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The impact of immersive technologies in our daily life

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Informations	Abstract
KEYWORDS: Immersive technologies Virtual Reality (VR) Augmented Reality (AR) Mixed Reality (MR) Immersive Videos (IV) * Correspondence kezihi.soufyane@gmail.com Reçu le/ Révisé le /Accepté le	We began this year with the same picture we did last year due to the pandemic. In the whole world, communication and meet with each others are no longer possible, which leads the governments of all countries to resort to video call communication Visio conference using software such ZOOM. This latter is also being used in so many domains and with regard to the academic field, specially teaching. The Visio conference way comes short, in other words it is not as effective as the traditional technique therefore the IT (information technology) section takes place the immersive technologies to come out with optimal solutions. In this paper, we will discuss the efficient use of immersive technologies in improving virtual communication and meeting in many fields such as academic, politics, psychology, ... But not only, Immersive technologies are used also to facilitate training with simulation techniques, effectively used by virtual shopping, education, army training, medicine, physical rehabilitation, etc.

1. Introduction

With the evolution of technology into our daily life, we now live in the world of experience driven global connectivity, people share moments on social media, people learn from YouTube... Technology has never been the same in the past, technology is developed in order to help us share stories many aspects of our lives better than we have ever before. The rise of immersive technologies is giving us new opportunity to carry the communication road through direct experiences.

Most people think that virtual augmented realities can only be used in entertainment and gaming but the immersive technologies have revealed a power of key communication gaps, we would like to explore it with you a few ways how.

We propose in this paper to discuss the effect of immersive technologies in our lives in current pandemic situation and in which field those technologies are the most applied and helping. In fact, since we cannot attend courses, talking face-to-face with colleagues or sharing moment outside with friends, we are more using social networks, videoconferencing and tele-working to keep in touch whether in a professional or friendly context. For this purpose, people have turned to immersive technologies such as VR (virtual reality) that immerse yourself completely in a digital world using VR goggles. AR (augmented reality), which allows you to place digital objects into the real world seeing

without manipulation. MR(mixed reality, which is about interact with digital objects that are superimposed onto the real world using Hololens, IV (immersive videos) are spherical videos based on video recordings in all directions at the same time.

The paper is organized as follow. In the second section, we will discuss related work. In the third section, we will introduce immersive technologies and their methods such as virtual reality, mixed and augmented reality. The different application domains of immersive technologies will be presented in the fourth section. We will finish the article with the section of conclusion and some perspectives.

2. Related work

Many research works were done in the field of immersive technologies. Our study aims to review the impact of the immersive technologies on all the aspects of the communication and in the use of simulation technique in some particular areas.

Staler [1] defined immersive technology as technology that offers a high quality or quantity of sensory information to the use, while, Lee et al.[2] defined it as technology that blurs the lines between the physical and virtual worlds.

Honda et al. [3] studied the challenges and the opportunities of immersive technologies. They underlined the use of immersive technology as a management tool where they focused on virtual and augmented realities (VR and AR), haptic technology

and tele-immersion. Sharm et al. [4] discussed how the immersive technologies could influence software engineering. Hall et al. [5] analyzed the promise and the peril of immersive technologies by focusing on augmented and virtual reality methods. Calvet et al. [6] reviewed the basics and the main

application of immersive technologies in higher education in order to enhance e-learning.

The table below summarizes some research works and studies on the application of immersive technologies in different fields.

Table 1. Summary of literature review on immersive technologies

Year	Authors	discussed methods	Application	Deduction
2015	Shelton et al. [7]	VR, AR and MR	Games and robotics	A variety of immersive technologies used with elderly people were effective
2018	Feng et al. [8]	Immersive virtual reality (IVR) based serious games (SGs)	Game	IVR based SGs methods attracted more attention because they are highly engaging and promote greater cognitive learning
2021	Khan et al. [9]	ImTs system including VR, AR and MR	The construction Industry	Integration level of ImTs was relevant for academicians and professional industry
2020	Elghaish et al. [10]	Drones based on immersive technologies		The use of immersive technology helped in digital transformation of the construction industry
2019	Checa and Bustillo[11]	VR and game based approach	Learning and training tasks	The use of VR combined to game based approach enhanced learning and training methodologies
2019	Lorenzo and Lorenzo [12]	AR and VR	Education	Using VR and AR technologies helped students to better understand their projects
2020	Hamilo et al. [13]	VR and Head-Mounted-Displays (HMD)		HMD allowed students to explore complex subjects in a way that traditional methods cannot.
2020	Radianti et al. [14]			The interest in immersive VR technologies for educational purposes increased these last years.

Immersive technologies are more considered now in the current pandemic situation in the world. In fact, the application of immersive technologies brought solution during Covid'19, such as in healthcare education [15], data protection [16] and virtual tourism using extended reality [17].

3. Immersive technologies and their methods

In the real world, immersive technologies have unearthed a power to solve key communication gaps, for the uninitiated the premise of immersive technology is quite simple, virtual reality is a fully enclosed digital environment that replaces user's world environment, augmented reality is a digital overlay into the real-world environment and mixed reality is combination hybrid of AR and VR or physical digital.

Immersive sensory feeling and 360 is an omnidirectional view, something like this can achieved using a 360 capture camera.

Immersive exhilarating connected experiences. To those who has sensation can start experimenting with 360 capture devises and bringing them along to shows the covered experience; putting the 360 footage into VR camera via a headset enables a wraparound view when you looked inside, it allows you to live vicariously and visually. This experience broke down social boundaries and connected people together better.

Immersive mediums like VR and AR can be worth a thousand pictures and videos.

This technology can be used as an empathy for raising awareness fundraising, education, storytelling mission, goals to outcomes.

3.1. Virtual Reality (VR)

The history of the virtual reality (VR) is fascinating; there are many different stages of development of virtual reality [6], which are:

- In 1968 – The first VR HMD, The Sword of Damocles, was created,
- Then in 1991, the first VR arcade machine, virtuality, was introduced.
- In 2015, Google launched Cardboard, which uses a head mount to turn a smart phone into a VR device.
- In 2018, Facebook revealed camera-loaded glasses optimized for 'social VR'.
- More than 85 million VR headsets will be in use in China, according to PwC in 2018.
- In 2023 – Cloud-based VR gaming will be increasingly prominent, supported by 5G networks.
- And in 2030 – VR will be a \$28bn market, according to Global Data forecasts.

Virtual reality (VR) is a computer-simulated experience that replaces the user's perception completely from the real world to a similar or completely different virtual world. VR is the most widely known of these technologies. It tricks the user's senses into thinking they are in a different environment.

VR is very immersive experience relying on Head Mounted Displays (HMDs). The sense of presence is using HMD or headset, the user experiences a computer-generated world of imagery and sounds in which one can manipulate objects and move around using haptic controllers while tethered to a console or PC [18].

It allows users to see a virtual world that totally replaces the real world. Interaction and movement within this alternative world are of great importance.

3.2. Augmented Reality (AR)

In 1960, Tom, Furness started his research in 1965 as a US Air Force officer at Wright-Patterson Air Force Base; he worked on designing better cockpits for fighter jets. In 1970, touch fewer Computers. If connecting planes were the first big step in AR, connecting computers was the second. In 1990_Hockey Pucks. The first real AR splash made towards mass adoption was often described as among the most contested inventions in sports history. In 2000, L.Frank Baum has illustrated novel. In 2010 Smartphones. It was hard not to notice Pokémon Go, the augmented reality throwback by Niantic that encouraged players to get outside and catch digital monsters on their phones.

In the latest 20s Immersive. March 2019, supply-chain analyst Kuo Ming-Chi predicted that mass the production of Apple's first-generation AR headset, powered wirelessly by iPhone, would ramp up by Q4 2019 [19].

Augmented reality (AR): is where virtual objects and environments are mixed with the real world, in other word, AR is a superimposition of virtual elements in a real environment seen through devices such as a Smartphone, tablet, or see-through glasses [18].

The user views his real environment along with computer-generated perceptual information. AR overlay digital information on real-world elements. It enhances the real world experience with other digital details, layering new layer of perception, and supplementing the user's reality or environment by keeping the real world central.

3.3. Mixed Reality (MR)

Mixed reality (MR) ranges from one extreme end to another, where real and virtual worlds are mixed. MR combines real world and digital elements. Devices can be classified according to the role played in the real and virtual environments and can be placed on a continuum that goes from AR to VR. New images may be placed in a real space in such a way that they can interact, to some extent, with what is real in the physical world we know [18]. Usually, the user wears a head-mounted display (MR). In mixed reality, the user can interact with and manipulate physical and virtual items and environments, using next-generation sensing and imaging technologies. Mixed reality allows the user to immerse in the combination of real and virtual world using their own hands—all without ever removing one's headset. It provides the ability to have one foot (or hand) in the real world, and the other in an imaginary place, breaking down basic concepts between real and imaginary.

3.4. Immersive Video (IV) or 360 video

These are spherical videos based on video recordings where a view is recorded in all directions at the same time using a set of cameras or an omnidirectional camera, which allows the viewer, during playback on normal flat display, to control the viewing direction like a panorama [18]. However, there is little freedom to interact or move through the images.

4. Application domains of immersive technologies

The workable applications usage of the immersive technologies, such as IV, VR, AR, and MR is not term of imagination; it is an effective useful technology in multiple fields like army, decoration, medicine and re-education using simulation and communication methods, also our current worldwide disaster which all lead to the resource to the immersive technologies.

According to the pandemic situation, VR have successfully created a virtual shopping space which lets customers to superimpose 3D products in their phones or tablets, they can buy or place order whether from fashion or furniture with no need to leave the home, thanks to the virtual reality, and we now have virtual trial rooms.

In the grocery shopping experience, many technologists like Richmond who said: "I can imagine an augmented reality app being developed in the

future that helps people deal with social distancing more efficiently" [20]. Using such an app, would essentially map out where a user is in relation to where other users are; it would pull data on higher risk areas based on population density and other factors, enabling the user to navigate around a particular area more safely.

Anderson Maciel, an IEEE Member notes that immersive technologies have been utilized in medical education for over two decades now. "Applications range from helping educate physicians prior to delicate surgeries to enabling patients to virtually interact with doctors in an appointment" [20] also said: "Immersive technologies have been leveraged in medicine for some time now."

IEEE Senior Member Jacob Scharcanski also mentioned the use of VR and 3D : "Virtual reality and 3D imaging technologies can be leveraged to better spot the unique characteristics associated with COVID-19" [20].

Moving forward, AR/VR technologies are poised to potentially augment care providers' ability to understand specific illnesses, such as COVID-19, providing unprecedented insight into how to combat them.

In one specific example of an immersive technology that sought to address the notion of returning to a new normal and supporting transition back into schools (and/or entering a new school for the first time) the lead author co-developed a HMD-based VR tour of an autism specific school in the U.K. The purpose of this was to develop a visual and highly immersive experience of the entire school that could be viewed on a HMD or even a computer monitor. This experience was designed to provide a tour of the school with social distancing measures in place. Firstly, yellow lines on the floor indicate a 2-meter separation and secondly, the classroom views provide a view of spaced tables; indicating reduced class sizes and how a classroom during COVID-19 will appear. In addition to the spacing and classroom views, users also are able to tour the school grounds to identify a range of places and spaces well in advance of returning to, or joining, the school (i.e. soft play area, quiet rooms, teaching/staff rooms) [21]. The school is using this to help alleviate pressures of entering the "unknown" and "unexpected". This has implications for anxiety, as well.

Due to the social distancing norms, teaching for all students globally had come to a dead-end. AR brought the rescue through immersive and engaging learning solutions. Beyond education, immersive technologies are supporting citizens throughout the COVID-19 pandemic by enabling a sense of normalcy. For those practicing social distancing and remaining home, AR/VR/MR can also be used to augment fitness-focused games, enable virtual travel, and optimize social gatherings.

With the improvement of people's aesthetics and the demand for the innovation of indoor space emotional

design, the evaluative experiment and analysis of interior decoration design can be conducted by immersive virtual reality technology, so as to effectively figure out the deficiencies and problems in the interior space decoration design process and make timely modification and optimization. Therefore, making theoretical and experimental research on the indoor space design of Guanzhong residents based on immersive virtual reality technology, and has achieved certain results [22].

For the medicine field, Creation of the hybrid pediatric surgery book based on AR. A pediatric surgery book was created from lecture notes prepared using reference textbooks for subjects involving gastrointestinal atresias, ileus, malrotation, abdominal anomalies, and trauma. Then parts that had been found appropriate for implementing AR were enhanced with visual instructions to make the book easier to use.

The hybrid pediatric surgery book based on AR enabled students to examine spatial relationships and complicated pathologies and interact with them by walking around, zooming in/out, moving, and turning them [23]. In addition to models, anonymized radiological views were added to the related content, which allowed students to easily access the radiologic views, look at their highlighted or raw versions, and examine them in detail by zooming.

Construction of the Mirror World Simulation. 360-degree video recording of three selected places, including classroom, operation room, and meeting room, were recorded. Then, video file sizes and color/light settings were adjusted using the Gear 360 video. Using the operation room portal, students could experience the surgical procedure as if they were present in OR and review the surgical procedure from different angles [23]. The classroom portal would increase student engagement in lectures, and the meeting room would help incorporate crowded student groups in meetings.

There are numerous strengths underlying the use of VR with rehabilitation. Among these are that VR provides the opportunity for ecological validity, stimulus control and consistency, real-time performance feedback, independent practice, stimulus and response modifications that are contingent on a user's physical abilities, a safe testing and training environment, the opportunity for graduated exposure to stimuli, the ability to distract or augment the performer's attention, and perhaps most important to therapeutic intervention, motivation for the performer [24]. The application of Fish Tank VR as a rehabilitation tool for patients with spinal cord injury.

A related concept to the planning or rehearsal of a mission is the analysis of a completed mission for future training. In the military, such an analysis is known as after-action review (AAR). Both virtual environments and AR generate data that may be used for this type of training. In the same way that

AR could reduce the modeling costs associated with virtual training, AR might help reduce the expense of setting up a formal AAR [25].

Military equipment maintenance requires a high level of expertise. The application of AR can integrate knowledge into the system and save it in the form of animation, voice and text for a long time. The use of AR technology can also solve the problem that the actual equipment cannot appear in the training site and cannot be repeatedly disassembled in the training [26]. When the real equipment cannot appear in the training ground, virtual equipment can be used for training. When the real equipment cannot be disassembled repeatedly, AR technology can be used to display the internal structure and disassembly process of the equipment without disassembling.

5. Conclusion

The immersive technologies have been very successful in recent years in many areas. In this paper, we discussed how immersive technologies are helpful and efficient in both communication and simulation fields. In fact, many training and learning process in education, army, medicine, and physical rehabilitation were done thanks to immersive AR, VR and MR techniques. With the apparition of the Covid'19, immersive technologies became more exploited, in particular, for virtual shopping, which allowed people to buy many things from home, teleconference for students and workers to reduce the risk of contamination, virtual tourism, which allowed people to visit places around the world without leaving home. However, the application of immersive technologies can become more widespread by applying it to mobile device, to space exploration from the earth or to flood the market.

6. References

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