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The Past Present and Future of Virtual and Augmented Reality

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Abstract: *Mixed Reality Interfaces (MRITFs) like the Hololens and low-cost virtual reality (VR) machineries similar to the Oculus Rift, , Sony PlayStation and HTC Vive VR are attracting the attention of users and researchers, suggesting that they may be the next largest technological innovation stepping stone. However, the VR technology's olden times is elongated than it seems: In the late 1980s, the initial marketable VR tools seemed, and the concept of virtual reality was developed in the 1960s.As a result, thousands of scientific papers have been issued over the past two decades as hundreds of researchers investigated the processes, effects, and applications of this technology. What does this significant research produce? Using cutting-edge scientometric methods, this paper will investigate the field's existing research corpus to answer this question. In the Web of Science Core Collection scientific database, we gathered all existing VR-related articles. The resulting dataset contained 21,667 VR and 9,944 AR records. The author, title, abstract, country, and all of the references (which were required for the citation analysis) were all included in the bibliographic record. The literature was analyzed using network and cluster methods, and the results revealed a symbiotic panorama marked by changes and developments over time. Indeed, whereas conference proceedings and journals were the primary forms of VR publication up until five years ago, journals are now the primary means of communication. In a similar vein, although computer science was initially the most prominent area of research, clinical areas and countries participating in VR research have both grown in recent years. The present work focuses on the anticipated future capabilities, enhancements, and difficulties of virtual reality (VR), as well as the evolution and changes that have occurred over time in the main application areas. We conclude by taking into consideration the disruptive impact that VR/AR/MRITF will have not only on scientific fields but also on human communication and interaction—much like the introduction of mobile phones did—by altering social communication and interaction as well as increasing the use of scientific applications (such as in clinical settings).*

Keywords: Virtual Reality, Augmented Reality, Quantitative Psychology, Measurement, Psychometrics, Scientometrics, Computational Psychometrics, Mathematical Psychology

I. INTRODUCTION

Investors and the general public have shown an interest in virtual reality (VR) and augmented reality (AR) over the past five years, particularly since Mark Zuckerberg purchased Oculus for two billion dollars (Luckerson, 2014;2016 (Castellvecchi)According to Korolov (2014), a lot of other businesses, including Sony, Samsung, HTC, and Google, are currently investing a lot in virtual reality and augmented reality.Ebert, 2015;2016 (Castellvecchi)However, whereas virtual reality (VR) has been used in research for more than 25 years, with thousands of papers and a strong interdisciplinary community of researchers, augmented reality (AR) has a more recent application history (Burdea and Coiffet, 2003;Kim, 2005;Bohil and other,2011;2014; Cipresso and Serino2014 (Wexelblat).The study of virtual reality (VR) began in the field of computer graphics and has since spread to several other fields (Sutherland, 1965, 1968;1996, Mazuryk and Gervautz;Choi et al.,2015).Videogames that use virtual reality (VR) tools are becoming increasingly popular, making them useful tools for neuroscientists, psychologists, biologists, and other researchers.Indeed, navigation studies, which include complex experiments that could be carried out in a laboratory using virtual reality (VR), are one of the primary research objectives. Without VR, the researchers would have to go directly into the field, possibly with limited intervention.Since the Nobel Prize in Physiology or Medicine was given to John M. O'Keefe, May-Britt Moser, and Edvard I. Moser in 2014 for their discoveries of nerve cells in the brain that enable a sense of place and navigation, navigation studies have been of significant interest for the functional understanding of human memory in dementia.This knowledge has been expanded by writing about "the brain GPS" in magazines and journals, which provides a clear understanding of the mechanism.Virtual reality (VR) has been used in a lot of clinical studies (Bohil et al.,2011;Serino and others,2014), Edvard I. Moser, winner of the Nobel Prize, made a comment about the use of virtual reality (Minderer et al.,2016), highlighting its significance for clinical research.In addition, it is now simple to access any field thanks to the availability of free VR experimental and computational tools (Riva et al.,2011;2015 Cipresso;2016 by Brown and Green;Cipresso and other,2016).

The intrigue application system of increased reality, which may be a more later innovation than virtual reality, illustrates that education and learning show up to be the foremost predominant region of investigate at the minute. In truth, increased reality makes it conceivable to bolster learning by, among other things, expanding inspiration for learning and progressing substance comprehension and memory retention.AR, on the other hand, is still rising in logical scenarios, while VR benefits from clearer and more unequivocal areas of application and investigate areas. In arrange to explore how the mental structure of this information space has changed over time, we display a efficient and computational investigation of the rising intrigue VR and AR areas in terms of different co-citation systems in this article.

1.1 Virtual Reality Concepts and Features

Midway through 1960, Ivan Sutherland attempted to describe virtual reality (VR) as a window through which a user perceives the virtual world as if it looked, felt, and sounded real and in which the user could act realistically (Sutherland, 1965). This was the beginning of the concept of virtual reality.

Since then, a number of definitions have been developed based on the application area: For instance, "real-time interactive graphics with 3D models, combined with a display technology that gives the user the immersion in the model world and direct manipulation" was the definition provided by Fuchs and Bishop (1992) for virtual reality. the appearance of being a part of a synthetic environment as opposed to simply being a spectator in one," according to Gigante (1993).VR uses binaural sound, 3D, stereoscopic head-tracking displays, hand/body tracking, and According to Gigante (1993), "VR is an immersive, multi-sensory experience."According to Cruz-Neira (1993), The term "virtual reality" describes 3D computer-generated immersive, interactive, multisensory, viewer-centered settings as well as the set of technology needed to create those environments.

Despite their differences, these definitions highlight three characteristics of VR systems that are consistent: immersion, the sensation of being a part of an environment and its inhabitants (Biocca, 1997;1997, Lombard and Ditton; Loomis and other,1999;2000 Heeter;Biocca and other,2001;Bailenson and others,2006;2007 by Skalski and Tamborini;2009, Andersen and Thorpe;Slater, 2009;Sundar and others,2010).Immersion is particularly concerned with interactions, the amount of senses activated, and how realistic the stimuli utilised to create environments are. Slater (2009) asserts that this trait may be influenced by the properties of the technological system being utilised to distance the user from reality.

The user's level of immersion can be affected by three types of virtual reality systems:

Desktop-based virtual reality (VR) applications are the simplest and cheapest type. Non-immersive systems reproduce real-world images.

Immersive systems support a variety of sensory outputs, including audio and haptic devices, head-mounted displays (HMDs), and head-mounted displays (HMDs) for enhancing the stereoscopic view of the environment through the user's head movement.

Fish Tank VR and other semi-immersive systems fall somewhere in the middle. Using a perspective projection that is coupled to the observer's head position, they present a stereo image of a three-dimensional (3D) scene on a monitor (Ware et al.,1993).Higher-tech immersive systems have demonstrated the closest experience to reality, allowing users to "be in" or be present in the virtual environment while also creating the illusion of technological non-mediation (Lombard and Ditton, 1997).In addition, the most immersive systems, such as VR glasses, helmets, HMD, and CAVE systems, can allow for the addition of multiple sensory outputs, allowing for immersive interaction and actions (monitor of a computer).

In addition, haptic output devices, speakers, and auditory devices can stimulate body senses, making the virtual experience feel more real. Haptic devices, for instance, can influence the user's force models and touch sensation.

1.2 Virtual Reality Applications

VR has been utilized in a variety of industries, including gaming (Zyda, 2005;Meldrum and others,2012), training in the military (Alexander et al.,2017), design architecture (Song et al.,Englund et al., 2017), education2017), training in social and academic skills (Schmidt et al.,2017), surgical procedure simulations (Gallagher et al.,2005), elderly caregiving or psychological treatments are two additional fields in which VR is exploding (Freeman et al.,2017;Neri and co.,2017).A recent and extensive review by Slater and Sanchez-Vives (2016) identified the primary VR application evidences, along with their strengths and weaknesses, in a number of research fields, including science, education, training, physical training, social phenomena, moral behaviors, and travel, meetings, collaboration, industry, entertainment, and news. Besides, another audit distributed for this present year by Freeman et al. (2017) examined virtual reality in mental health and demonstrated its effectiveness in diagnosing and treating a variety of mental illnesses, including eating disorders, schizophrenia, anxiety, and bipolar disorder.

There are a lot of options that make it possible to use virtual reality as a stimulus instead of real ones, creating highly realistic experiences that would be impossible in the real world. Because of this, virtual reality (VR) is frequently used in studies of novel approaches to psychological treatment or training, such as for phobia-related issues (such as agoraphobia, phobia of flying, etc.)Botella and others,2017).Or, more simply, it is utilized as an enhancement of conventional motor rehabilitation programs (Llorens et al.,2014;Borrego and other,2016), creating games that make the tasks easier.More specifically, Virtual Reality Exposure Therapy (VRET) has demonstrated its effectiveness in psychological treatment by allowing patients to gradually confront fearful stimuli or stressful situations in a secure setting where the therapist can control their psychological and physiological responses (Botella et al.,2017).

1.3 Augmented Reality Concept

The Virtual-Reality Continuum, as proposed by Milgram and Kishino (1994), incorporates four systems:real environment, virtual environment, augmented virtuality, and augmented reality (AR).A more recent technological system known as augmented reality (AR) is one in which virtual objects are added to the real world in real time as the user interacts with it.based on Azuma et al.2001) An AR system ought to:1) In a real environment, combine real and virtual objects;2) operate continuously and interactively; (3) associate virtual and real objects with one another. Additionally, despite the fact that augmented reality (AR) experiences may appear distinct from virtual reality (VR), the quality of AR experiences may be considered comparable. To be sure, as in VR, sensation of presence, level of authenticity, and the level of reality address the principal includes that can be viewed as the signs of the nature of AR encounters. The perception of "being there" on a physical, cognitive, and emotional level is higher when the experience is perceived as realistic and there is congruence between the user's expectation and the interaction within the augmented reality environments. In both augmented reality and virtual reality environments, a sense of presence is essential for mimicking real-world behaviors (Botella et al.,2005;Juan and co.,2005;Bretón-López and others,2010;Wrzesien and other,2013).

1.4 Augmented Reality Technologies

The various augmented reality (AR) systems share three technological components: a surface to project virtual elements to the user, a geospatial datum for the virtual object, similar to a visual marker, and sufficient processing power for graphics, animation, and image merging, similar to a computer and a monitor (Carmigniani et al.,2011).An augmented reality (AR) system must also have a visual display, such as glasses, through which the user can see the virtual objects overlaying on the real world in order to function. The camera must be able to track the user's movement in order to merge the virtual objects. There are currently two-display augmented reality (AR) structures: a video see-through (VST). The first one discloses simulated objects to the user by taking real objects or scenes with a camera and covering virtual things or protrusive them on a audiovisual or a screen. The second one combines virtual objects on a transparent surface, such as glasses, so that the user can see the added elements. The latency is the primary distinction between the two systems:A time lag between the user's action and performance and the system's detection of the virtual objects could result from an OST system taking longer to display them than a VST system.

1.5 Augmented Reality Applications

In psychological health, there is a growing body of research demonstrating AR's effectiveness, particularly in the treatment of psychological disorders (Baus and Bouchard, 2014;ChicchiGiglioli and Others,2015).For instance, in the treatment of anxiety disorders such as phobias, AR exposure therapy (ARET) demonstrated efficacy in a single session and maintained its positive impact at one or three months and beyond. ARET, like VRET, creates a secure and ecological setting where any kind of stimulus can occur, allowing patients to maintain control over their experiences and gradually eliciting feelings of fear or stress. In point of fact, when a patient experiences a fear, such as a phobia of small animals, AR applications permit, in accordance with the level of anxiety experienced by the patient, to gradually expose the patient to animals that he or she dreads by adding new animals to the session, expanding their range, or speeding up. According to the various studies, AR is able to arouse patient anxiety at the beginning of the session, which decreases after one hour of exposure. Patients were able to approach, interact with, and kill real feared animals after the session, in addition to better managing the animals' fear and anxiety.

II. RESULTS

A complex picture emerges from the literature review on virtual reality.At first glance, the document-type statistics from the Web of Science (WoS) show that proceedings papers, which made up almost 48% of the total (10,392 proceedings), and articles on the topic, which made up about 47% of the total (10,199 articles), were used a lot as research results.However, if we only look at the past five years (which contain 7,755 articles, or roughly 36% of the total), the situation shifts, with approximately 57% of articles (4,445) and approximately 33% of proceedings (2,578).As a result, it is evident that VR has evolved beyond the technological level.

All articles' "Category" fields are used to compute nodes and edges as co-occurring subject categories for the subject category.

Computer science leads the subject category statistics from the WoS, followed by engineering. Together, these two fields account for 15,341 articles, or roughly 71% of all production. However, if we use Kleinberg's algorithm for burst detection (Kleinberg, 2002, 2003),Seymour (2002) in Cluster #0 is the document with the most bursts, ranking first in terms of bursts.The second is Grantcharov (2004), which has bursts of 51.40 in Cluster #0.The third is Saposnik (2010), which has bursts of 40.84 in Cluster #2.With 38.94 bursts, Rothbaum (1995)'s Cluster #7 is the fourth.With 37.52 bursts, Holden (2005) is the fifth in Cluster #2.With 33.39 bursts, Scott (2000) is the sixth in Cluster #0.With 33.33 bursts, Saposnik (2011) in Cluster #2 is the seventh. Burdea et al. is the eighth (1996) in Group #3, with explosions of 32.42.Burdea and Coiffet (2003)'s Cluster #22, which has bursts of 31.30, is the ninth.Table 3 shows that Taffinder (1998), in Cluster #6, is the tenth, with bursts of 30.96.

Citation Network and Cluster Analysis for AR In the Augmented Reality scenario, Azuma (1997) in Cluster #0 ranks highest in terms of citation counts, with 231.Azuma et al. () is the second one.2001) with 220 citation counts in Cluster #0Van Krevelen (2010), with 207 citations, is the third in Cluster #5.With 157 citations, Lowe (2004) ranks fourth in Cluster #1.Wu (2013) ranks fifth in Cluster #4, with 144 citation counts.With 122 citation counts, Dunleavy (2009) ranks sixth in Cluster #4.Zhou (2008) ranks seventh in Cluster #5, with 118 citations.With 117 citation counts, Bay (2008) ranks eighth in Cluster 1.With 109 citations, Newcombe (2011) ranks ninth in Cluster 1.Carmigniani et al. () is the tenth.2011), with 104 citations, in Cluster #5.

The organization of report co-references is outwardly perplexing (Figure 10) since it incorporates 1000s of articles and the connections among them. However, this analysis is crucial for gaining a comprehensive understanding of the subject because it can be used to identify the potential body of knowledge in the field. Subsequently, for this reason, a bunch examination was directed (Chen et al.,2010;González-Teruel and others,2015;2015, Klavans and Boyack).The clusters, which are identified by the two algorithms in Table 3, are depicted in Figure 11.

The interdisciplinary nature of AR research is made clear and visible by the identified clusters, which highlight distinct parts of the literature. However, the dynamics necessary to determine AR research's past, present, and future are still unclear. We looked at how these clusters related to each article's temporal dimensions. Figure 12 presents a summary of the findings. It is evident that the current areas of AR research are clusters #1 (tracking), #4 (education), and #5 (virtual city environment).The clusters can be identified in Figure 12 and Table 3.)

to determine the four historical epochs (colored:blue, green, yellow, and red) from previous AR studies to current ones.

III. DISCUSSION

There are two reasons why our findings have important repercussions. The current work initially highlighted the development and evolution of VR and AR research and offered a clear perspective based on reliable data and computational analyses. Second, our VR findings made it abundantly clear that the clinical aspect of VR is one of the most extensively studied aspects ever, and it appears to be continuing this trend. During this development period, pioneering ergonomic research methods were combined to create the first efficient clinical systems for surgery, telemedicine, human spatial navigation, and the initial stages of the development of therapy and laparoscopic skills. The clinical-VR era, which places a strong emphasis on rehabilitation, neurosurgery, a new phase of therapy, and laparoscopic skills, emerged during the new millennium. The quantity of utilizations and articles that have been distributed in the last 5 years are in accordance with the new mechanical improvement that we are encountering at the equipment level, for instance, with so many new, HMDs, and at the product level with a rising number of autonomous developers and VR people group.

Even though this scenario has huge repercussions for patients, it is abundantly clear that VR and AR research will not only find use in clinical settings in the future. The publication of the findings in scientific papers has resulted in the ongoing development of VR and augmented reality technologies. Therefore, it is evident that the research conducted to develop a new technology may never be published in a scientific paper if it has been developed for the industrial market or consumer market but not for clinical purposes. Despite the fact that the research included in our manuscript was considered to be published, we must acknowledge the existence of several unpublished studies. The fact that a number of VR and augmented reality articles have been considered in the Web of Knowledge database, which serves as our source of references, is the third reason why our analyses highlighted a "clinical era."We referred to "research" as the database entry that was taken into consideration in this article. Naturally, this is a limitation of our investigation because there are numerous other databases of significant value to the scientific community, including IEEE Xplore Digital Library and ACM Digital Library. The Web of Knowledge database typically contains the most significant journal articles published in these databases; As a result, we are convinced that our research was among the best in computer science or engineering. As a result, we believe that taking into account the large number of articles that are cited in our research can help overcome this restriction.

When all of these factors are taken into consideration, it is evident that clinical applications, behavioral aspects, and technological advancements in VR and AR research are all components of a situation that is more complex than the old platforms that were utilized prior to the widespread adoption of HMD and solutions. We believe that this work may provide stakeholders with a clearer vision by highlighting all of the connections and implications of the research in a variety of fields, including clinical, behavioral, industrial, entertainment, educational, and many more. It also provides evidence of the current frontiers of research and the challenges that are anticipated in the future.

REFERENCES

[1]. Alexander, T., Westhoven, M., and Conradi, J. (2017). "Virtual environments for competency-oriented education and training," J.Res.Pers.43,163–170.doi:10.1016/j.jrp.2008.12.040

[2]. Azevedo,R.T.,Bennett,N.,Bilicki,A., Hooper, J.,Markopoulou, F., and Tsakiris, M.(2017).

[3]. Azuma, R., Baillot, Y., Behringer, R., Feiner, S., Julier, S., and MacIntyre, B. (2001).Recent advances in augmented reality. IEEE Comp. Graph. Appl. 21, 34–47.doi:10.1109/38.963459

[4]. Bacca, J., Baldiris, S., Fabregat, R., and Graf, S. (2014). Augmented reality trends in education: a systematic review of research and applications.J.Educ.Technol.Soc.17,133.

[5]. Bailenson,J.N.,Yee,N.,Merget,D.,andSchroeder,R.(2006).Theeffectof behavioral realism and form realism of real-time avatar faces on verbal disclosure, nonverbal disclosure, emotion recognition, and copresence in dyadic interaction. Presence15,359–372.doi:10.1162/pres.15.4.359

[6]. Baños, R. M., Botella, C., Garcia-Palacios, A., Villa, H., Perpiñá, C., and Alcaniz, M.(2000). Presence and reality judgment in virtual environments: aunitaryconstruct?Cyberpsychol.Behav.3,327–335.doi:10.1089/10949310050078760

[7]. Baños,R.,Botella,C.,García-Palacios,A.,Villa,H.,Perpiñá,C.,andGallardo,M.(2009). Psychological variables and reality judgment in virtual environments: the roles of absorption and dissociation. Cyberpsychol. Behav. 2, 143–148. doi:10.1089/cpb.1999.2.143

[8]. Baus, O., and Bouchard, S. (2014).