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Virtual and Augmented Reality: Enhancing Customer Experience and Future Trends in VR/AR

Mr. Sanskar Kagdelwar[1], Dr. Mohammed Bakhtawar Ahmed[2]

[1]Student, K.K. Modi University, Durg
[2]Faculty, K.K. Modi University, Durg

Abstract

Increased Reality (AR) and Virtual Reality (VR) within the Field of Instruction AR and VR advances have revolutionized the way we instruct and learn, advertising immersive computerized encounters, hands-on reenactments, and upgraded engagement. In spite of the fact that still in their early stages, these innovations have experienced fast development within the instructive division, with wearable gadgets playing a significant part. An in-depth examination of 1536 thinks about from the Scopus database appears a require for more successful usage and customization of these innovations inside instructive settings. As AR and VR innovations proceed to development, there's a developing number of instructive employments for them within the domain of proficiency.The Advancement of Virtual Reality Technology The thought of virtual reality was to begin with presented within the 1960s, with the primary VR items hitting the showcase within the late 1980s. A scient metric consider of 21,667 VR inquire about papers and 9,944 AR inquire about papers uncovers a complex and advancing scene. This ponder focuses out the development of clinical ranges and the rise within the number of nations partaking in VR investigate. Long run of VR/AR/MRITF is expected to cause major disturbances in different logical disciplines, human interaction, and the economy.

Keywords: Augmented Reality (AR), Virtual Reality (VR), Immersive Digital Experience, Interactive Terrain, Simulation, Educational Applications, Wearable Devices, Technological Innovation, Mixed Reality Interfaces (MRITF), Scient metric Analysis

INTRODUCTION

In the last 5 times, virtual reality(VR) and stoked reality(AR) have attracted the interest of investors and the general public, especially after Mark Zuckerberg bought Oculus for two billion bones (Luckerson, 2014; Castelvecchi, 2016). Presently, numerous other companies, similar as Sony, Samsung, HTC, and Google are making huge investments in VR and AR(Korolov, 2014; Ebert, 2015; Castelvecchi, 2016). Still, if VR has been used in exploration for further than 25 times, and now there are 1000s of papers and numerous experimenters in the field, comprising a strong, interdisciplinary community, AR has a more recent operation history(Burdea and Coiffet, 2003; Kim, 2005; Bohil etal., 2011; Cipresso and Serino, 2014; Wexelblat, 2014). The study of VR was initiated in the computer plates field and has been extended to several disciplines(Sutherland, 1965, 1968; Mazuryk and Gervautz, 1996; Choi etal., 2015). Presently, videogames supported by VR tools are more popular than the history, and they represent valuables, workrelated tools for neuroscientists, psychologists, biologists, and other experimenters as well. Indeed, for illustration, one of the main exploration purposes lies from navigation studies that include complex trials that could be done in a laboratory by using VR, whereas, without VR, the experimenters would have to go directly into the field, conceivably with limited use of intervention. The significance of navigation studies for the functional understanding of mortal memory in madness has been a content of significant interest for a long time, and, in 2014, the Nobel Prize in " Physiology or drug " was awarded to JohnM. O'Keefe, May- Britt Moser, and EdvardI. Moser for their discoveries of whim-whams cells in the brain that enable a sense of place and navigation. Journals and magazines have extended this knowledge by writing about " the brain GPS, " which gives a clear idea of the medium. A huge number of studies have been conducted in clinical settings by using VR(Bohil etal., 2011; Serino etal., 2014), and Nobel Prize winner, EdvardI. Moser reflected about the use of VR(Minderer etal., 2016), pressing its significance for exploration and clinical practice. Also, the vacuity of free tools for VR experimental and computational use has made it easy to pierce any field(Riva etal., 2011; Cipresso, 2015; Brown and Green, 2016; Cipresso etal., 2016). Borders in Psychology

Virtual Reality generalities and Features

The conception of VR could be traced at the medial of 1960 when Ivan Sutherland in a vital handwriting tried to describe VR as a window through which a stoner perceives the virtual world as if looked, felt, sounded real and in which the stoner could act really(Sutherland, 1965).

Since that time and in agreement with the operation area, several delineations have been formulated for illustration, Fuchs and Bishop(1992) defined VR as " real- time interactive plates with 3D models, combined with a display technology that gives the stoner the absorption in the model world and direct manipulation "(Fuchs and Bishop, 1992); Gigante(1993) described VR as " The vision of participation in a synthetic terrain rather than external observation of such an terrain. VR relies on a 3D, stereoscopic head- shamus

Displays, hand/ body shadowing and binaural sound. VR is an immersive,multi-sensory experience "(Gigante, 1993); and " Virtual reality refers to immersive, interactive,multi-sensory, bystander- centered, 3D computer generated surroundings and the combination of technologies needed erecting surroundings "(Cruz- Neira, 1993).

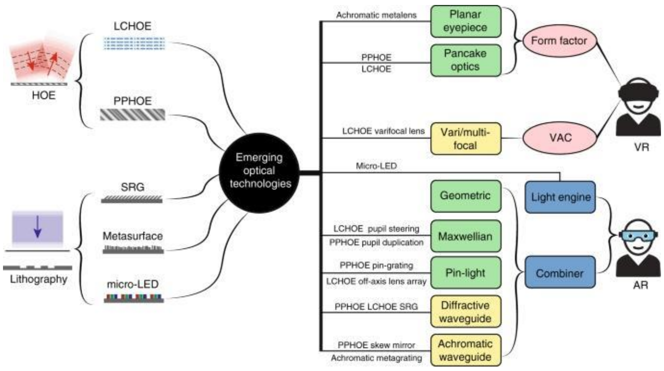
Advanced or lower degrees of absorption can depend by three types of VR systems handed to the stoner

Non-immersive systems are the simplest and cheapest type of VR operations that use desktops to reproduce images of the world.

Immersive systems give a complete simulated experience due to the support of several sensitive labors bias similar as head mounted displays(HMDs) for enhancing the stereoscopic view of the terrain through the movement of the stoner's head, as well as audio and haptic bias.

Semi-immersive systems similar as Fish Tank VR are between the two over. They give a stereo image of a three dimensional(3D) scene viewed on a examiner using a perspective protuberance coupled to the head position of the bystander(Ware etal., 1993). Advanced technological immersive systems have showed a closest experience to reality, giving to the stoner the vision of technologicalnon-mediation and feeling him or her of “ being in ” or present in the virtual terrain(Lombard and Ditton, 1997). Likewise, advanced immersive systems, than the other two systems, can give the possibility to add several sensitive labors allowing that the commerce and conduct were perceived as real(Loomis etal., 1999; Heeter, 2000; Biocca etal., 2001).

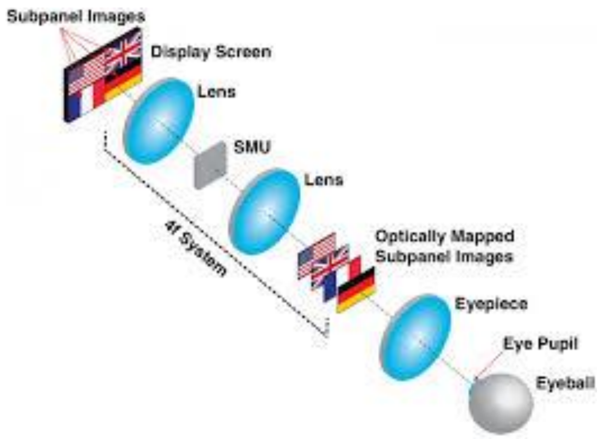
From Virtual to Augmented Reality



Looking chronologically on VR and AR developments, we can trace the first 3D immersive simulator in 1962, when Morton Heilig created Sensorama, a simulated experience of a motorcycle running through Brooklyn characterized by several sensory impressions, such as audio, olfactory, and haptic stimuli, including also wind to provide a realist experience (Heilig, 1962). In the same years, Ivan Sutherland developed The Ultimate Display that, more than sound, smell, and haptic feedback, included interactive graphics that Sensorama didn’t provide. Furthermore, Philco developed the first HMD that together with The Sword of Damocles of Sutherland was able to update the virtual images by tracking user’s head position and orientation (Sutherland, 1965). In the 70s, the University of North Carolina realized GROPE, the first system of force-feedback and Myron Krueger created VIDEOPLACE an Artificial Reality in which the users’ body figures were captured by cameras and projected on a screen (Krueger et al., 1985). In this way two or more users could interact in the 2D-virtual space. In 1982, the US’ Air Force created the first flight simulator [Visually Coupled Airbone System Simulator (VCASS)] in which the pilot through an HMD could control the pathway and the targets. Generally, the 80’s were the years in which the first commercial devices began to emerge: for example, in 1985 the VPL company commercialized the DataGlove, glove sensors’ equipped able to measure the flexion of fingers, orientation and position, and identify hand gestures. Another example is the Eyephone, created in 1988 by the VPL Company, an HMD system for completely immerging the user in a virtual world. At the end of 80’s, Fake Space Labs created a Binocular-Omni-Orientational Monitor (BOOM), a complex system composed by a stereoscopic-displaying device, providing a moving and broad virtual environment, and a mechanical arm tracking. Furthermore, BOOM offered a more stable image and giving more quickly responses to movements than the HMD devices. Thanks to BOOM and DataGlove, the NASA Ames Research Center developed the Virtual Wind Tunnel in order to research and manipulate airflow in a virtual airplane or space ship. In 1992, the Electronic Visualization Laboratory of the University of Illinois created the CAVE Automatic Virtual Environment, an immersive VR system composed by projectors directed on three or

more walls of a room.
More recently, many videogames companies have improved the development and quality of VR devices, like Oculus Rift, or HTC Vive that provide a wider field of view and lower latency. In addition, the actual HMD's devices can be now combined with other tracker system as eye-tracking systems (FOVE), and motion and orientation sensors (e.g., Razer Hydra, Oculus Touch, or HTC Vive).
Simultaneously, at the beginning of 90', the Boing Corporation created the first prototype of AR system for showing to employees how set up a wiring tool (Carmigniani et al., 2011). At the same time, Rosenberg and Feiner developed an AR fixture for maintenance assistance, showing that the operator performance enhanced by added virtual information on the fixture to repair (Rosenberg, 1993). In 1993 Loomis and colleagues produced an AR GPS-based system for helping the blind in the assisted navigation through adding spatial audio information (Loomis et al., 1998). Always in the 1993 Julie Martin developed "Dancing in Cyberspace," an AR theater in which actors interacted with virtual object in real time (Cathy, 2011). Few years later, Feiner et al. (1997) developed the first Mobile AR System (MARS) able to add virtual information about touristic buildings (Feiner et al., 1997). Since then, several applications have been developed: in Thomas et al. (2000), created ARQuake, a mobile AR video game; in 2008 was created Wikitude that through the mobile camera, internet, and GPS could add information about the user's environments (Perry, 2008). In 2009 others AR applications, like AR Toolkit and SiteLens have been developed in order to add virtual information to the physical user's surroundings. In 2011, Total Immersion developed D'Fusion, and AR system for designing projects (Maurugeon, 2011). Finally, in 2013 and 2015, Google developed Google Glass and Google HoloLens, and their usability have begun to test in several field of application.

Virtual Reality Technologies



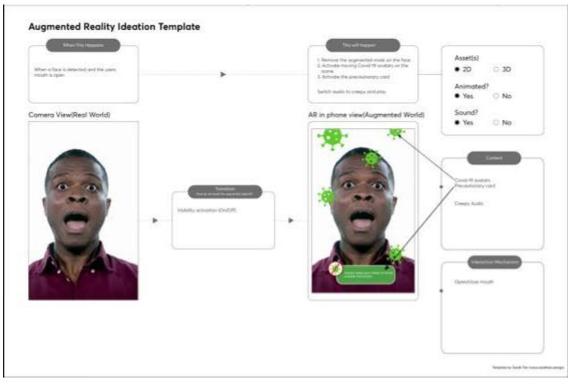
Technologically, the bias used in the virtual surroundings play an important part in the creation of successful virtual gests . According to the literature, can be distinguished input and affair bias(Burdea etal., 1996; Burdea and Coiffet, 2003). Input bias are the bonesThat allow the stoner to communicate with the virtual terrain, which can range from a simple joystick or keyboard to a glove allowing capturing cutlet movements or a shamus Suitable to capture postures. Further in detail, keyboard, mouse, trackball, and joystick represent the desktop input bias easy to use, which allow the stoner to launch nonstop and separate commands or movements to the terrain. Other input bias can be represented by tracking bias as bend-seeing gloves that capture hand movements, postures and gestures, or pinch gloves that descry the fritters movements, and trackers suitable to follow the stoner's movements in the physical world and restate them in the virtual terrain.

On the negative, the affair bias allow the stoner to see, hear, smell, or touch everything that happens in the virtual terrain. As mentioned over, among the visual bias can be set up a wide range of possibilities, from the simplest or least immersive(examiner of a computer) to the most immersive one similar as VR spectacles or helmets or HMD or delve systems. Likewise, audile, speakers, as well as haptic affair bias are suitable to stimulate body senses furnishing a further real virtual experience. For illustration, haptic bias can stimulate the touch

Augmented Reality Concept

Milgram and Kishino(1994), conceptualized the Virtual- Reality Continuum that takes into consideration four systems real terrain, stoked reality(AR), stoked life, and virtual terrain. AR can be defined a newer technological system in which virtual objects are added to the real world in real- time during the stoner's experience. Per Azuma etal.(2001) an AR system should(1) combine real and virtual objects in a real terrain;(2) run interactively and in real- time;(3) register real and virtual objects with each other. Likewise, indeed if the AR gests could feel different from VRs, the quality of AR experience could be considered also. Indeed, like in VR, feeling of presence, position of literalism, and the degree of reality represent the main features that can be considered the pointers of the quality of AR gests . Advanced the experience is perceived as realistic, and there's consonance between the stoner's anticipation and the commerce inside the AR surroundings, advanced would be the perception of " being there " physically, and at cognitive and emotional position. The feeling of presence, both in AR and VR surroundings, is important in acting actions like the real bones (Botella etal., 2005; Juan etal., 2005; Bretón- López etal., 2010; Wrzesien etal., 2013).

Augmented Reality Technologies



Technologically, the AR systems, still colorful, present three common factors, similar as a geospatial detail for the virtual object, like a visual marker, a face to project virtual rudiments to the stoner, and an acceptable processing power for plates, vitality, and incorporating of images, like a pc and a examiner(Carmigniani etal., 2011). To run, an AR system must also include a camera suitable to track the stoner movement for incorporating the virtual objects, and a visual display, like spectacles through that the stoner can see the virtual objects overlaying to the physical world. To date, two- display systems live, a videotape see- through(VST) and an optic see- however(OST) AR systems(Botella etal., 2005; Juan etal., 2005, 2007). The first one, exposures virtual objects to the stoner by landing the real objects scenes with a camera and overlaying virtual objects, projecting them on a videotape or a examiner, while the alternate bone, merges the virtual object on a transparent face, like spectacles, through the stoner see the added rudiments. The main difference between the two systems is the quiescence an OST system could bear further time to

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display the virtual objects than a VST system, generating a time pause between stoner's action and performance and the discovery of them by the system.

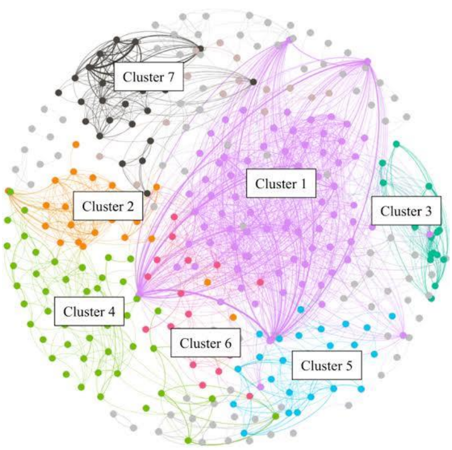
Augmented Reality operations

Although AR is a more recent technology than VR, it has been delved and used in several exploration areas similar as armature(Lin and Hsu, 2017), conservation(Schwald and De Laval, 2003), entertainment(Ozbek etal., 2004), education(Nincarean etal., 2013; Bacca etal., 2014; Akçayır and Akçayır, 2017), drug(De Buck etal., 2005), and cerebral treatments(Juan etal., 2005; Botella etal., 2005, 2010; Bretón- López etal., 2010; Wrzesien etal., 2011a, b, 2013; see the review Chicchi Giglioli etal., 2015). Further in detail, in education several AR operations have been developed in the last many times showing the positive goods of this technology in supporting literacy, similar as an increased- on content understanding and memory preservation, as well as on learning provocation(Radu, 2012, 2014). For illustration, Ibáñez etal.(2014) developed a AR operation on electromagnetism generalities ' literacy, in which scholars could use AR batteries, attractions, lines on real superficies, and the system gave a real- time feedback to scholars about the correctness of the performance, perfecting in this way the academic success and provocation(Di Serio etal., 2013). Deeply, AR system allows the possibility to learn imaging and acting on compound marvels that traditionally scholars study theoretically, without the possibility to see and test in real world(Chien etal., 2010; Chen etal., 2011).

As well in cerebral health, the number of exploration about AR is adding , showing its efficacity above all in the treatment of cerebral complaint(see the reviews Baus and Bouchard, 2014; Chicchi Giglioli etal., 2015). For illustration, in the treatment of anxiety diseases, like phobias, AR exposure remedy(ARET) showed its efficacity in one- session treatment, maintaining the positive impact in a follow- up at 1 or 3 month after. As VRET, ARET provides a safety and an ecological terrain where any kind of encouragement is possible, allowing to keep control over the situation endured by the cases, gradationally generating situations of fear or stress. Indeed, in situations of fear, like the phobias for small creatures, AR operations allow, in agreement with the case's anxiety, to gradationally expose case to fear creatures, adding new creatures during the session or enlarging their or adding the speed. The colorful studies showed that AR is suitable, at the morning of the session, to spark case's anxiety, for reducing after 1 h of exposition. After the session, cases indeed more than to more manage beast's fear and anxiety, earthenware suitable to approach, interact, and kill real stressed creatures

Accoutrements and styles

Data Collection



The input data for the analyses were recaptured from the scientific database Web of Science Core Collection(Falagas etal., 2008) and the hunt terms used were “ Virtual Reality ” and “ stoked Reality ” regarding papers published during the whole timespan covered. Web of wisdom core collection is composed of Citation indicators, Science Citation Index Expanded(SCI- EXPANDED) – 1970- present, Social lores Citation Index(SSCI) – 1970- present, trades and Humanities Citation Index(A&HCI) – 1975- present, Conference Proceedings Citation Index- Science(CPCI- S) – 1990- present, Conference Proceedings Citation Index- Social Science & Humanities(CPCI- SSH) – 1990- present, Book Citation Index – Science(BKCI- S) – 2009- present, Book Citation Index – Social lores & Humanities(BKCI-SSH) – 2009- present, Arising Sources Citation Index(ESCI) – 2015- present, Chemical indicators, Current Chemical responses(CCR- EXPANDED) – 2009- present(Includes Institut National de la Propriete Industrielle structure data back to 1840), Index Chemicus(IC) – 2009- present.

The attendant dataset contained a aggregate of 21,667 records for VR and 9,944 records for AR. The bibliographic record contained colorful fields, similar as author, title, abstract, and all of the references(demanded for the citation analysis). The exploration tool to fantasize the networks was Cite spacev.4.0. R5 SE(32 bit)(Chen, 2006) under Java Runtimev. 8 update 91(make1.8.0_91- b15). Statistical analyses were conducted using Stata MP-resemblant Edition, Release14.0, StataCorp LP. Fresh information can be set up in Supplementary Data distance 1.The betweenness centrality of a knot in a network measures the extent to which the knot is part of paths that connect an arbitrary brace of bumps in the network(Freeman, 1977; Brandes, 2001 Chen, 2006). Structural criteria include betweenness centrality, modularity, and figure. Temporal and cold-blooded criteria include citation burstness and novelty. All the algorithms are detailed(Chen etal., 2010).

Citation Network and Cluster Analyses for AR

Looking at Augmented Reality script, the top ranked point by citation counts is Azuma(1997) in Cluster# 0, with citation counts of 231. The alternate bone Is Azuma etal.(2001) in Cluster# 0, with citation counts of 220. The third is Van Krevelen(2010) in Cluster# 5, with citation counts of 207. The 4th is Lowe(2004) in Cluster# 1, with citation counts of 157. The 5th is Wu(2013) in Cluster# 4, with citation counts of 144. The 6th is Dunleavy(2009) in Cluster# 4, with citation counts of 122. The 7th is Zhou(2008) in Cluster# 5, with citation counts of 118. The 8th is Bay(2008) in Cluster# 1, with citation counts of 117. The 9th is Newcombe(2011) in Cluster# 1, with citation counts of 109. The 10th is Carmigniani etal.(2011) in Cluster# 5, with citation counts of 104.

Discussion

Our findings have profound counteraccusations for two reasons. At first the present work stressed the elaboration and development of VR and AR exploration and handed a clear perspective grounded on solid data and computational analyses. Secondly our findings on VR made it profoundly clear that the clinical dimension is one of the most delved ever and seems to increase in quantitative and qualitative aspects, but also include technological development and composition in computer wisdom, mastermind, and confederated lores. clarifies the history, present, and future of VR exploration. The onset of VR exploration brought a easily- identifiable development by interfaces for children and drug, routine use and behavioral- assessment, special goods, systems perspectives, and tutorials. This pioneering period evolved in the period that we can identify as the development period, because it was the period in which VR was used in trials associated with new technological impulses. Not unexpectedly, this was exactly attendant with the new frugality period in which significant investments were made in information technology, and it also was the period of the so- called ‘ fleck- com bubble ’ in the late 1990s. The convergence of pioneering ways into ergonomic studies within this development period was used to develop the first effective clinical systems for surgery, telemedicine, mortal spatial navigation, and the first phase of the development of remedy and laparoscopic chops. With the new renaissance, VR exploration switched explosively toward what we can call the clinical- VR period, with its strong emphasis on recuperation, neurosurgery, and a new phase of remedy and laparoscopic chops. The number of operations and papers that have been published in the last 5 times are in line with the new technological development that we’re passing at the tackle position, for illustration, with so numerous new, HMDs, and at the software position with an adding number of independent programmers and VR communities. In this script, it’s clear that the future of VR and AR exploration isn’t just in clinical operations, although the counteraccusations for the cases are huge. The nonstop development of VR and AR technologies is the result of exploration in computer wisdom, engineering, and confederated lores. The reasons for which from our analyses surfaced a “ clinical period ” are threefold. First, all clinical exploration on VR and AR includes also technological developments, and new technological discoveries are being published in clinical or technological journals but with clinical samples as main subject. As noted in our exploration, main journals that publish multitudinous papers on technological developments tested with both healthy and cases include Presence Teleoperators & Virtual surroundings, Cyberpsychology & Behavior(Cyberpsychol BEHAV), and IEEE Computer Graphics and Applications(IEEE Comput Graph). It’s clear that experimenters in psychology, neuroscience, drug, and behavioral lores in general have been probing whether the technological developments of VR and AR are effective for druggies, indicating that clinical behavioral exploration has been incorporating large corridor of computer wisdom and engineering. A alternate aspect to consider is the artificial development. In fact, once a new technology is envisaged and created it goes for a patent operation. Once the patent is transferred for enrollment the new technology may be made available for the request, and ultimately for journal submission and publication. Also, utmost VR and AR exploration that that proposes the development of a technology moves directly from the presenting prototype to entering the patent and introducing it to the request without publishing the findings in scientific paper. Hence, it’s clear that if a new technology has been developed for artificial request or consumer, but not for clinical purpose, the exploration conducted to develop similar technology may noway be published in a scientific paper. Although our handwriting considered published inquiries, we’ve to admit the actuality of several inquiries that haven’t been published at all. The third reason for which our analyses stressed a “ clinical period ” is that several papers on VR and AR have been considered within the Web of Knowledge database, that’s our source of references. In this composition, we appertained to “ exploration ” as the one in the database considered. Of course, this is a limitation of our study, since there are several other databases that are of big value in the scientific community, similar as IEEE Xplore Digital Library, ACM Digital Library, and numerous others. Generally, the most important papers in journals published in these databases are also included in the Web of Knowledge database; hence, we’re convinced that our study considered the top- position publications in computer wisdom or engineering. Consequently, we believe that this limitation can be overcome by considering the large number of papers substantiated in our exploration. In entertainment, VR has brought about a new period of gaming and liar, furnishing druggies with unknown situations of absorption and interactivity. Gamers can now step into completely realized worlds, passing stories and gameplay from a first- person perspective that was preliminarily unconceivable. Also, AR has revolutionized mobile gaming, with titles like Pokémon Go demonstrating the eventuality of blending digital content with the physical world. In education, VR and AR are proving to be important tools for existential literacy. They offer scholars the capability to explore literal spots, conduct virtual wisdom trials, and interact with complex 3D models in ways that traditional styles can not match. This hands- on approach enhances understanding and retention, making learning further engaging and effective. Healthcare is another field where VR and AR are making significant impacts. VR is being used for pain operation, cerebral remedy, and surgical training, offering cases and interpreters innovative ways to approach treatment and education. AR, on the other hand, assists surgeons with real- time data during procedures, perfecting perfection and issues. Despite their benefits, challenges remain. High development costs, the need for technical tackle, and enterprises over sequestration and data security must be addressed. Also, as these technologies come more integrated into diurnal life, icing availability and precluding digital peak are pivotal considerations. In conclusion, VR and AR are reshaping how we interact with digital content, offering immersive and interactive gests that enhance colorful aspects of life. As technology advances and becomes more accessible, the implicit operations of VR and AR will continue to expand, driving invention and transubstantiating diligence worldwide. The future of VR and AR holds instigative possibilities, promising to produce more connected, interactive, and fortified surroundings for druggies across the globe.

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