,
e) whether the participants have received any in-service training about how to use AR technology in ELT, and
f) whether the participants would like to participate if there was an opportunity to take an in-service course about the use of AR technology in ELT.

The third section included three open-ended questions. The open-ended questions asked about:

1. what the participants knew about AR technology,
2. what the participants thought about the use of AR technology in education, and
3. what the participants thought about the use of AR technology in ELT.

2.4. Data Analysis

The quantitative data were analyzed through descriptive statistics. The Cronbach's Alpha coefficient of the closed-ended questions was 0,716. The qualitative data were analyzed through content-analysis. First, both participants read the data many times and derived codes from the data. Second, they categorized codes under the themes depending on the similarities and differences between the codes. Third, they organized and presented the data according to the themes without adding their own comments. Fourth, they interpreted the data without conflicting with it. To make the qualitative data analysis trustworthy, thick description was used.

3. Findings

The research questions of the present study were categorized as quantitative questions and qualitative questions to organize the findings of the present study, so the findings of the present study were presented as the quantitative findings and qualitative findings.

3.1. Quantitative findings

Table 1 below presents the descriptive statistics of the research questions 1, 2, 3, 4, 5, and 6.

Table 1. The descriptive statistics of the research questions 1, 2, 3, 4, 5, and 6

Research questions	Yes		No	
	f	%	f	%
1. Have the Turkish ELT teachers heard of the use of AR technology in education?	6	54,5	5	45,5
2. Have the Turkish ELT teachers ELT heard of the use of AR technology in ELT?	4	36,4	7	63,6
3. Have the Turkish ELT teachers used AR technology to teach English in their English language classes?	4	36,4	7	63,6
4. Have the Turkish ELT teachers received any pre-service training about how to use AR technology in ELT?	0	0	11	100
5. Have the Turkish ELT teachers received any in-service training about how to use AR technology in ELT?	0	0	11	100
6. Would the Turkish ELT teachers like to participate if there is an opportunity to take an in-service course about the use of AR technology in ELT?	11	100	0	0

According to Table 1, 54,5% of the participants have heard of the use of AR technology in education, while 45,5% of them have not heard of it. Though four participants have heard of the use of AR technology in ELT, seven participants have not heard of the use of AR technology in ELT. 36,4% of the participants have used AR technology to teach English in their English language classes, but 63,6% of the participants have not used it. None of the participants (*f*=11) have received any pre-service and in-service training about how to use AR technology in ELT. All participants would like to participate if there is an opportunity to take an in-service course about the use of AR technology in ELT.

3.2. Qualitative analysis

The content analysis of the qualitative data was presented in Table 2 below.

Table 2. The content analysis of the research questions 7, 8, and 9

Themes	Codes
Knowledge about AR technology	Combining the real world with virtual reality
	Teaching vocabulary
	Promoting products
	Relatively new technology
Thoughts about the use of AR technology in education	Being effective and useful in education and/or language learning
	Effective for new generation
	Suitable for all age groups
	Making lessons more interesting and accessible
	Facilitating learning
	Having potential
	Future of education
	A good opportunity for education
Thoughts about the use of AR technology in ELT	Being motivating and effective in language learning
	Effective for language learning activities
	Vocabulary teaching
	Providing more teaching opportunities
	Overcoming teaching barriers

In terms of *the knowledge about AR technology*, according to Table 1, *combining the real world with virtual reality* is what five participants know about AR technology though three participants state they do not know anything about AR technology. To illustrate:

- Participant 1: "I know that it's combining teaching/real life objects with the use of technology/virtual reality."
- Participant 4: "It [AR technology] uses sensors and CPU power to create images around us."
- Participant 6: "I know that it [AR technology] is a digital content which stimulates real-world environment."
- Participant 10: "It [AR technology] is a kind of technology that enhances how we experience reality. It combines reality with graphics, video, sound created by computers. In other words, it combines physical reality with virtual reality."

Participant 2 knows that AR technology can be used to *teach vocabulary* as understood from her statement "It [AR technology] is an effective method for teaching specific skills. Making students prepared to the unknown words is a useful way to motivate them by using Augmented Reality Technology." Also, participant 3 knows that AR technology can be used to *promote products* as seen in her statement "I know some programmes or organizations promote their products by using augmented reality tech." In addition, participant 9 knows that AR technology is *a relatively new technology* as his statement "I know it [AR technology] is a relatively new technology that is being integrated in many areas of education."

In terms of the thoughts about the use of AR technology in education, four participants think that AR technology is effective and useful in education and/or language learning. The quotations below indicate this.

- Participant 6: "It [AR technology] would be very useful in learning a language new language. Creating a real-world environment for students to practice using a new language would be wonderful."
- Participant 9: "It [AR technology] could be quite effective in language classes if the curriculums are designed suitably and if the teachers are given same training. It can be useful in engaging students."
- Participant 10: "It [AR technology] would be perfect…"

Participant 1 who says "In our lives, with our new-generation learners who are submerged in technology, it's more effective to use AR for learning" thinks that AR technology is *effective for new generation*. Also, participant 2 thinks that AR technology is *suitable for all age groups, makes lessons more effective,* and *facilitates learning* as her statements "[AR technology is] used for every age group. Different subjects become interesting. [AR technology] helps and facilitates learning process. [AR technology] makes limited subject more accessible" support this. In addition, participant 4 thinks that AR technology *has potential* to be used in education, participant 7 thinks that AR technology *is the future of education,* and participant 8 believes that AR technology *is a good opportunity for education*, while participants 3 and 5 report that they do not have any idea about the use of AR technology in education.

In terms of *the thoughts about the use of AR technology in ELT*, participants 1, 2, 4, 7, 9, 10, and 11 think that AR technology can be used effectively in ELT, while participants 3, 5, 6, and 8 do not have any idea about the use of AR technology in ELT. Four participants think that AR technology *can be motivating and effective in language learning*. To illustrate:

- Participant 1: "It [AR technology] would be really motivating and effective especially while studying vocabulary."
- Participant 2: "I personally believe that using visual aids makes students more prepared and more motivated since they can link themselves with the subject by visualizing and creating a different perspective in terms of learning a new language."
- Participant 4: "It [AR technology] might help learners in English language learning. Interacting with objects around them will be beneficial."
- Participant 7 thinks that AR technology can be effective for language learning activities as understood from her statement "Aug. reality can be very effective while doing controlled or semi-controlled practices during a class." Also, participant 9 thinks that AR technology can be used to teach vocabulary in ELT. The quotation below shows this.

- Participant 9: "Especially in vocabulary classes. I believe it [AR technology] can come in handy. I saw some videos on YouTube in which teachers used AR to show the different verb forms in different tenses with fun activities. It could be a gamechanger if applied well."

In addition, participant 10 thinks that AR technology can *provide more teaching opportunities* and *overcome teaching barriers*. The quotation below shows this.

- Participant 10: "It [AR technology] would be perfect as it would increase opportunities to teach language. It could also eliminate the barriers to language teaching by making the process more natural."

4. Discussion

One of the findings of the present study is that less than half of the participant Turkish ELT teachers are aware of the use of AR technology in ELT and have used it in their English language classes. This finding may stem from the lack of pre-service and in-service training about how to use AR technology in education as the findings of the present study have revealed that none of the participants received any pre-service and in-service training regarding the use of AR technology in ELT. Thus, the lack of pre-service and in-service training may have caused them not to have enough skills, experience and/or knowledge required to use the AR technology in their English language classes, which may have affected the use of AR technology in teaching English negatively. However, the participant Turkish ELT teachers are willing to compensate for their lack of pre-service and in-service training on the use of AR technology in ELT since one of the findings of the present study has indicated that all participants want to receive in-service training on it; thus, they can be aware of the increasing importance of AR technology in education and its benefits for teaching English in their classes.

The qualitative findings of the present study have revealed that most of the participants know that AR technology combines the real world with virtual reality, is a relatively new technology, and can be used to teach particularly vocabulary though they may not have enough knowledge and skills to use AR technology in their English language classes and despite the low number of the participants who have heard of the use of AR technology in ELT and who have used it in their classes. This finding may result from the popularity of AR technology in other fields such as marketing and shopping. Another qualitative finding of the present study is that the participant ELT teachers have positive thoughts about the use of AR technology in both education and ELT despite their lack of pre-service and in-service training on the use of AR technology in ELT. This finding can be the reason why the participant ELT teachers would like to receive in-service training on the use of AR technology in ELT, that is, the participants are aware that they don't have enough skills and knowledge on the use of AR technology in ELT, so they probably hesitate. However, they have positive thoughts towards it, which may lead them to use AR technology to teach English to their students.

5. Conclusion

The present study aimed to find out the Turkish ELT teachers' perceptions about the use of AR technology in ELT. Its quantitative findings have indicated that more than half participants have not heard of and used the AR technology in ELT, none of them have received any training on it, and all have wanted to be trained on it. The qualitative findings have shown that the participants have positive thoughts about it and know AR technology to some extent. Both the quantitative and qualitative findings of the present study have the following pedagogical implications:

1. Universities should include AR technology in their pre-service English language teacher education programs.
2. Schools and universities should organize in-service training programs for ELT teachers on how to use AR technology in education.
3. The use of AR technology should be promoted in English language classes by providing the necessary equipment and infrastructure.

Having been conducted at a higher education context and having eleven participants are the limitations of the present study; therefore, its findings cannot be generalized. Yet, to have a more comprehensive understanding of the phenomenon under investigation in this study, further studies can be made with more participants in different contexts such as primary schools, middle schools, high schools, and universities in Turkey or in different countries by following the methodology of the present study. Pre-service English language teacher education programs can be evaluated in terms of their inclusiveness of emerging technologies such as AR technology in further studies. In addition, a pre-service or in-service course can be developed on the use of AR technology in ELT, and its effects on ELT teachers can be searched in further studies.

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Virtual Museum of Harran School

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Abstract: The main objective of this project is to introduce the medieval Harran School to the whole world using virtual reality technologies. 3D models of the medieval castle and one of its big halls obtained by photogrammetric methods were transferred to Unity Engine. In the hall, 3D models of objects used in ancient times and found during excavation works on the side were added. Necessary objects and lighting and visuals of great Islamic scholars were added to create a museum environment in the hall. It was transferred to the virtual reality environment with the Unity game engine. Currently, this virtual environment can be consumed by PC based head-mounted devices while works for an Android application are still going on.

Keywords: Virtual Reality, Virtual Museum, Harran School

1. Introduction

After the schools of philosophy in Alexandria were closed philosophers moved to Harran and thus, creating the "Harran School" started the golden age of Islam (Menemencioglu, 2007). The most important names to be mentioned are Jabir Kura, Al-Battani, Jabir Bin-Bayan and Ibn Teyime. Al-Battani had a great impact on the works of Copernicus who gives frequently reference to him. It ended in 1258 with the Mongol invasions and the Siege of Baghdad. This in turn led to the escape of philosophers and scientists to Italy giving birth to the Renaissance. The recently established Umbrella Group of Harran School is trying to bring the importance of this Harran School in transferring knowledge from the antique to the centers of Islamic science in Harran and Bagdad and finally to the West (Harran University, 2019). Anatolia, which has hosted many civilizations from prehistoric times to the present, is home to rich artifacts and traces from many cultures, which are considered as cultural heritage. Today, the task of storing, preserving, protecting and exhibiting cultural heritage is mostly done in museums. However, with the rapid development of technologies such as computer animation, photography, laser scanning and virtual reality, it is now possible to store and display the cultural heritage in virtual environments. Basic archaeological documentation processes are now also called digital documentation or modelling. Today, societies are moving towards a common cultural heritage as a result of the multidisciplinary use of such technologies. As a result of these developments, "cultural heritage products" in museums, which are among the cultural assets of the world, are presented to the common use and sharing of humanity in an enriched visual structure. Thus, museums turn into universal exhibition halls in a virtual environment (Alav et al. 2005).

The three-dimensional nature of the real world increases the need for three-dimensional visualization on computers. Three-dimensional images attract more attention and provide the most realistic visualization. Today, many 3D modelling programs allow for the interactive creatıon of such modles. They give the opportunity to look around easily by rotating the models around any axis and also to obtain moving images of the model (Uğur 2002). In this context, photogrammetry technique is a method that has been used for years for archaeological measurements and documentation and 3D modeling of historical artifacts. With the development of digital techniques, photogrammetry has become a more efficient and economical method for the documentation and preservation of architectural works (Ulvi 2008). Yıldırım (2012) determined the extent to which the Topkapı Palace Museum currently benefits from information technologies and considering the applications used in well-known museums of the world.

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The findings served the writing of recommendations for the best usage of its assets by means of the most current technologies. Ünlü (2010) conducted a study aiming to bring some sample suggestions for the web pages related to Turkey's museums that the Ministry of Culture and Tourism will publish in the future. This resulted in the setting-up of a section, in which 47 virtual museums are presented (T.C. Kültür ve Turizm Bakanlığı, 2021). The Hafencity University Hamburg in cooperation with the Museum Alt-Segeberger Bürgerhaus developed a VR application for a virtual museum to bring a in the Early Modern Age setting (around 1600) again to life. Focus of this application was to show how a representative house of this small town in Northern Germany evolved over time to become a museum eventually. The data basis of this project consists of digital terrain models and 3D models produced by means of photogrammetry and laser scanning techniques. Information related to the history and technical details of the building could explored interactively using a head-mounted-display (HMD) of HTC VIVE (Deggim et al., 2017) Yakar and Yılmaz (2008) stated that there are many advantages of using digital terrestrial photogrammetry in the preservation and documentation of cultural heritage based on their field works and studies of Horozlu Han in Konya. They showed how the preparation of relief plans, restitution and restoration plans can contribute to transferring cultural heritage to future generations. Uysal et al. (2013) mention the importance of studies be done on behalf of humanity to protect its historical and cultural heritage and transfer it to future generations, and that different methods can be used to produce three-dimensional models for the protection and promotion of archaeological artifacts. They showed that UAVs can be used efficiently in photogrammetric survey studies for archaeological sites.

Within the framework of different excavation projects Önal (2019a, 2019b, 2019d) could demonstrate how developed Harran city during the middle age was. For example, the Çarşı Hamam, which was unearthed to the east of Harran Great Mosque (Ulu Mosque), consist of changing rooms, rooms with warm water and those with hot water. The remains have largely been preserved. Also, he created a restitution plan of the mentioned bath. This plan can be utilized for animations that displays details of the original architecture. Again, in the east of Ulu Mosque, a bazar together with many artefacts was excavated. Among them different pottery, glass, and metal objects could be retrieved and were made available for converting into digital three-dimensional objects. Within the Inner Castle, the bathrooms of this former palace were unearthed. The documentation of this bath, most of which are still standing, could relative easily be used for an animation about everyday life of Harran City.

In his book “Mythology and History of Harran”, Ekinci (2008) gives detailed information about the history, social structure and religious differences within the city of Harran. Such information is essential for a museum for explaining the background of different objects and putting them into the right display settings of a museum. Building a new museum from scratch is a big undertaking requiring a lot of resources – and not only financial ones. According to Walhimer (2015) who has been charged with the opening of many museums, the construction of a new museum building including everything covering a space of 1000 square meters would cost about USD 2,5 million. And after everything is ready yearly operating costs of about USD 360000 have to be covered as well. A virtual museum can be defined as “a digital entity that draws on the characteristics of a museum, in order to complement, enhance, or augment the museum experience through personalization, interactivity and richness of content.” (Wikipedia, 2021). The release of an application on a CD-ROM by Apple Computer, Inc. in 1992 can be regarded as the starting point of virtual museums (Miller et al., 1992). This and other of the first implementations of virtual museums followed the broader concept of virtuality without having reached the level of virtual reality.

Considering the above-mentioned financial numbers and the fact that such a budget would not be available in the near future it was decided to start with a virtual implementation of the envisaged Harran Museum and with triggering events that could lead to its physical implementation eventually. Correspondingly, the purpose of this project named “First Step for the Establishment of a Harran School Museum” comprised the following:

1. Detection of the current state of the Harran archaeological site using high resolution camera and photogrammetry methods,
2. Simulation of Haran's medieval city,
3. Data collection and interpretation for the Harran School Museum, and
4. Components 1,2 and 3 to be exhibited in a virtual museum that can be visited by members of virtual reality devices.

Due to a very limited budget works on the second component could not be realized during this project. Within this paper, only the fourth component will be explained in more detail.

2. Methodology

2.1. Detection of the current state of the Harran archaeological site

In this study, SfM Photogrammetry has been used to make scaled and realistically textured models of buildings within an archaeological sites and artefacts that had been excavated there. It should be remembered that while the quality of textured 3d model depends on the image quality, the completeness of the 3d model requires the availability of images of all sides.

Figure 1: DJI ENTERPRISE PHANTOM 4 RTK UAV used for this flight mission and flight plan example

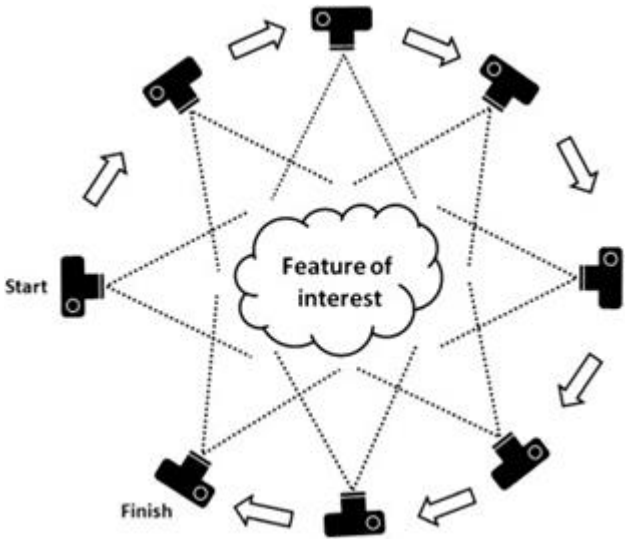

Figure 2: Terrestrial image capturing example for Structure from motion

During a first step, photographs of the entire Inner Castle were taken using a DJI ENTERPRISE PHANTOM 4 RTK quadrocopter equipped with an in-build 1-inch, 20-megapixel CMOS sensor. They served as a data input for creating a 3D model by making use of AGISOFTR software. During a second step, 3D models of selected objects that had been excavated at Harran archaeological site were generated. A total of 10 models could be finished until now with most of them originating from the Middle Ages while some data back to middle and late stone age.

2.2. Data collection and interpretation for the Harran School Museum

Archives and libraries in Turkey, Iraq and the United Kingdom were searched for documents related to the Harran School. Especially, the collections of the Süleymaniye Library in Istanbul and the archives of the Turkish Historical Society in Ankara were studied in further detail. After having received these documents, they were examined for their significance concerning the Harran School and their usability for the virtual museum. Emphasis was laid on the works of scientists that had a known influence on scientific developments in the modern era of the western world. Notes on works of relevance for this project have been taken and translation of selected documents from Arabic into Turkish language have started.

2.3. Development of a Virtual Museum

Under this work package, the purpose was to develop an application for a virtual museum that can be experienced by means of a desktop and Android application to be consumed by HMD for virtual reality. The virtual museum should consist of 2 salons, in which all archaeological artifacts and other related objects had to be exhibited. For this, after having identified the most appropriate location at the Inner Castle photographs of one big room were taken and the corresponding 3D model was created. Using 3DMax software, the 3D models had to be edited in order to remove wholes, to add a floor and an entrance door. After the salon had reached a state that made it usable for the museum further editing was carried out using the game machine Unity that included the following:

1. Placement of the Inner Castle on the satellite image derived from Google Earth,
2. Placement of the exhibition room within the Inner Castle,
3. Duplication of the 3D model of one room,
4. Connecting both rooms by means of a passage,
5. Adding lighting with lamps appropriate for a museum,
6. Creating pedestals for all the objects to be exhibited, and
7. Hanging portraits of important scientists of Harran School at the walls,

In addition, by using the MOVE functionality the user of this application will be enabled to move freely around in the two rooms. For this, it is required that he owns the controllers supported by HMD he is using.

3. Results

Withing this research, two major tasks have been accomplished: 1) Using different techniques content related to the Harran School of the Islamic period has been collected and processed. 2) Exhibition halls of a virtual museum, in which the content created in task 1 can be displayed, have been created. When starting the VR application, the visitor will be flown automatically from space to the current city of Harran, then approaching the archaeological site and finally will be landed in the Inner Castle (figure 3) where he will be let in into one of the two exhibition halls (see figures 4).

Figure 3: 3D model of Harran Inner Castle showing the current state

Figure 4: One exhibition hall of the virtual museum

Then, he can move around in two salons of the museum located within the caste. The walls of the museum have been left in its original structure like the look today to deliver a feeling of authenticity. Here, he can take a closer look on selected objects, which currently, consist of 3D models of artefacts that have been excavated from the archaeological site of Harran (figure 5), 3D models of tools that have been created from images found in the respective original documents and portraits of the most important scientist of this epoch.

Figure 5: 3D model of a jar made of terracotta used for measuring purposes

At the moment, the virtual museum of Harran School can only be visited by means of an HMD for virtual reality connected to a PC. Works on an Android App that will enable interested users to visit the museum by means of an HMD connected to a mobile phone only are continuing.

4. Discussion

With the ultimate goal of spreading knowledge about the Harran School to the whole world a virtual museum about this school based on virtual reality technology has been created for the first time in Turkey. This virtual museum will be accessible by means of HMD connected to a PC via YouTube or a basic HMD for mobile phones via an Android App. A virtual museum published on the Internet has the big advantage over a physical implementation of a museum that virtually everyone in the world owning a newer smartphone is enabled to visit it. Still, he must purchase an HMD. However, in the case of the Android solution prices start as low as USD 10.

Yet, just that there is an App available does not mean that anyone is going to use it. For example, a search for "virtual museum" as an Android App at Google Play delivers 248 results. Most of them offer virtual tours of some well-known and some lesser-known museums in the world while virtual reality applications are less frequent. A more detailed analysis reveals that only 13 of them have been downloaded more than 5000 times. Among them, the app "Louvre Museum Buddy" having the Mona Lisa as its logo can be found. Naturally, Harran School cannot compete with such a celebrity and therefore, it remains to shown that enough mobile phone users can be attracted to our app. Some may argue that for someone who has visited a museum by means of virtual reality no longer the incentive to visit the real archaeological site and the museum at site exists. Givin the current limited performance of VR applications on mobile phones such an apprehension can be doubted. It is much more likely that the virtual experience will create the appetite to see the real thing e.i. the physical implementation of the Harran Museum after it will have been built someday.

Another issue that needs further attention is the fact that the current amount of content of this virtual museum is not sufficient to attract visitors. This missing content can be attributed to different reasons. One of them is the requirement that original documents relating to the Harran School that are mostly written in Arabic must be translated into Turkish and English language. As experience shows especially scientific terms that have been used at those times are no longer in use today. That means that sound translations can only be achieved by Arabic speakers that have a profound knowledge in the respective field of science like astronomy, mathematics and medicine. This requires adequate funding, which was not available for this ongoing project. A technical detail that must be mentioned is the missing accuracy of the side walls of the Inner Castle giving the currently existing 3D model a blurred appearance. This inaccuracy is due to the flight height of the UAV (about 80 m) that makes its deliverables not very suitable for inclusion in an VR environment. Although this part of the application is hardcoded and lasts only several seconds an enhancement will require a new flight with different flight parameters because it is not possible to exchange only parts of the existing 3D model.

As this project is still not finished some additional works have still to be carried out. Among them linking the exhibited objects with the related necessary information that can be handled by the user by means of controllers (in the case of the PS application) or by means of eye focus (in the case of the Android app) must be implemented. Only by this, these objects will have a meaning and the user of the app will have an experience comparable to a real museum.

5. Conclusion

Within an ongoing project, the first steps for the creation of a virtual museum of the medieval Harran School have been implemented. This includes the creation of 3D models of the location of the museum, the Inner Castle of Harran archaeological site, artefacts that have been excavated there, the inner architecture of the museum, exhibition of some objects and documents within the two museum halls and their integration in a virtual reality environment that can be experienced by members of HMDs connected to a desktop PC. The development of an Android App and adding of more objects to the two exhibition halls is still continuing. The exhibition of a sufficient number of objects to give the user the real feeling of visiting a museum will require additional funding. Especially, the creation of 3D models of historical scientific instruments and the translation of original scientific documents from medieval Arabic into Turkish and English is a very time-consuming task requiring very specialized expertise. Only with such a further enhancement enough users will install this APP on their mobile phones and eventually, some of them will decide to visit Harran (what is the ultimate goal of our efforts).

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Augmented Reality and Mixed Reality in Education

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Abstract: Augmented Reality (AR) and Mixed Reality (MR) is indispensable one for the learning process in this e – world. It enhances the understanding of the contents, improves learning spatial structure and function as well as learning language associations. AR and MR play a major role in long- term memory retention in learning the ideas and concept. Learners' motivation is highly intensified by the combination of real and virtual world. These digital elements provide improved physical task performance and collaborations in Education. This paper focuses on giving insightful thought about AR and MR technology with digital environment.

Keywords: Augmented Reality, Mixed Reality, Digital Environment, Digital Elements

1. Introduction

Advancement in Technology creates the most live environment for learners in all the fields. The new trends in technology significantly increase the range and refine the feasible learning and teaching activities. Taking a break from the mundane, assume the role of Augmented Reality (AR), wrap the bright shades of Mixed Reality (MR) and let go of the shackles in learning experiences of the real world. AR & MR wave to flow without a hitch to care and cherish every visual brought out of the real world. It makes people realize that this quality, we often restrict and reserve is an actual power of technology. Augmented Reality is an interactive experience in which digital information is infused into the user's perspective of the real world by technology. This environment can be accessed by head-mounted or hand-held AR technology, as well as a computer display, special eyeglasses, gaming devices, or even a smartphone.
"Mixed reality" takes this technology a step further by fusing the physical and virtual worlds in ways that allow them to interact. While AR effectively builds a virtual overlay on top of the real environment, MR focuses on integrating virtual objects and input into the physical world. As a result, MR immerses the user in immersive learning. An architect, for example, could be able to "test drive" a building that has yet to be built, utilising MR technology to "walk" through its rooms and even take a "tour" of its HVAC system. Virtual reality (VR), a close cousin of MR, is described as immersing a user in a completely simulated environment. XR, or extended reality, is a phrase used to group AR, MR, and VR together.

2. Need for Augmented and Mixed Reality in Education

During this perpetual time of technology, this paper highlights the applications of Augmented Reality (AR) and Mixed Reality (MR) in Education. In the Immersive Learning Landscape, AR/MR applications, such as AR gears and glasses, and sensors, are creating technologies that make use of technological developments in software and hardware for both mobile and non-mobile devices.AR is implied in the fields of advertising, retail, navigation, maintenance & repair, manufacturing. In recent years, they have been creating greater impact among educational researchers and practitioners and they are intended to implement these technologies in their fields as well. AR and MR plays a major role in the fields of Holographic devices, immersive devices, communication, education, and manufacturing. AR/MR technologies have the potential to usher in a new era in education by transforming how individuals of all ages learn new skills and interact with one another and their surroundings. Implementing augmented reality in education at an early stage can benefit the industry while also assisting students in achieving their academic objectives. Despite the growing interest in AR/MR devices as learning tools, the number of primary research studies on their integration into educational environments is still limited. Augmented reality provides students with new and fascinating learning opportunities, mostly because it allows them to view things that are not feasible in real life. Dinosaurs can be brought into the classroom, 3D history models can be explored, and human anatomy can be closely examined. While incorporating AR into a distance learning setting may be more difficult, it is possible with adequate student and learner collaboration. Augmented Reality can teach us a lot of things that would be impossible to teach in normal life, which is why it is such an important technology.

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2.1. General Benefits of AR/MR Technology

- Increased productivity
- Interesting engaging content
- Long-term knowledge retention
- Quality work
- Streamlined Work processes
- Early detection of flaws
- Cost saving
- Real time Inspection
- Cross-geographic Collaboration
- Enhanced decision making
- Virtual work
- No physical training stuff
- Interactive Learning material
- Rise-free exploration

2.2. Augmented Reality and Mixed Reality in Education

Teachers can use augmented reality to present virtual examples of ideas and incorporate gaming aspects to supplement textbook material. This helps the students to increase the span of attention and improves the retention of concepts in memory longer than usual. For the eyes glistening with the quest to learn more about the new abode of technology in the wee hours of learning, AR & MR plays an important role in Education. AR is revolutionising education making learning immersive and more engaging.

- AR/MR integration pedagogical paradigms, learning theories, and educational techniques
- Real-time monitoring and assessment of students
- Groups of augmented teachers and students
- Educators' professional development programmes for using AR/MR devices in the classroom
- Augmented reality (AR) and mixed reality (MR) learning environments and educational applications design and development
- Game-based AR/MR learning settings
- Formal (K-12), informal (vocational education, work-based learning), and non-formal (vocational education, work-based learning) AR/MR learning settings and domains; open and distance education
- Copyright and fair use of educational augmented reality and mixed reality apps
- Learner mobility and transitions across formal, non-formal, and informal learning contexts are made possible
- Issues with AR/MR learning experience testing, assessment, and quality
- User acceptability of augmented reality and mixed reality learning apps (teachers, students, and parents)
- Issues with AR/MR for teaching and learning in terms of infrastructure, administration, and organisation
- Concerns about privacy and security in relation to AR/MR in education

Tablo 1. Applications of AR and MR technologies

Categories of AR & MR	AR & MR in VariousFields	Applications
Guidance and Collaboration	Automotive, construction, aerospace & defence, industrial products, oil & gas, healthcare providers, power & utilities, technology	Helps the worker to visualise the tasks such as maintenance, repair or assembly. It improves productivity, reduces risks, streamlined work processes, cross-geographic collaboration
Immersive Learning	Higher education, health care providers, consumer products and industrial products	Provides improved therapeutic outcomes, reduced risks, cost savings, strong retention of material
Enhanced Consumed Experience	Media & entertainment, automotive, banking & securities, healthcare providers, industrial products, travel, hospitality and services	Enables better customer engagement, increased sales, enhanced brand positioning, increased marketing opportunities
Design and Analysis	Aerospace and defence, industrial products, automotive, construction, real estate, technology	Employs new methods to analyse data and generate insights, cost savings, increased efficiency, early detection of design flaws

2.3. Advantages of AR/MR in Education

- Instead of holding chemicals in hand, it helps the students perform the experiments in the safer environment.
- Simulated development cycles in which space, season, and other aspects are taken into account allow students to learn about plants and their relationships with their environments.
- By merging digital goods into the "real world," augmented reality (AR) promotes interactivity and engagement.
- Cost friendly makes these apps do not limit the students in learning in the classroom.
- It helps in understanding the abstract, spatial geometric concepts through virtual 3D objects.
- It allows students to focus on curriculum subjects while spending less time learning how to use new technology.
- AR enhances the ability of student’s retention and acquisition of information and skills.
- Instead of traditional view, this technology presents information in two- dimensional method.
- AR intensifies students’ knowledge in various areas such as
- Working with numbers
- Reading
- Real-life environments & scenarios
- Spatial concepts
- Content creation
- Playing
- It helps in communicate and collaborate in the learning process.
- It stimulates interest and discussion in different subject areas.

3. Conclusion

In education, augmented reality allows students to access more interactive and appealing material with more interesting content in the form of videos, images, animations,and other media that can capture the attention of the student at all academic levels, resultingin increased knowledge and retention. Using augmented reality to pique people's interest inthe education industry might be a game-changer for both academics and students, allowing them to expand their knowledge while avoiding the tedious aspects of the existing educational system. By incorporating augmented reality into education, academics may contribute to the progress of the industry as a whole, achieving higher results with greater potential while attracting new students to their educational institutions. One important reason is that accepting responsibility for projects increases a student's sense of responsibility and engagement with the material. AR bridges the gap between textbook information and learning content developed by educators. AR is becoming more cost-efficient, accessible, effective, and vital, notably in equipping schoolchildren with the skills and information needed to collaborate with others andadvance in future employment. Designing open-ended classes that allow children to pursue their own interests will be a crucial aspect in increasing their effectiveness and confidence in these areas. Embracing the AR & MR technology in all the fields especially in Education, accepting and flaunting its necessity is beyond the imagination and they have the power and responsibility to the channel. Augmented Reality and Mixed Reality in Education shouldbe encouraged for experiencing vibrant hues, exciting times of real-world experience in the learning process. AR/MR enhances learning is for all and deals with the issues of equity, accessibility, and diversity.

Tablo 2. Some of the App's of AR/MR in Education

S. No.	AR Applications	Uses
1	SkyView	People can use SkyView to identify stars, constellations, planets, and even satellites by pointing their mobile device upward. It allows pupils to explore the universe through the use of augmented reality night sky overlays.
2	Froggipedia	Instead of dissecting the frogs in the biology lab which is very disgusting and awful for us as well as frogs, through Froggipedia, the students can explore the internal organs of frogs with AR technology.
3	Microsoft Holo Lens	Medical students and professionals can use MR reality to learn about the human body. Students can learn about anatomy by flowing through the bloodstream, isolating parts, enlarging them, and even walking inside those components of the human body using Microsoft Holo Lens, which also aids in learning how to treat medical disorders.
4	Google Expeditions	Instead of the most expensive expeditions such as touring Base camps, work stations, industries, Louvre etc., Google Expeditions can provide highly immersive trips.
5	Virtual Speech	It uses immersive, realistic virtual reality simulations to aid improve public speaking skills.
6	Mondly	It helps learning languages by having real conversations
7	ARKit	It gives users AR experiences with the help of amazing 3D graphics and vertical tracking It gives non-interrupted AR experiences It provides greater immersive opportunities by incorporating real- world objects into the AR experiences
8	Vuzix Blade smart glasses	The Glasses use GPS to provide directions and snap images. It's utilised for virtual gaming, face recognition, and holographic displays. They are lightweight and have wave-guide technology.
9	Quiver	Quiver includes a set of colouring pages that allow youngsters to spin a globe in mid-air and make cells explode off the paper. This app allows students to engage with three- dimensional figures in addition to the visuals in their textbooks.
10	Elements 4D	This programme aids in the creation of lesson plans for students in elementary, middle, and high school. Educators can print out the triggered images and assemble blocks for an AR experience.
11	Blippar	Blippar helps in transforming the child's reading experience by making them to think intensely and approach in a new way.
12	Arloon Plants	Through Arloon trigger, the students can observe the plant growth and movement. It also provides some foundational science concepts regarding plants growth.
13	Aurasma	Recently with scannable technology, QR Codes and AR is used to share student work. Users of Aurasma can upload trigger images of their choice and add videos to make their very own AR experience.
14	Math Alive	Teachers and students place the trigger card under a camera to practise counting and basic numeracy skills.

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Appraising the Role of Virtual Reality in the Architectural Domain

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Abstract: The objective of this briefing is to present virtual reality in Architecture. This paper outlines "What is Virtual reality?" and how it is influencing the present architectural field. In this paper, we will also talk about some of the benefits of virtual reality in architecture. It can help architects create 3d models of various objects and help visualize complex structures using tools like "Twinmotion" and "Shapespark". Virtual Reality technology has recently been brought to architectural representation, providing architects with a platform to display unbuilt concepts as immersive experiences. Virtual Reality is an immersive environment that most people associate with technology such as smartphones. Designers can utilize specialized VR headsets and technology to give a customer or a part of their design team the sensation of being in the digital world shown on screen. This method of representation is unique in the architectural profession, since virtual reality may provide the sense of being completely immersed in a place at full size, possibly provoking an emotional response from users akin to what actual architecture can evoke.

Keywords: Virtual World, Architecture, Visualization, Immersive, Twinmotion, Shapespark

1. Introduction

1.1. What is virtual reality?

Virtual Reality (VR) is a name for computer-generated 3D images that allow the users to enter and interact with other realities. It is a technology that has recently been introduced, and it has made head-mounted displays (HMDs)more inexpensive. Its capacity to allow the user to see at one of several levels has earned it a variety of potentials in the Construction industry. Virtual Reality is a conceptualized technology that refers to the world of digital worlds that Jaron Lanier was trying to create in 1989 when he was working on computer simulations. Virtual reality is a type of computer simulation that allows a person to interact with an environment through a screen. The concept of virtual reality is what people experience when they're not feeling like they're actually in the real world. This technology works by allowing users to experience a full-headset experience. Mottle says. "You could perform room-scale VR and 'walk' across the environment depending on whatever gadget you'reusing." It is feasible to perform room-scale VR and stroll throughout a space using virtual reality designtools. There are two forms of tracking for VR headsets: inside-out and outside-in. The VR headset andcontrollers are tracked by an external device with an outside-in. The VR headgear and controllers are tracked from the inside-out using sensors on the headset.

1.2 How Is VR Influencing Architecture?

VR technology has so much potential in the architectural world. VR architecture is an opportunity toserve a wider community by designing spaces that are designed to accommodate varying numbers of people . From concept to the final product, virtual reality can help designers and architects collaborate more effectively and sell their ideas better. One of the most difficult tasks for an architect is persuadinga client that their design is viable.

1.3. VR brings people together

Contractors, engineers, and designers may be able to collaborate more efficiently via virtual reality. Architects, engineers, and contractors all have their own opinions about how to build a project, which can lead to misunderstandings and mistakes. VR on the other hand is simple to demonstrate to other team members to improve project knowledge and collaboration

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1.4. Tool for design

As well as visualizing an environment, VR may be used to create a setting. After the project is designed, you may find that you need to make some changes. This becomes an expensive issuewhen barriers are created and customer alterations are needed. The designer may study an alternate design choice within the software and rectify any flaws before such a project is created, which is more efficient and cost-effective than remodelling a real site, thanks to virtual reality technologies. This helpsto eliminate rounds of revisions and allows for modifications to the design process to be made in real time.

Figure 1. Illustration of VR for Developing Architecture

1.5. Accessibility

Small businesses and customers have struggled to overcome the costs of expensive software and equipment, which is usually a luxury reserved for the larger corporations and their corporate customers. This technology should be available to all consumers, large or little. For both the customer and the creative team, the benefits of virtual reality outweigh the costs. A virtual reality project design and view provide a more accurate cinematic experience of a plan without avoiding the scale and viewpoint constraints of a plan, picture, or model..

1.6. Less-reworked models

In 3D, you create models that are designed to work seamlessly in your software. However, as your buyers get more familiar with the models, the data is constantly being reintroduced into them. you go back and revise the model again until you've given your buyer exactly what they want. This process usually leads to negative feedback. Once people get used to the technology, they won't demand to see how it affects them physically. Instead, they'll just ask for feedback about how it's done.

2. VR in Architecture is a Natural Fit

VR images are more realistic and better than 2D ones due to the better understanding of scale andsize. However, they can also highlight issues such as blocked sitelines and lighting. VR projects are the solution to every architectural issue.

2.1. Something that does not yet exist

This is a natural match for architecture; in fact, we frequently use an unbuilt structure or arefurbishment as an example. However, it might also be about modifying the layout, the façade, or the landscape. VR presentations, whether from CAD, Video, or Photography sources, are the best methodto communicate your idea of something that hasn't yet been constructed, from concept to final sign-off.

2.2. Something that exists yet is located a long way away.

When it comes to restricted travel, whether it's due to economic constraints, a dislike of airports, or a limited capacity to go overseas, VR comes to the rescue when your customer or stakeholders are faraway. It also expands the geographic area where you may pitch. Virtual reality is the closest thing to witnessing something in person.

2.3. Something that is too big, inconvenient, or costly to model

We've worked with clients to create virtual showrooms for a wide range of items, but when it comesto VR for architecture, this final category is where you can really speed up client decision-making, which should assist you with project schedules and ROI. When it comes to finishes, materials, and even the placement of internal walls and windows, we occasionally ask customers to make judgments based on a sample when they don't have a complete mental picture. Modelling the alternatives in virtual reality offers your clients a better grasp of the options and the confidence to make faster selections.

3. Benefits of VR in Architecture

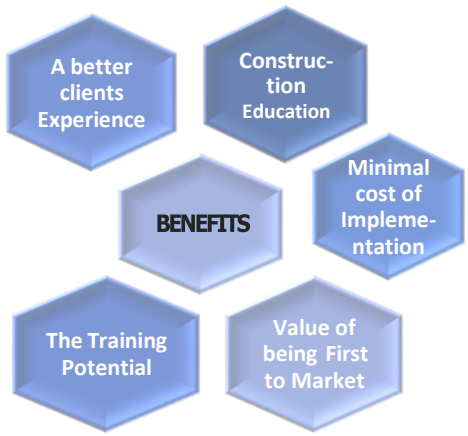

Figure 2. Pictorial representation of benefits

3.1. A better clients experience

Getting customers to comprehend and visualize designs inside a specific area is one of the most challenging architectural challenges. This is where VR may help him have a more immersive experience. Architects must sometimes persuade clients that the finished product is preferable to 2D and 3D models, but VR provides a better sense of what to expect with the next-general experience. Customers may also connect with the space, enter and depart rooms, and examine design decisions as if they were completed. Clients may 'walk' inside their finished product before construction begins and quickly comprehend the designer's thoughts. They notice the design in every detail .

3.2. Construction Education

Virtual reality may serve as a training area for new construction employees throughout the building process. VR experiences may function as a proactive way to make building sites better efficient, simple, and, most importantly, safe, by providing details regarding the various materials necessary for each phase, collision detection, and site walkthroughs.

3.3. Minimal Costs of implementation

Creating a virtual reality experience can be done considerably faster and for a fraction of the expense of a showroom. A virtual reality (VR) experience, on the other hand, might be integrated into a basic showroom, allowing potential clients to explore a variety of structures, plans, and siteseverything into a central place (and/or online).

3.4 The Value of Being first to Market

They claim that tremendous risk equals great profit. In terms of brand awareness, being one of the early movers in the industry provides a significant competitive advantage. Virtual reality experiences are relatively new architectural technologies that will only grow in popularity in the next month's. As a result, if you're thinking about adopting virtual reality for a project, you should get started right away.

3.5. The Training potential

You may automate your internal training procedures by using virtual reality design tools. You may utilize the program to show your recruits what you expect from them. Furthermore, because of the interaction inherent in VR, your staff may learn as they go. You may create models that your staff can test out in a virtual environment. This results in a more interesting training environment, which leads tofaster learning.

4. VR Tools for Architecture

4.1. Twin motion

Twinmotion is a visual design tool that works seamlessly with various AEC models. It is powered byUnreal Engine and allows users to generate stunning visuals in a brief period. Twinmotion is a 3D and visualization program that allows users to work on large projects much faster. It's also designed to provide better performance than competing solutions. The MSRP for Twinmotion is $499 for a perpetual license".

Figure 3. Logo of Twin motion

4.2. Functions for creating detailed 3D visualisations

Interface: Twinmotion's straightforward features make it a very simple solution to comprehend anduse.
Environment: Complete control over the atmosphere, storms, foggy, particles (freezing rain), breeze, and their effects on the plants.
Library: Twinmotion's collection has a large number of realistic materials, light sources, and 3Dobjects.
Phasing: A layer system lets users hide or display objects and files in the construction phase.
Several outputs: Twin motion can create picture panoramas, movies, and self-executing BIM motionfiles.
Virtual reality: Twinmotion's connectivity with the Oculus Rift and HTC VIVE headgear enables usersto easily convert from a 3D Autocad or BIM design to a fully immersive VR experience.
Animation: With just two clicks, you may make a way such as in which your items will move in real-time. Everything is possible, from a crowded street to the launch of a helium balloon.

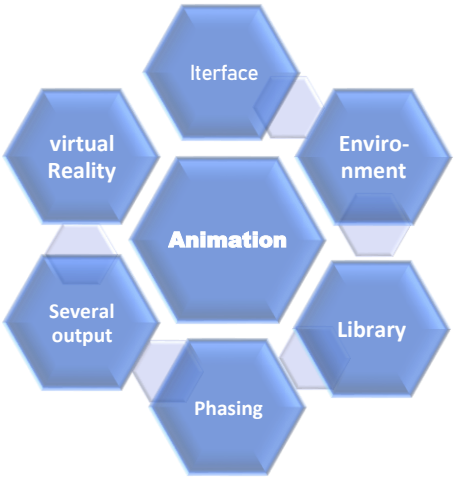

Figure 4. Image Depicting The Functions Of Twin Motion

4.3. Shapespark

Shapespark is used by architects, designers, and archviz experts to showcase designs and produce realistic visualizations for real estate marketing initiatives. Shapespark enables the architectural designer to develop real-time browser simulations with physically realistic lighting, perfect for client meetings and presentations. The visuals may be shared via links, and they work with the Oculus Rift VR device to provide a stereoscopic 3D perspective to users. Because Shapespark makes use of WebGL, a web technology that is accepted by all contemporary browsers and operating systems by default, visualisations may be examined directly in the browser without the need for plugins. Shapespark, unlike static renderings, lets viewers freely enter and walk around a location, inspecting every aspect**.**

Figure 5. Logo of Shapespark

4.4. Features of shapespark

High-quality real-time rendering : Realistic lighting and materials without the use of a sophisticatedcomputer throughout the presentation.
Full movement freedom : The viewer is no longer restricted to a few static images but can freelymove about the 3D environment.
3D Meetings :Turn any 3D model into a meeting area where people can move around and communicate in 3D with only a few clicks. In the 3D world, participants can employ interactive featuressuch as screen sharing.
No programming knowledge is necessary : Shapespark, unlike gaming engines, is aimed at designers and 3D artists, and so does not require any programming expertise to produce real-time visualizations.
Virtual reality mode : Virtual Reality is supported by all Walkthroughs developed in Shapespark.
Interactive features: To allow the user to alter materials, you may add material selectors to your model. You may also include clickable components in your model to provide the user with further information. The presentation might include video textures and music.
Make use of your existing 3D modelling software :Shapespark integrates with popular modelling tools like SketchUp and Revit so you don't have to change your design workflow.

5. Conclusion

Virtual reality is currently used in almost every industry. You can't fathom your existence without virtual reality technology. It can alter the way architects design structures. We discussed Virtual Reality and its relevance in architecture in this article. While the goal of Virtual Reality within Architecture is to get a good working relationship between VR and BIM, there is a whole different world where it can be used. This world can be explored in various ways, such as virtual tours, immersive learning, and fully immersive architectural studies. It is still in the initial phases of development, with many users building their application services. While virtual reality is currently an option, it will soon become a need.

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Virtual Reality: How Real is the Indian Education Field?

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Abstract: Virtual reality (VR), Augmented Reality (AR) and Mixed Reality (MR) are transforming education. Use of technology in education has become unavoidable and application of technology has simplified many tasks with the help of EdTech platforms and remote learning devices. There are many resources available for both educators and learners alike, to pursue Open and Distance Learning (ODL) through Virtual Reality, Augmented Reality and Mixed Reality. These resources make learning memorable, as the learners can identify their needs and implement them with a joy of learning. Virtual reality puts them in real immersed environment making complex concepts simpler and easy to understand and comprehend. Indian initiatives in the field of Virtual Reality usage in the field of education is in the nascent stages only and the government has taken bold steps. This thematic paper on Virtual Reality in Education with special reference to Open and Distance Learning (ODL) tries to put how the pandemic has forced to adapt to modern innovative pedagogy.

Keywords: Virtual Reality, Augmented Reality, Mixed Reality, Technology, Education

1. Introduction

Enforced self-isolation as a result of the coronavirus pandemic, throughout the globe has promoted remote learning and extensive technology use in education, as the world is witnessing since March 2019. Entities must adopt a new method to adapt to changing learning habits. To enhance their capabilities, a remote and scattered workforce demands considerably deeper engagement tactics based on technological approaches. Education is undergoing dramatic changes as a result of this pandemic. Learning styles are constantly evolving, and technology plays a significant role in the lives of students. Online, mobile, and virtual reality is transformingthe way to learn. Students and adult learners are aware of the knowledge they wish to acquire andthe resources available to them. New generation learners are tech-savvy, self-sufficient, and haveall of the answers. They want learning to be enjoyable, interactive and engaging, and they want tounderstand why they require new information and how it will benefit them. When it comes to customizing information for a certain audience, the role of technology iscrucial. Virtual reality is the process of creating virtual simulations through the use of computerized technology and devices. This places the viewer in the same environment as the image, allowing them to not only see but also feel what is happening in front of their eyes, as with 3D techniques, which is a feature of virtual reality as well. Users can use their sense stimulationsto move up and down and see everything as if they were truly a part of a virtual world when theyare embedded in that technology with the required specific devices. At home, people use advancedtechnologies and predict them being adopted in classrooms. As digitalization continues to transform our lives, the education sector is compelled to incorporate technology into the classroom. Apart from widely adopted mobile apps, EdTech platforms, and remote learning tools, there are two additional technologies worth focusing on in the coming years: Augmented Reality (AR) and Virtual Reality (VR), both of which are determined to maintain the cutting edge of modern technology in education. Mixed reality (MR) isthe combination of VR and AR in desirable and required proportion. Implementing virtual realityin education will assist educators, students, and providers of learning solutions in resolving the following challenges:

- Perceiving complicated information and developing specialized abilities.
- Analyzing large amounts of data and presenting it in an interactive format
- Demonstrating the relevance of theoretical knowledge acquired during lessons
- Retaining acquired knowledge and matching acquired skills to actual job requirements and
- Utilizing exceptional experiences to engage students in the educational process

2. Importance of Technology in Education

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The purpose of technology in education is to maximize the effectiveness of a sound education. Technology has revolutionized virtually every aspect of life, from interpersonal communication to the economy, the entertainment industry, and even education. Students today, more than ever, appear to be confronted with changes that fundamentally alter not only their learning process, but also their daily lives. Numerous tasks have become simpler, allowing children to focus on their personal development and also it lowers the cost of education by providing access to a variety of skills and online degrees.With the advent of internet, computers, tablets, and smartphones, technology-based education is likely to become more exciting than discouraging. Access to education has become significantly easier as a result of technological advancements; individuals can now choose from a variety of learning styles and degree options.

3. Difference among Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR)

AR and VR are fundamentally distinct, despite the fact that they are both visual technologies that rely on non-traditional interactions. Mixed reality is a term that refers to the employment of many technologies at the same time. With the acquisition of Tesseract, a deeptech business that created an MR device called Holoboard, Reliance Jio hopes to make mixed reality commonplace in India. AR is a multi-sensory interactive experience that blends real-world and virtual elements. It is known for enhancing users' perceptions by merging real-world objects and naturally stacking information or visual assistance on top. These days, the most common instances of AR technology are animated emojis on smartphones. AR applications can enhance on-the-go learning for maintenance and troubleshooting, systems maintenance tasks, and other computer-aided learning and training in the industrial setting. VR, on the other hand, is a simulated experience that can either deliver a highly realistic virtual experience or provide stunning new visual sensations that defy reality. Currently, standard virtual reality systems generate visuals, sounds, and other sensations using either VR headsets or multi-projected environments. Virtual reality applications are being used in the healthtech, edtech, and consumer services industries.

4. VR and Education

While the majority of people have heard of virtual reality (VR), many are unaware of what it is or how it is used in educational processes of teaching and learning. It is a term that refers to interactive content (images or videos) that enables the viewer to explore a scene in 360 degrees. It immerses or surrounds the viewer. Essentially, there are three major ways to incorporate virtual reality technology into the educational process. The first is to create an immersive classroom environment through the use of projections on the walls and throughout the environment. The second is to augment surroundings with augmented reality technology via smartphones, as seen in augmented reality applications such as Pokémon GO. Thirdly, learners can be equipped with virtual reality/augmented reality devices or glasses such as Google Glasses, Face Computers, iphone device (expected to be launched in 2022) to delve deeper into the virtual world. No technology can completely replace human interaction, but it can enhance it. Virtual reality is rapidly gaining traction in education, with almost all students of all ages adopting it. Virtual reality is an excellent tool for providing students with a new perspective and firsthand experience of the subject they are studying without physically being there.

Virtual reality in education is drawing major investment, in addition to its popularity among instructors and students. According to the Perkins Coie's 2018 Survey Report on Augmented and Virtual Reality, the education sector ranks second in terms of investment in the deployment of virtual reality technology. It is not necessary to spend a lot of money to bring augmented and virtual reality equipment into the classroom. Resources ranging from low-cost viewers like Google Cardboard to cost-effective equipment that connects to smartphones are accessible without breaking the bank. Teachers can use tools such as 360 Cities, which allows pupils to go to cities such as Rome and Tokyo for a cheap or no cost. Another software TimeLooper, allows students to experience historical settings such as mediaeval London or World War II via the viewpoint of history. There are several challenges in education that are unlikely to be solved exclusively through the use of virtual reality technology. On the other hand, the interactivity enabled by virtual and augmented reality can help mitigate low levels of student engagement, which has become one of the field's most hotly debated issues. By implementing an immersive VR application, one can significantly increase learners' enthusiasm for studying. Rather than sitting through a tedious classroom lesson, learners can engage in real-world activities and become active participants. Through the use of virtual reality, they can interact with objects, one another, and teachers in novel ways. Additionally, virtual reality eliminates all of the distractions that plague classrooms. Procrastination becomes more enticing than studying.

Tablo 1. Resources of VR

S.No	VR Application	Functions/Uses/Options
1	360 Cities	Virtual Tour of Cities of the World
2	TimeLooper	Historical Lens – to experience mediaeval periods
3	Arloopa	Enables to position 3D objects precisely within AR
4	AugThat	Library of Augmented Virtual Reality
5	Arize	Allows creating a direct link to a website.
6	CoSpa es Edu	Tools and resources that enables students to create 3D, learnto code, and engage more deeply with their curriculum
7	Google Cardboard	A low-cost virtual reality headset that works withsmartphone VR applications
8	Nearpod	This is a free VR – based curriculum for teachers
9	Immersive VREducation	This is an open-source education platform enables educatorscreate their own lesson plans and immersive experiences.
10	EON Reality	Students and teachers can collaborate to create a blended-learning environment that combines 3D with power Point,sound effects and notes among other things.
11	Schell Games	Interactive game experiences with the goal of positivelyinfluencing a person's Knowledge, Attitude and Habits.
12	Minecraft EducationEdition	The popular game now includes an educational component that enables students to create their own virtual worlds, suchas Fort Clatsop or Jamestown.

5. Multifaceted Applications of VR

It is easily accessible to all students and teachers and can easily be monitored. Virtual experiences have the potential to captivate and inspire students in a profound way. Students can learn and gain experience through VR; it has the ability to inspire students; it fosters imagination and the ability to create new things; it engages students and promotes student interaction; it fosters an inclusive classroom environment, memorable learning, and a realistic travel experience. In education, virtual reality is used to increase students' engagement with their studies. Virtual Reality creates the physical world in which we live. It has the potential to transform the way education is delivered in the modern era.

Virtual reality can be used in almost all walks of life. Its application in industries of wide range including medical, paramedical, architecture, national security such as military and policing, anti-terrorism, traffic accident awareness, and weather forecasting are immense. New avenues are opening everyday with innovative experimentations.

As more people come into contact with digital automation in all spheres of life, particularly at work, educational platforms, online courses, and virtual classrooms assist learners in grasping technology and remaining current on industry-wide transformations. Today, a teacher does not teach students; rather, he or she serves as a mentor, guiding students on their path to acquiring knowledge and applying Virtual reality in an open environment.

6. Indian Initiatives

In 2018, under 'The Prime Minister's Digital India' scheme, a Rs. 130 crore project launched the first-of-its-kind AR based education and training institute in Varanasi City as a joint venture with US based AR company, 'Eon Reality'. This project will give students of skill schools and engineering, hands-on training for excellence in ultramodern machines. IIT Madras has created a body consisting industries, academicians, fresh startups, governmental agencies to create new advanced technologies and applications in Virtual Reality (VR), Augmented Reality (AR) Mixed Reality (MR/XR) and haptics. Indian Chapters of International VR/AR Association (VRARA) are functioning in various cities of India. It is designed to collaborate between industries, educational institutes, research organizations to establish high standards among member organizations.

Virtual and Augmented Reality Center of Excellence (VARCoE), Odisha, is striving for excellence in a wide range of industries and research fields such as Product and Skill Development, Health and Medical Sciences, Art and Architecture, Transport, Construction, Tourism, Entertainment, Productivity Software and Education. The center has multi-disciplines engaged in research, teaching and servicing. UE & HCL lab, and Department of Design, IIT, Guwahati is undertaking a research project on 3D user interfaces for Virtual and Mixed Reality with several complex tasks in VR environment working on user centered aspects of Internet Of Things (IOT). The Sainik (Military) School for Girls, Kherva, Gujarat, has the India's first interactive virtual reality-based education classroom with 3D and 360-degree technology.

7. Futuristic Approach of VR, AR and MR

AR, VR and MR are seen as the future of learning and education as:

- it helps the learner to remember what has been learned,
- learning experiences are tailored to the learner,
- provides expandable experimentation possibilities,
- reduces reliance on rote memory learning,
- both the educators and students are empowered and
- encourages active and interactive learning.

It is realized that AR, VR and MR technology may be useful not only for children, but also for re-skilling, corporate learning, industrial applications, and other purposes. Educators, too, may gain a lot from using AR/VR approaches for teaching when they're combined with the correct content. Content reigns supreme, regardless of medium, according to Edtech startups. VR headsets, like textbooks, will collect dust on a shelf if they don't have the correct material. Learning may be made more entertaining for learners and students by using virtual labs, social media learning, and gamification. In the future, books could be digitized, with AR technology included. Teachers can publish helpful milestones in the actual world for students to stumble upon. Subjects and digital versions of real-world things will simplify lesson delivery. New games with AR-enabled assistance and immersive VR experiences could change student learning and coaching. Virtual reality is the next big thing in education and training; it will enable the development of a new pedagogy for the study of previously difficult scientific theories, increases students' knowledge area, boosts students' creativity, and improves students' understanding level. Students can easily grasp difficult concepts in a short period of time; distractions do not occur while studying; it increases learners' efficiency in acquiring knowledge; it increases teachers' skill among teachers; it improves students' memory power through connection with education; and it makes students more active.

8. Disadvantages of VR

There are certain disadvantages of augmented reality too. Students tend to become 'lazy learners' and turn more towards entertainment and recreational aspects than educational. Lack of teachers' interest and knowledge of modern innovative technology to adapt to new methods of emerging pedagogy is a real challenge. It requires specialized devices and content adapted to VR, AR and MR. The cost factor may hinder many institutes to adopt these measures. It can be expensive to implement and some schools may not have the necessary budget and depend on subsidies being put in place.

9. Conclusion

The pandemic has the pushed entire world into unforeseen situations. But life has to go on and as it is said 'necessity is the mother of invention' many innovative measures are taken. Education field is no exception. Though initial efforts of Virtual reality started in 1980's and grew through 2000s it has found its application presently. VR, AR and MR are being used widely in every aspect of life now. Virtual reality (VR), augmented reality (AR), and Mixed Reality (MR) are technological innovative pedagogical methodologies that provide joy of memorable learning for the learners. There are many resources available both for the educators and learners alike. Applications of Virtual reality is very wide and is being used in almost all fields of industries, medical and pure sciences, arts and architecture, agriculture, power, urban and rural planning etc. Indian initiatives are in nascent stage due to the well-known reasons of diversity. Yet the government has taken bold steps to mitigate the shortcomings. The future of Education is in the laps of VR, AR, and MR.

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Uses, Benefits and Challenges of Mixed Reality for the Social Sciences: An Exploratory Study

Bhavna Chibber[1] and Rashmi Pandey[2]

Abstract: Students are taught mostly with the books which represent things/concepts in a two-dimensional medium, students have to use their own imagination for understanding things and to image the concepts/things in a three-dimension medium. This is where Mixed Reality may be used to plays a Crucial role. Mixed Reality can for certain facilitate the understanding of the course contents and increase the interest of the student. Hence by combining education with Mixed Reality, which is a blend of virtual reality and physical reality it creates new kind of provisions which enables educators to visualize things to the students in three-dimensional medium, and hence enhance the whole attractiveness and learning experience of the Mixed Reality using students. Mixed Reality is a one of the latest technological aspect that amalgamate ubiquitous computing, tangible computing, and also social computing. This technology combines both physical reality and virtual reality and presents to the students' three-dimensional models of things/concepts to be taught. This research paper reviews the use of Mixed Reality on the academic performance of students of Social Science. It also outlines the various challenges like technological, pedagogical, require for previous training, and reduced sociability related to the implementation of Mixed Reality for the educator and students of Social Science, this research paper tries to study these and other challenges and provide certain most feasible solutions for them. This research paper outlines what and how different approaches to Mixed Reality may be useful to the students and educators in the area of Social Science. The research paper also bestows an preface to the technology of Mixed Reality and its prospects for education in the area Social Science. Key technologies and methods that are well discussed within the ambience of education in Social Science.

Keywords: Mixed Reality, Vreality, 2D, 3D, Social Science, Physical Reality, Challenges

1. Introduction

Mixed reality is the merging of the real and virtual worlds, resulting in new environments and scenarios in which physical and digital objects coexist and interact in realtime. Mixed reality is the younger sibling of lmixed reality. Lmixed Reality is delivered by some mobile device that is a handheld device which includes a devices like smart-phone or tablet or i-pads, on the other hand Mixed Reality is delivered by the use of some device which is head-mounted and has a see-through glasses. The integration or amalgamation of virtual and real worlds produces results in some new environments and one can visualise in which physical and digital objects may exist concurrently and can interact in real time. For example, imagine a surgeon wearing a digital overlay while performing an operation, providing specific live information about the surgical process and the current state of the patient's condition such as blood pressure and other vital insights such asurine.

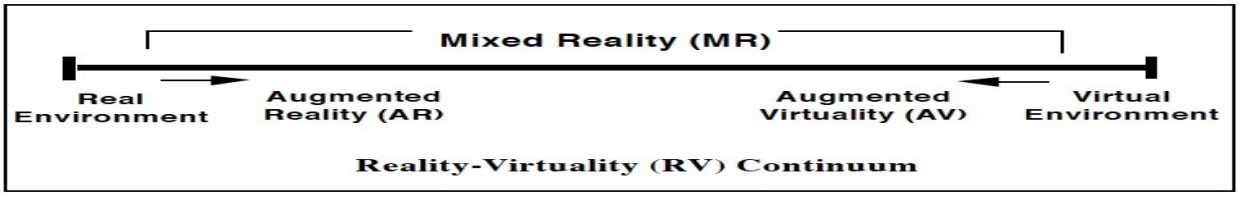

Figure 1. Mixed Reality

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Microsoft has introduced to the whole world the term "Mixed Reality" during one of its event in 2016 during its release of the Microsoft HoloLens. Beside from being mounted on the head, Mixed Reality also differs from wel known lmixed reality in that it has a much more advanced understanding of real world space and also has the ability to fix holograms in that space.

Lmixed Reality (AR)-Digital elements that are added to a live view, typically by using the camera on a smartphone, handheld device, or mobile device. A few examples include lmixed reality experiences such as Snapchat lenses and Pokemon Go.

Virtual reality (VR)- This term refers to a completely new enveloping experience that isolates you from the physical world. Users can be transported into real world and imagined environments such as a penguin colony, elephant herd, Burj Khalifa, or even on the back of a dragonlike avatar movie using virtual reality devices such as Google Cardboard, HTC Vive, or Oculus Rift.

Mixed reality experience is a amalgamation of elements of both lmixed reality and virtual reality, in which real world objects interact with digital world objects, Mixed reality is the technology that is just being launched with Microsofts Hololen's to be most effective early provisions of MR.

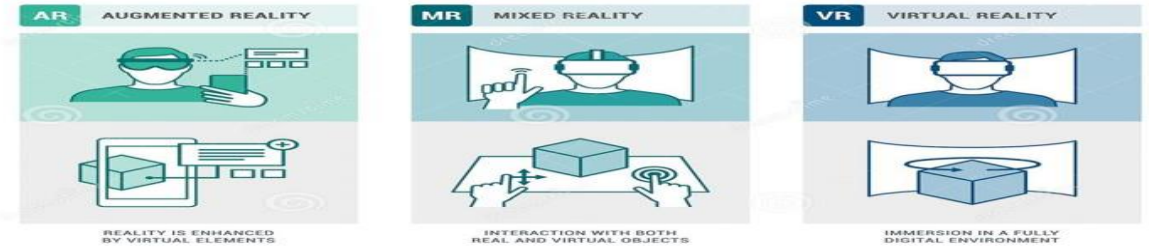

Figure 2. Realities

1.1. Mixed Reality provisions used in education

There are various provisions that are used to create a Mixed Reality environment, and they are evolving over time. Because this is a very new technology, various research is being conducted in various research institutes of multinational corporations and educational institutes. Some of the Mixed Reality provisions which are currently is use are as follows. The following are some examples of Mixed Reality provisions that are used in education:

- HoloLens from Microsoft:The concept introduced by the Microsoft HoloLens was the extrusion of images into our physical world. Essentially, by looking through the lens, we gain entree to lmixed reality. This means that objects are created digitally and can be interacted with. The holograms will be projected into reality, granting them to be interacted with and even explored.
- CAE:- CAE is an lmixed reality solutions which can help in completely transmute education in healthcare and also impart its training.
- GIGXR:-GIGXR is an enveloping learning platform which is conveying extended reality (XR) in learning applications which is used for medical and nursing schools, higher education, healthcare and enterprise globally.
- Hevolus:-Hevolus solutions is helping transmute the procuring process into an engaging and emotionally advantageous experience.

- Kognitiv Spark:-Remote-Spark is an application which is used in industrial lmixed reality appliance through remote support. It can grants remote workers to lodge a low-bandwidth, encrypted/decrypted video and audio call with subject matter advisors when they require help solving a complex problem.
- Lenovo Explorer
- Samsung Odyssey
- Acer Windows Mixed Reality
- Enveloping VR Education
- Google Expeditions.
- Virtual Reality Goggles
- VR Museum of Fine Art
- Mondly

1.2. Use of Mixed Reality in Education

As technology advances, learning continues to reach new heights. Educators and students are working together to make lessons more collaborative and learning more selfdirected. This is made possible by mixed reality, which simplifies complex content that is difficult to understand in 2D. The use of HoloLens has been shown to improve knowledge retention and comprehension. Educators are granting students' experiences during lessons to be enhanced. Bringing the content to life and granting for participation makes the class more enjoyable. Furthermore, because students can visualise all concepts in 3D, learning time will be maximised. Students will be able to pace their learning at their own pace both inside and outside of the classroom. Students can access content which is given by educators from anywhere. This will enable students to learn more quickly and effectively which is a result of this. Students can learn in any environment as long as they have their equipment with them. HoloLens can benefit all students, including those with learning disabilities. Personalized holograms can be created to meet the specific requires of each student. Each student can have an experience tailored to their learning style, giving them the best chance of learning effectively. Mixed reality is not a new technology. Engineering, medicine, the military, manufacturing, and psychological treatments are just a few examples. Mixed Reality has also made contributions to the area of education; in this research paper, we attempted to investigate the method by which Mixed Reality can be used in learning students of Social Science. Learning Social Science with Mixed Reality can be made more understandable and interesting, as evidenced by the various examples. Mixed Reality-based explanations can be used to explain a wide range of theoretical concepts.

- Stone ages
- Jurassic period
- Old Civilization
- Layers of Earth etc.

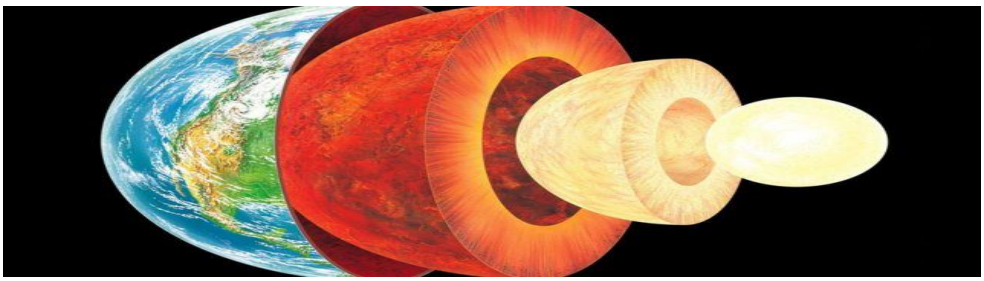

Figure 3. Layer of Earth

This research paper examines Mixed Reality as a theoretical subject in the context of Social Science learning. Traditional learning methods do not engage students in the subjects and do not pique their interest; however, the use of Mixed Reality can provide a new approach to the learning of Social Science. As a result, the researchers attempted to learn about the benefits and challenges of using Mixed Reality which is used in the area of Social Science learning from higher education students in this research paper.

2. Literature

2.1. Benefits of Mixed Reality in Social Science Education

Learning materials will be available round the clock and from any geographical or virtual location. Mixed reality has the potential to replace paper textbooks, posters, physical models and printed material, which will result into education having more mobility and approachable. Mixed reality education will not necessitate much more specialised equipment. Unlike virtual reality and augmented reality, mixed reality does not necessitate a lot of pricey hardware. Education using mixed reality helps in increasing students interest and students engagement. Mixed reality education is interactive and has a very significant positive attitude to students. It will keep students interested in the lessons and make learning more pleasurable while still being straightforward. Education using mixed reality increases collaborative abilities. Education using mixed reality is more efficient and at the same time is effective learning process. Mixed reality in education helps students in achieving better results by granting them to visualise and fully immerse themselves in the subject matter. Isn't a picture really worth a thousand words? As a result, rather than reading about something in theory, students may see it in action with their own eyes. Experiential learning. Professional training, in addition to schooling, can tremendously benefit from the usage of mixed reality. Accurate reproduction of in-area conditions, for example, can aid in developing the practical skills required for a particular job. Training for workplace safety and efficiency. Imagine performing heart surgery or space shuttle operations without putting people at danger or risking millions of dollars in harm if something goes wrong. This is made feasible by mixed reality. It's appropriate for students at all stages of education and training. Whether it's kindergarten learning games or on-the-job training, there's something for everyone.

2.2. Challenges of Mixed Reality in Social Science Education

Despite the aforementioned advantages, there are a few problems to be aware of while developing solutions using mixed reality. Some teachers may find it difficult to implement these new technology since their prior training lacks the requisite skills. Only the most open-minded professors and innovative educational institutions should use mixed reality apps in the classroom. Mixed reality requires a significant amount of training**.** Each mixed reality situation investigated was distinct, necessitating a different programme and educational qualifications. Because of its one-of-a-kindness, both educators and kids will need training to fully comprehend how to use eachmixed realitysoftware. Because of its one-of-a-kindness, both educators and kids will need training to fully comprehend how to use eachmixed realitysoftware. Furthermore, lecturing professors found it difficult to relinquish control and let pupils to explore the learning environment on their own. Teachers should be taught how to employ a hands-off approach with their students, as well as how to illustrate how this method promotes a positive learning environment. Giving kids more control over their learning might reduce the anxiety of not knowing what is on each student's device. Furthermore, teachers believed that if they were left alone without the researchers, they would be unprepared to manage the similar situation. If instructors are expected to employ mixed reality technology in the future, researchers should provide training to them. The use of the surrounding environment to set up learning locations is required in many mixed reality applications. Students receive information by walking about and using their mixed reality technology equipment. When pupils approach close to the correct sites, the information must be activated by GPS coordinates or other techniques.

Both the developer and the educator must be aware of their surroundings for this to succeed. As a result, teachers must either train themselves or attend environmental training sessions. If a mixed reality application is designed to be completed at a school where children are near fire alarms, for example, information about fire safety appears on their device, and the instructor or developer must be informed of the location of any fire alarms. In order to use mixed reality in the classroom, you'll need a specified set of resources. Not every student, for example, has a smartphone capable of running mixed reality apps. There are numerous hurdles to overcome when planning to integrate this type of technology in the classroom. Many teachers lack the abilities to programme their own mixed reality learning experience and must rely on pre-made creation resources, which are uncommon. However, there are numerous free resources accessible for teachers to use, but it is important to note that because instructors are not well taught, they are unable to use these tools. Mixed reality systems are becoming easier to use and mean minimal programming knowledge, making them more appealing to the average instructor.

A GPS error can be caused by either the GPS's software or an erroneous configuration. This was thought to be the "most serious" flaw. The ability of the gadgets to be utilised efficiently outside was also recognised as a flaw in this investigation. The sun's radiation, as well as the noisy surroundings, may make it very difficult for students to learn. Students who worked in groupings scored significantly higher than students who worked alone. These multi-user groups must communicate with one another. As a result, one of the issues noted in this study is the need for developers to build spaces for team members to collaborate. The mixed reality environment's success may be jeopardised without this additional platform. When adopting mixed reality in the classroom, there are a variety of devices that can be employed. Computer-generated visuals are imprinted on the user's reality via glasses, hand-held devices, and headwear. The mixed reality software you create must run well on all platforms and devices. However, providing the same level of mixed reality content on each platform is almost hard.

When participating in outdoor activities, pupils are unable to operate on their gadgets while also keeping an eye on where they are going. As a result, teachers were compelled to reroute pupils to safety after they wandered into highways. Some learning situations necessitate student mobility. Exploring the world is a frequent assignment; however, pupils must obtain permission from the school administration to travel outside of the classroom. Without this component, the usage of mixed reality technologies by teachers and students would be severely constrained. Using mixed reality devices with kids necessitates careful classroom management. If mixed reality gadgets are not correctly developed, they can cause certain health risks. Using poorly constructed mixed reality devices can result in tunnel vision, which should be avoided. The type and amount of information supplied should be considered by developers and instructors. This may help to keep the brain from being overworked. Furthermore, when a user is overloaded, tension and other forms of frustration can emerge, diverting the student's attention away from the learning goal. Mixed reality learning environments are frequently constructed with many roles so that students can work in groups and collaborate with one another. Student absences are unavoidable, yet they have a significant impact on the learning environment. Furthermore, depending on the mixed reality programme, teacher assertiveness, and intrinsic drive, pupils who are working without limits can accelerate through or ignore information. Students may speed through the activity without completely understanding the information offered. Students should be monitored to stay on target and on pace, even when mixed reality leads to a high level of involvement.

3. Methodology

The success of any research is based on its planning and methodology of study. A well-planned research overcomes many difficulties in the path of the researcher; Therefore, for effective, systematic study of any research work, it is necessary to have an effective or clear plan and method of study.

3.1. Design

The qualitative research approach was employed by the researchers to fulfil the study's aims. The research is exploratory in character and achieves its goals. Exploratory research, as the name implies, is designed to elucidate research topics rather than providing definitive answers to current problems.

3.2. Objectives

The study's key goals include the following points:

- How many people are familiar with Mixed Reality
- How can Mixed Reality be utilised to teach Social Science?,
- What are the benefits and drawbacks of mixed reality?
- Mixed Reality, as a appliance in Social Science learning and its future use to find out what other changes can be made, etc.,

3.3. Sampling Method

It was not possible to include all students in this study due to constraints such as time, pandemic period and scope of study. In this context, it was necessary to ensure that the study is representative so a random sampling method has been chosen to select the sample for research.

3.4. Sample

Students and teachers of higher education were selected by the researchers, in which data has been collected from 20 teachers and 100 students associated with the area of Social Science learning.

3.5. Provisions

For the collection of data in the present study, researchers used the following two provisions:

- Questionnaire.
- Interview

4. Data Analysis and Interpretation

To make the research study convenient and more appropriate, it is divided into five dimensions:

- Awareness of Mixed Reality
- Information about the provisions of Mixed Reality
- Mixed Reality's Advantages in Social Science Education
- Challenges of Mixed Reality in Social Science education
- Future advantages of mixed reality in social science teaching

Both the interview and questionnaire tools' questions were created with these dimensions in mind.

4.1. Students:

To collect information about Mixed Reality from the students, online Google Forms mixed questionnaire was used in which 100 students gave response which we have seen by dividing them into some dimensions.

a. Awareness of Mixed Reality

On first question how many students are familiar with Mixed Reality. About 50% students answered yes and about 50% students answered no, which clearly shows that nearly half the students are aware of Mixed Reality, and its use in education.

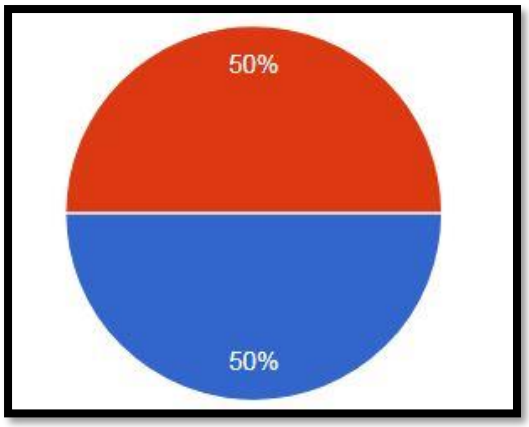

Figure 4. Answer Rate

b. Information about the provisions of Mixed Reality

Students gave varying responses on the Mixed Reality provisions which they know, have used or even heard about the provisions, results are as mentioned below:

- Microsoft HoloLens,- 60%
- Students Enveloping VR Education-20%
- Students Google Expeditions-80%
- virtual reality goggles-60%
- VR Museum of Fine Art-40

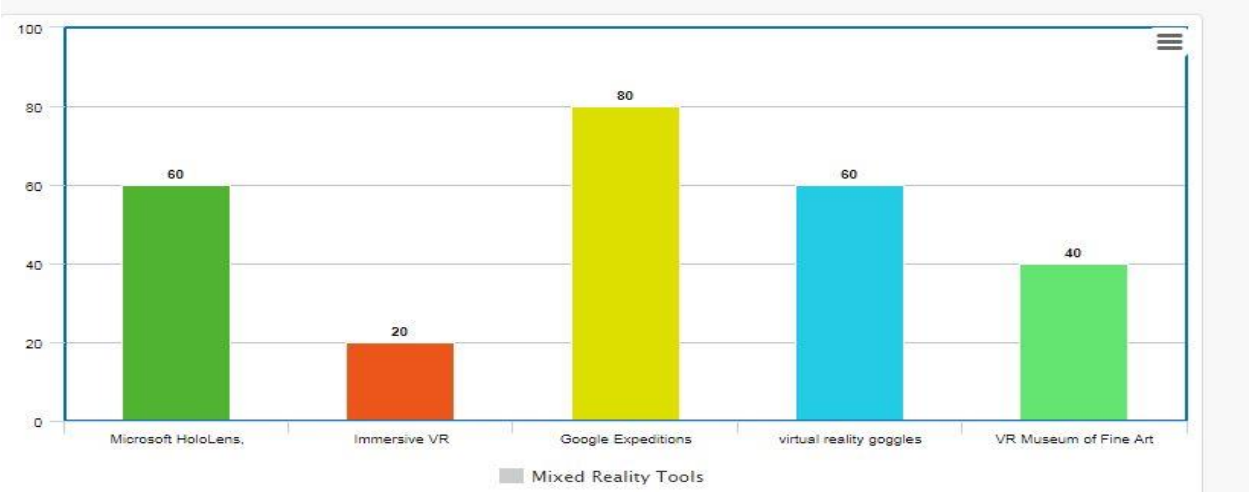

Figure 4. Information about the provisions of Mixed Reality

c. Mixed Reality's Benefits in Social Science Education

Most Received Feedback on the Benefits of Mixed Reality in the Social Science "Helpful in presenting reality, thereby fulfilling the purpose of explaining the concept in the Social Science classroom". Some students said Mixed Reality good for enhancing education. some students said 'It Will Grow and help in Social Science area as it provides flexibility to feel and touch the object used '. 50% of students did not respond to this question because they did not know about Mixed Reality.

d. Challenges of Mixed Reality in Social Science education

What are the challenges of Mixed Reality in the learning area of Social Science , an important fact emerges that there is a lack of training among teachers to use reality as a appliance of education, Second, students and teachers have less entree to this new technology.

e. Benefits of Mixed Reality education in future

- It's use will increase in the coming time, which will increase creativity and understanding in the classroom, so that students will be able to make their own decisions.
- MR provisions can help educators and students in enhancing their learning learning process.
- It will grow and help in every area as it provides flexibility to feel and touch the object.
- It increases the specific areas of theoretical knowledge in terms of evaluating real life situations with the help of advanced technological interventions.

4.2. Teachers

Interview method has been used to collect data about Mixed Reality from teachers in which responses are taken through phonic interviews with 20 teachers which we will look at in four dimensions:

a. Awareness of Mixed Reality

On the question of awareness of Mixed Reality, only 7 out of 20 teachers reported being familiar; others were not aware of the use of Mixed Reality as a learning appliance in the Social Science s.

b***. Information about the provisions of Mixed Reality***

On the question of knowledge and use of equipment to reality, only 6 teachers said that they were familiar with it, others were not familiar with its equipment.

c. The advantages of Mixed Reality in Social Science education

The responses received on the benefits in the area of Social Science education of the fact that with its use the concepts of Social Science can be easily explained to the students, its use can be made to make the classroom more lively, interesting, the student himself can be more subject to Will be able to add, this will reduce the workload of teachers etc.

d. Challenges of Mixed Reality in Social Science education

The response received from most teachers to the question of the challenges of using reality was that teachers lack information related to Mixed Reality, this technology has little or no entree in the area of Social Science learning responses like It can be very costly to use, etc received.

5. Conclusion and future work

In this research paper, an attempt has been made to see the awareness, benefits and challenges of Mixed Reality in the area of Social Science learning. For the study, the researchers have chosen a random sampling method to select the sample for research. The total size of the sample is 100; In which the graduate and postgraduate students have been taken for research purpose. Phonic interview appliance has been used to collect data from teachers. Mixed questionnaires have been used under the interview so that teachers can openly share their experiences and challenges. Here the questions have been analyzed on the basis of the answers obtained in the interview.

While analyzing the research questions, the researcher got some conclusions related to his questions and objectives which are as follows; Only 50% of the students and 7 out of 20 teachers responded yes to the awareness of Mixed Reality, which shows that very few teachers and students are familiar with Mixed Reality in the area of Social Science learning. The Mixed Reality devices also received far fewer responses. Students were more familiar with the devices than teachers. The key facts that emerge from the responses received on the benefits of Mixed Reality are that; the concepts of Social Science can be easily explained to the students, its use can be made to make the classroom more lively, interesting, this will reduce the workload of teachers, Helpful in presenting reality, thereby fulfilling the purpose of explaining the concept in the Social Science classroom,reality good for enhancing education. 50% of students did not respond to this question because they did not know about Mixed Reality.

So the main fact that comes out from this whole study is that there is very little awareness among the teachers and students associated with the area of Social Science learning about Mixed Reality and its associated provisions, it can be said that very few are familiar. Students are more familiar with this subject than teachers, the second main fact that emerges from Mixed Reality is that through the use of its provisions, Social Science can be presented in a new way, instead of just learning it through the traditional method, thereby increasing the cognitive development of the students. and the interest of students on the subjects of Social Science will become more. Due to the small range of study and less time, some such things are; who have been left out. Therefore some suggestions for future studies in this area are as follows:

- To study also on primary and secondary level students.
- Covering more and more Social Science disciplines.
- Gaining knowledge from more literary sources.

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Perspective and Non-perspective Cameras in Virtual Worlds

Dursun Akaslan[1]

Abstract: Cameras use many types of projection modes for different uses. The perspective projection mode is the most common projection mode used for rendering a 3D scene because it is designed to copy the way human eye look at around. Additionally, perspective view is known as the most natural view. However, objects are not rendered the same size with the perspective camera. The distance between an object and the camera does matter in the perspective projection mode. This paper examines the difference between the orhographic and perspective cameras to understand how they affect geometries in virtual worlds. The best way to explain the differences between these cameras is by creating and looking at a couple of examples. A JavaScript library known as Three.js and Blender are used in the study to understand the difference between perspective and non-perspective cameras in virtual worlds. Our study indicates that there is a huge different in the way we create the perspective and orthographic cameras because they take different arguments. For instance, field of view (FOV) is the most important part of the scene that can be seen from the position of the camera. However, the orthographic camera is not interested with what FOV we look at the scene since all the objects are rendered at the same size. This study help game designer and developer to determine what type of projection mode they need to use in their games. For examples, the orthographic camera should be used in 2D games such as SimCity 4.

Keywords: Perspective Camera, Orthographic Camera, Virtual Worlds, Geometry

1. Introduction

Cameras are known as a device for taking photographs or making film or television programmes in the real world. Similarly, cameras are also used in the virtual worlds to define which portion of a scene is visible in the rendered image.

Cameras do not have any material or texture settings since they are invisible in renders. A scene and a camera in the virtual world are passed to a renderer for drawing the portion of the 3D scene that is based on the view of the camera as a 2D image. The most common cameras in the virtual worlds are known as perspective and orthographic cameras.

The purpose of our study is to examine the difference between the orhographic and perspective cameras to understand how they affect geometries in virtual worlds. To achieve our purpose, examples have been created and used in our study to understand the difference between these two types of cameras by considering various features of them.

2. Methodology

2.1. Perspective Cameras

The perspective camera is the first most common cmaera in the virtual world because it gives a 3D view where things in the distance appear smaller than things up close (Cabello, 2021). The view of the perspective camera view is illustrated in the Figure 1. A perspective camera defines its frustum based on 4 parameters as illustrated in Figure 2. As illustrated, those properties are used for modifying the perspective camera settings.

i. Field of View

The first parameter is known as the field of view (FOV). The FOV defines how tall the front and back of the frustum are by computing the correct height to get the specified field of view at near units from the camera (Cabello, 2021).

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ii. Aspect

The second parameter is used to define who wide the front and back of the frustum are in the virtual World. The aspect value is traditionally computed by dividing the width of the window to its height.

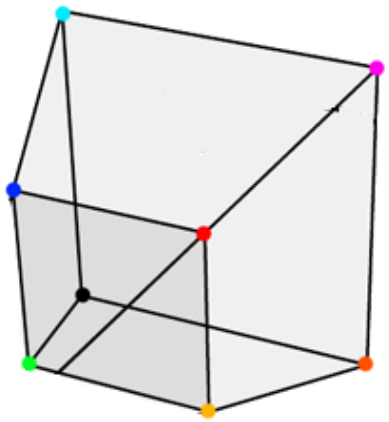

Figure 1. Perspective Camera View

iii. Near

The third parameter defines where the front of the frustum starts. As seen in the Figure 2, it plays a critical role in specifiyng what will be visible in front of the camera.

iv. Far

The fourth parameter defines wheere the frustum ends. The far value specifies what things will be invisible in the far front of the camera.

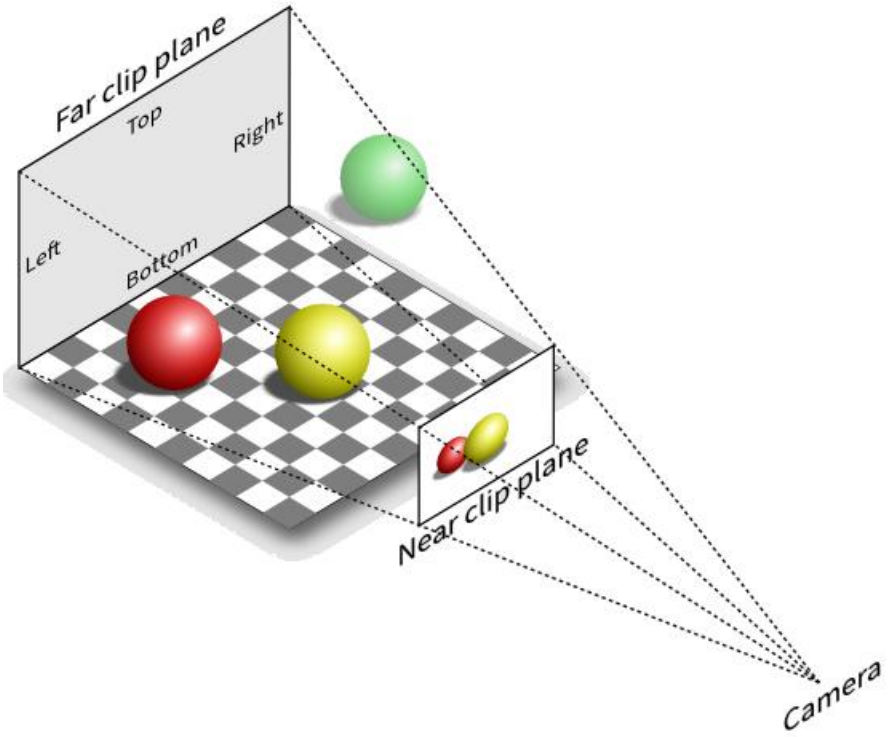

Figure 2. Perspective Camera Settings (Thompson, 2021)

2.2. Non-Perspective Cameras

The perspective cameras are known as a perspective camera whereas orhopgraphic cameras are described as a non-perspective camera. The non-perspective camera is the second most common camera in the virtual worlds. A orthographic camera does not specify a frustum. Rather than, it specifies a box as illustrated in Figure 3.

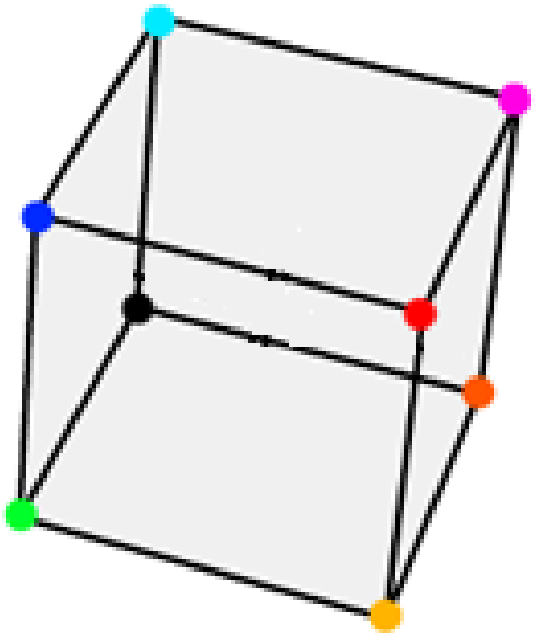

Figure 3. Non-Perspective Camera View

Because non-perspective cameras are projecting a box, there is no perspective. A orthographic camera specifies a box with the settings left, right, top, bottom, near and far as illustrated in Figure 4 (Cabello, 2021).

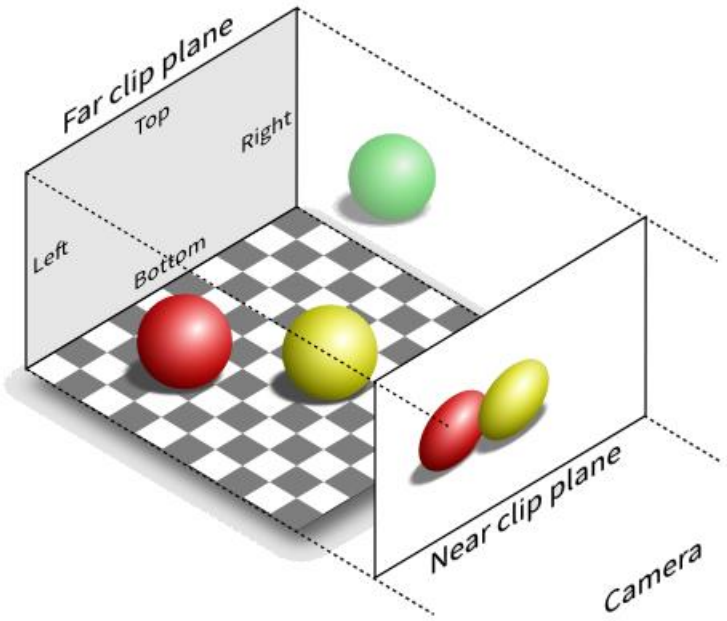

Figure 4. Non-Perspective Camera Settings (Thompson, 2021)

i. Left

The left parameter is the first parameter to customize a non-perspective camera. It is used to decribe the left border of the near and far clip plane in the virtual world.

ii. Right

The right parameter is the second parameter to customize a non-perspective camera. It is used to decribe the right border of the near and far clip plane in the virtual world.

iii. Top

The top parameter is the third parameter to customize a non-perspective camera. It is used to decribe the top border of the near and far clip plane in the virtual world.

iv. Bottom

The bottom parameter is the fourth parameter to customize a non-perspective camera. It is used to decribe the bottom border of the near and far clip plane in the virtual world.

v. Near

The fifth parameter defines where the front of the box starts. As seen in the Figure 4, it plays a critical role in specifiying what will be visible in front of the camera.

vi. Far

The sixth parameter defines wheere the box ends. The far value specifies what things will be invisible in the far front of the camera.

3. Findings and Discussions

3.1. Perspective and Orthographic Projection in Blender

A distinctive view of using orthographic and perspective cameras in virtual reality might been seen with ease by using a computer-aided design (CAD) software such as Blender. As seen in Figure 5 and 6, perspective and orthographic views are used in Blender. In the orthographic view, objects regardless of whether they are near to cameras or not appear to be exactly the same size. Moreover, there is no defect in the geometry of the objects.

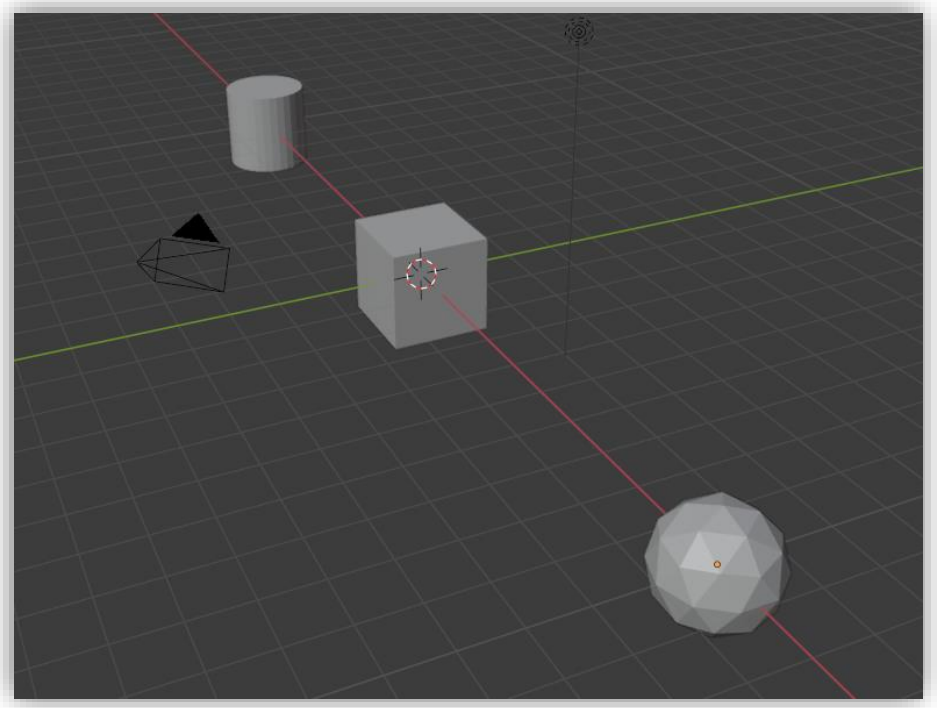

Figure 5. Orthographic View

As seen in the Figure 5 and 6, three objects have been located in the scene namely a cube, cylinder and icosphere. Distance between objects has been set as 10 units (m). The dimension of objects in X, Y and Z axes are specified as 2 m. As figures clearly illustrates that objects far from cameras in the perspective view appers to be smaller than ones near to cameras. However, that is not the case in the orthographic view because all objects look the same size.

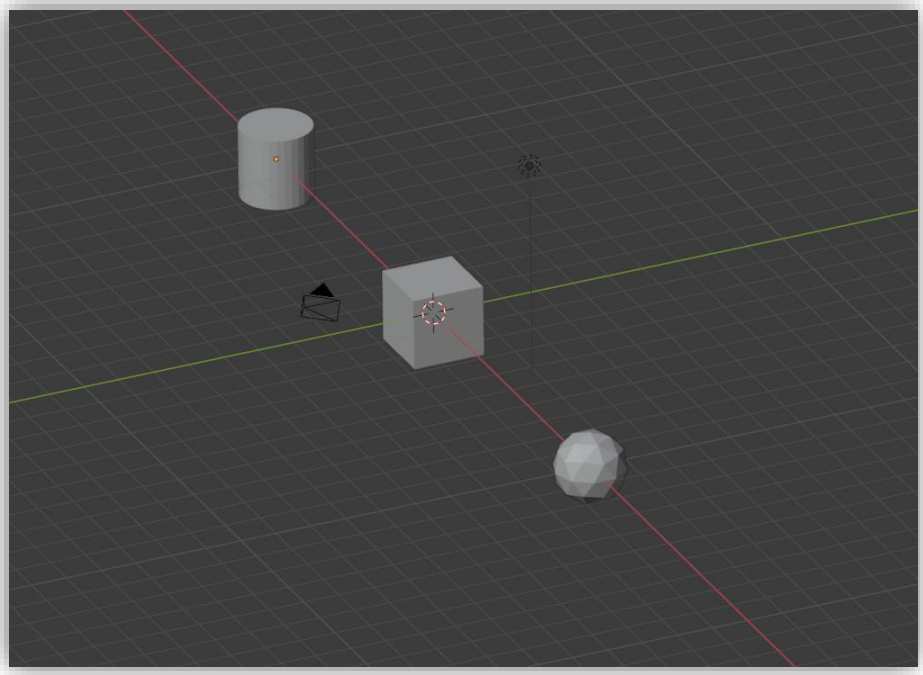

Figure 6. Perspective View in Blender

3.2. Perspective and Orthographic Projection in Three.js

A JavaScript library known as Three.js is also used in the study to understand the difference between perspective and non-perspective cameras in virtual worlds. As seen in the Figure 7, there are three objects with different colours in the scene namely a cylinder, cube and cone. Morevoer, a JavaScript library called “OrbitControl” is also used in our study to make a rotation over objects.

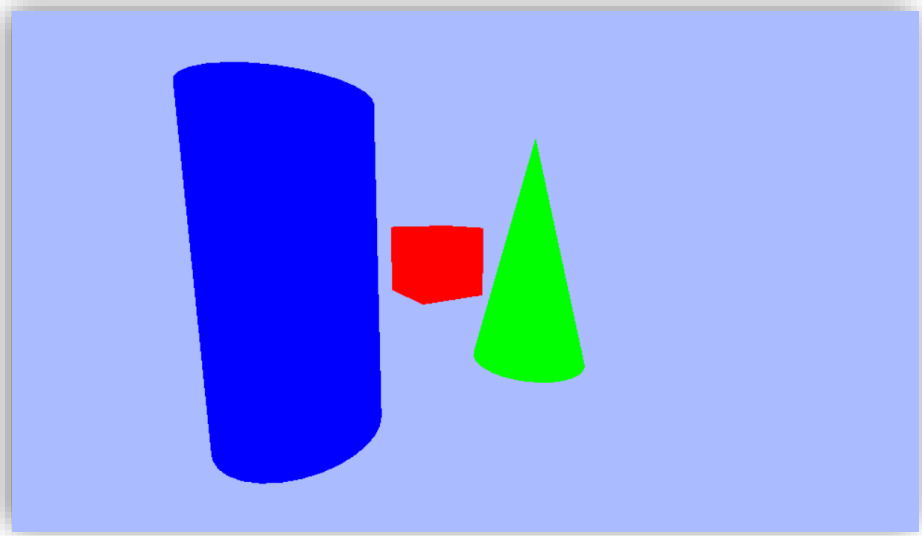

Figure 7. Perspective Camera in Three.js

Simarly, objects in the orthographics views appear at the same scale because its size in the rendered image stays constant regardless of its distance from the camera. However, as seen in Figure 7, the blue cylinder looks much larger than its original size in the perspective view.

4. Conclusion

Perspective and non-perspective cameras are the most common cameras in the virtual worlds with different purposes. However, they differ in the usage. Orthographic camera should be preffered in order to draw the up, down, left, right, back and front views of a 3D models. Perspective cameras are the most simlar to the way that human look at the objects around. Therefore, the perspective view should be preferred in human-look-related projects.

Our study indicates that there is a huge different in the way we create the perspective and orthographic cameras because they take different arguments. For instance, field of view (FOV) is the most important part of the scene that can be seen from the position of the camera. However, the orthographic camera is not interested with what FOV we look at the scene since all the objects are rendered at the same size.

This study help game designer and developer to determine what type of projection mode they need to use in their games. For examples, the orthographic camera should be used in 2D games such as SimCity 4.

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Real-Time 3D Preview and Export in Schematic and PCB Design

Dursun Akaslan[1] and Mehmet Hadi Suzer[2]

Abstract: Real-time 3D preview and export feature are becoming more important in showing the model of manufactured printed circuit board with all components installed because this feature facilitates the schematic and PCB design. By real-time 3d preview and export feature, users can rotate the board on three axes, zoom in and out in real time, change the colors of the board, copper areas, solder mastk, silkscreen and background. Moreover, boards can be exported to virtual reality modelling 2.0 formats for mechanical CAD modelling. This study investigates what factors and variables are critical in PCB design by considering the real-time 3D preview and export. The PCB program "DipTrace" has been used in our study to analyse the key factors and variables in schematic and PCB design. Our findings reveal that several factors and variables such as manual routing, autorouting, panelizing and net classess play an important role in schematic and PCB designs. Our study will help researchers understand the key components in PCB tutorials.

Keywords: PCB Design, Schematic Design, 3D Modelling

1. Introduction

The word PCB is used as an acronym and stands for Printed Circuit Board. Today, every electronics equipment in home and industry are manufactured with a single or multiple number of PCBs such as mobile phones, aircrafts, medical devices and industrial machinery (Salazar, Marzo, & Silvestre, 2019; Sreedhar, Mahato, Chaturvedi, & Jaiswal, 2021). The process of designing and laying out a PCB was very daunting task back in the pre-computer aided design days because PCBs were designed and laid out by hand using tapes and pads on clear drafting films, spending many hours over a fluorescent light box and routing tracks (Jones, 2004).

The computer-aided design (CAD) has replaced the traditional methods of designing and laying out PCB and reduced development time and cost in both hobbyist and professional electronics because it allows us to simulate and analyze schematic and PCB design prior to purchasing and manufacturing (Jones, 2004; Mitzner, 2009). Several PCB programs such as Altium, Fusion 360, NI Multisim, KiCad EDA, Autodesk Eagle, Ultiboard, SolidWorks PCB, OVR Stylus, Morph Sensor, ExpressPCB Plus and DipTrace are used as a design software for helping electronic engineers in designing layouts for PCBs. The schematic and PCB design programs have several key benefits such as (G2, 2021):

- Hobbyist and professionals can save time by using pre-made components included in the program,
- Users can test the strength of their designs in virtual settings,
- With 3D visualization features, PCB programs provides a holistic view of PCB design.

The purpose of this study to analyze what factors and variables play a critical role in schematic and PCB design by considering the real-time 3D preview and export. To achieve this purpose, two stages are followed by the authors of this study: first, general and specific features of the PCB design are examined and second, a PCB design software namely DipTrace is used to find out whether those features are applicable in PCB design virtually.

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2. Methodology

2.1. Target Groups

Schematic and PCB design programs such as DipTrace are mainly used by hobbyist and professionals. Teachers and engineers are the major users. For instance, electronic engineers in academia and industry work with printed circuit boards daily for designing and fabricating consumer and commercial electronics (G2, 2021). Moreover, teachers utilize schematic and PCB design programs for educating electronic students about the fundamentals of PCB design.

2.2. PCB Design Software

Salazar, Marzo, and Silvestre (2019) specifies a number of steps that must be carefully full filled in order to achieve an optimized circuit in PCB design namely drawing the schematic, creating the board, placing the parts and routing the signals, editing the board and checking, creating PCB manufacturing data. Several types of PCB design programs are used for applying the steps just mentioned in academia and industry with several features such as open-source and commercial PCB programs. G2 (2021) classifies PCB design programs based on schematic editor, component library, 3D visualization, design rule check, auto routing, differential pair routing and collaboration.

3. Finding and Discussion

As with most engineering design, there are several conflicting requirements in schematic and PCB design, and the last version of the PCB design strategy is determined after considering several trade-offs (Archambeault & Drewniak, 2002). A PCB design program must have some main features to be qualified as a PCB design program such as providing schematic editing tools, including a components library, and modifying PCB layouts and circuitry (G2, 2021). Figure 1 illustrates the main critical components in schematic and PCB design. As illustrated in the figure, libraries play a critical role in every stage of the PCB design because it gives users access to a number of pre-built components namely symbols, patterns and models.

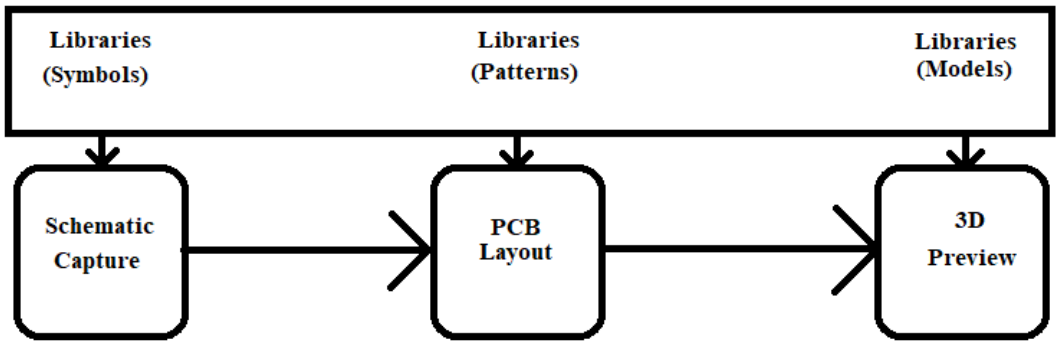

Figure 1. Key Components in Schematic and PCB Design Software

3.1. Schematic Capture

A complete and accurate schematic diagram should be ready before beginning to lay out PCB because a PCB design is manufactured version of our schecmatic (Jones, 2004). A schematic and PCB design program should have schematic editing tools that allows teachers and engineers to modify properties of components, wires, nets and pins in schematic capture (G2, 2021).

Schematic editors are required in PCB design because the component and part symbols should be placed, nets and buses should be drawn, and components should be moved, edited, and placed (Salazar, Marzo, & Silvestre, 2019). Moreover, the schematic symbol of each electronic component should have a PCB footprint associated with the schematic symbol (Salazar, Marzo, & Silvestre, 2019). Several key factors in schematic play an important role in schematic design namely electrical rule check, components, nets, interface and preparing to route. Table 1 illustrates the number of key factors and its main variables in schematic design software.

Tablo 1. Kay Factors & Variables in Schematic Design Software

No	Factors	Variables
1	Interface	Grid
2	Interface	Object
3	Interface	Schematic Information
4	Interface	Units
5	Interface	Toolbars
6	Components	Symbols
7	Components	Markings
8	Components	Properties
9	Components	Filters
10	Components	Alignment Center
11	Nets	Wires
12	Nets	Classes
13	Nets	Buses
14	Nets	Pins
15	Nets	Connectors
16	Electrical Rule Check	Run
17	Electrical Rule Check	Colors
18	Electrical Rule Check	Rules
19	Electrical Rule Check	Pin Types
20	Electrical Rule Check	Errors
21	Preparing to Route	Converting to PCB
22	Preparing to Route	Error Information
23	Preparing to Route	Attached Patterns
24	Preparing to Route	Units
25	Preparing to Route	Rule Settings

As seen in Table 1, many factors and variables have impacts on the schematic design software such as symbol, markings, classes, rules, and units. Figure 2 illustrates the schematic diagram of a particial counter in the DipTrace – Schematic Capture Program. As seen in the figure, symbols, markings, pins, and nets appear in the schematic at the first look. However, designing such a schematic diagram requires the usage of all variables in the Table 2.

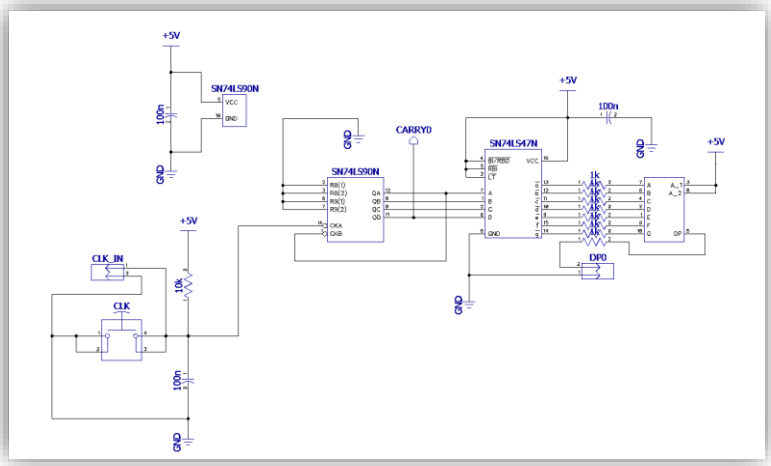

Figure 2. A Counter (Schematic Capture)

3.2. PCB Layout

A PCB might have several layers from 1 to 30 or more layers. A PCB might be a single-sided, double-sided, and multilayer PCBs. PCB boards with 1 layer or single-side PCBS are considered for the most common, simplest, and lower cost boards (Archambeault & Drewniak, 2002; Zakai, Faizan, & Khan, 2021). More sophisticated electronic circuits such as computer graphics cards or motherboards used in computers are composed of multiple layers sometimes up to sixteen or more (Salazar, Marzo, & Silvestre, 2019). Table 2 illustrates the number of key factors and variables in PCB design software. Moreover, Figure 3 illustrates a complete counter in the DipTrace – PCB Layout Program.

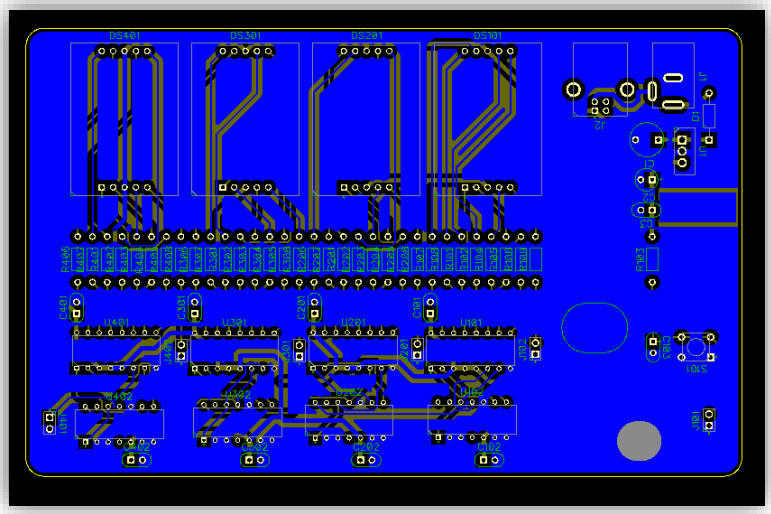

Figure 3. A Counter (PCB Layout)

As seen in the figure, patterns, markings, copper pour, board outlines, and peds appear in the PCB design at the first look. However, designing such a PCB requires the usage of all variables in the Table 3.

Tablo 2. Kay Factors & Variables in PCB Design Software

No	Factors	Variables	No	Factors	Variables
1	Introduction	Terms	26	Working with Vias	Types
2	Introduction	Materials	27	Working with Vias	Menus
3	Introduction	Soldermasking	28	Working with Vias	Properties
4	Introduction	Ampers	29	Working with Vias	Application
5	Introduction	Traces	30	Working with Vias	Converting
6	Interface	Menus	31	Copper Pour	Layers
7	Interface	Shortcuts	32	Copper Pour	Types
8	Interface	Panels	33	Copper Pour	Connectivity
9	Interface	Origin	34	Copper Pour	Properties
10	Interface	Default Values	35	Copper Pour	Border
11	Layers	Types	36	Autorouting	Routers
12	Layers	Parts	37	Autorouting	Shortcuts
13	Layers	Copper Pour	38	Autorouting	Shape Routes
14	Layers	Vias	39	Autorouting	Grdi Routers
15	Layers	Numbers	40	Autorouting	Settings
16	Manual Routing	Routing	41	Design Verification	Running
17	Manual Routing	Placement	42	Design Verification	Colors
18	Manual Routing	Modes	43	Design Verification	Rules
19	Manual Routing	Trace Width	44	Design Verification	Errors
20	Manual Routing	Toolbars	45	Design Verification	Real-time
21	Panelizing	Board Outlines	46	Printing	Graphics and Texts
22	Panelizing	Board Shapes	47	Printing	Images
23	Panelizing	Size	48	Printing	Placements
24	Panelizing	Type	49	Printing	Preview
25	Panelizing	Edge Rails	50	Printing	Exporting

3.3. 3D Preview

A physical structure of the PCB can be visualized by virtually using 3D models in the schematic and PCB design programs (Sreedhar, Mahato, Chaturvedi, & Jaiswal, 2021). The ability to have a look at a design in 3D helps hobbyists and professionals to catch any fault components that are interfering with the electrical circuitry (G2, 2021). Table 4 illustrates the number of key factors and variables in 3D Preview.

Tablo 3. Kay Factors & Variables in 3D Preview

No	Factors	Variables	No	Factors	Variables
1	Colors	Background	11	Models	Types
2	Colors	Board	12	Models	Import
3	Colors	Solder Mask	13	Models	Export
4	Colors	Copper	14	Models	Units
5	Colors	Silk Screen	15	Models	Display
6	Views	Standard	16	Transform	Position
7	Views	Isometric	17	Transform	Rotation
8	Views	Rotation	18	Transform	Scale
9	Views	Axes	19	Transform	Flips
10	Views	Zoom	20	Transform	Proportion

Moreover, Figure 4 illustrates a complete counter in the DipTrace – 3D Preview. As seen in the figure, 3D models and colors attract the attention of the users at the first look. However, designing such a 3D preview requires the usage of all variables in the Table 4.

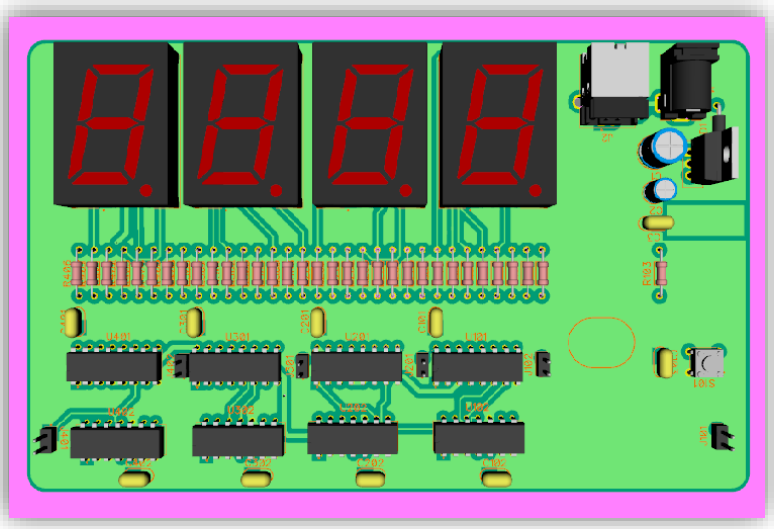

Figure 4. Counter (3D Preview)

3.4. Libraries

Schematic and PCB design programs normally contain a large number of electrical and electronics components. Libraries help teachers and engineers easily implement high-quality PCB footprints (G2, 2021). However, if any created footprint in the library is not well designed and verified with final product, a big productivity failure might happen (Salazar, Marzo, & Silvestre, 2019). Several key factors play an a critical role in PCB design namely electrical rule check, components, nets, interface and preparing to route. Table 4 illustrates the number of key factors and variables in PCB design software.

Tablo 4. Kay Factors & Variables in Libraries

No	Factors	Variables	No	Factors	Variables
1	Pattern Library	New Library and Pattern	6	Symbol Library	New Library and Symbol
2	Pattern Library	Pattern Editor	7	Symbol Library	Symbol Editor
3	Pattern Library	Pattern Properties	8	Symbol Library	Symbol Properties
4	Pattern Library	Layers	9	Symbol Library	Attached Pattern
5	Pattern Library	Pad Managers	10	Symbol Library	Pin Managers

4. Conclusion

3D preview positively affects learning curve of Schematic and PCB Design Software design in the century we currently live in. Most PCB design solutions such as DipTrace offer both 2D schematics and complete 3D visualization of the PCBs. Our findings reveal that many factors and variables have impacts on the Schematic and PCB Design Softwares. We found that there are four key components in the PCBs namely Schematic, PCB, 3D Preview and Libraries. Moreover, each key component has been affected by several factors and variables. In the future of our works, factors and variables revealed in our study will be used to organize a course on schematic and PCB design by considering the 3D visualizations and export features.

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