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REVIEW ON VIRTUAL REALITY ANALYSIS AND TECHNOLOGY

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***Abstract*— Scientific interest in virtual reality (VR) technology is growing at the moment. In a short period of time, virtual reality (VR) has established itself in both the specialist public and broader society. thanks to its numerous applications in a variety of settings and the falling cost of VR viewing equipment. Although this technology may seem like a 21st-century invention to many, its roots can be found several decades earlier. Taking Considering these factors, the purpose of this article is to examine VR's history and current state from two angles: a technological one that focuses on the technology's advancement and a philosophical one that explores its evolution. In turn, this historical review will enable us to discuss VR's potential uses in a variety of academic fields.**

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***Keywords*— VR, HMD, VR glasses, History, Technology, Applications, Virtual environments..**

I. INTRODUCTION

Mark Zuckerberg discussed virtual reality (VR) on stage at the Mobile World Congress in Barcelona on February 21, 2016. The picture of Facebook's founder wearing a VR headset and strolling down the aisle in front of over 10,000 people went viral, sparking discussions about the growing significance of this technology and how quickly it has found a niche in the market, even among non-techies. This has led to competition among tech companies to be the leader in the production of these devices. The ability for "immersion," or "entering" into the story through the construction of a virtual world, is the primary technological innovation brought forth by virtual reality. This possibility is not new, though. Virtual reality (VR) is a product of technology advancements, many of which are connected to the film industry and the pursuit of novel simulation methods. More specifically, the first virtual reality experiences date back to the 1960s, when inventors Morton Heilig and Ivan Sutherland created the first tools that could give the impression that anything was three dimensions. A few decades later, tech companies are focusing on virtual reality (VR) once more, fighting the notion that it is a "fad" and solidifying its growth and sales within the technical industry because of its numerous applications.

This study attempts to explore the technological history of VR, which will enable us to get closer to the evolution of its definition and pinpoint its actual applications. It is based on a thorough assessment of the literature regarding the beginnings and development of VR. .

METHOD

From a methodological perspective, this research is

I became aware of this subject of study by a methodical examination of the published scientific publications. This document review Using primary sources, we have been able to accomplish the following: search goals:

1.Examine the conceptual growth of virtual reality throughout its history.

2.Examine the technological development of virtual reality historically and logically.

3. Determine the potential uses of virtual reality in various academic domains. .

II. LITERATURE SURVEY

Alice's Adventures in Wonderland (1865), according to Román Gubern, is "the first mythical and fabulist formulation of the VR project" (Gubern, 1996, p. 161). The author specifically alludes to the final section of Car-Roll's original book, in which Alice's sister imagines the same characters and environment that Alice herself had only dreamed of, as though her sister "had entered the sam According to Governor (1996), Alice just departed. Adriana Paíno Ambrosio and M. Isabel Rodríguez Fidalgo, "that she (Alice) just left," Culture & History Digital Journal 9(1), June 2020, e010. eISSN 2253-797X, doi: https://doi.org/10.3989/chdj.2020.010. Gubern adds, "Narios anticipated something that Engineers would eventually build, with computer tools, a century later." This scenario suggests the "permanence of virtual space"

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(1996:161). In Pygmalion's Spectacles (1935), Stanley Weinbaum foresaw the development of virtual reality (VR) technology seventy years before Carroll. The story follows the protagonist as he meets Professor Ludwig, an inventor who has created a system that enables the user to interact with a functional world through all senses e virtual scenario." .

One of the first writers to mention a potential VR was Gottfried Wilhelm Leibniz, according to other authors like Eric Steinhart (1997). According to Steinhart (1997), the philosopher describes the Palace of Destinies (1710) as "an organized system of virtual worlds available for human perceptual exploration, along with an interface for exploring them," which is a structure capable of stimulating all senses and creating experiences in real time in non-existent environments. But as Parés and Parés (2010) note, Leibniz's concept stayed on paper until 1962, when it started to take shape as a developing VR technology. These literary examples, which predate the first virtual reality systems by a long shot, demonstrate people's fascination with the idea of "traveling" to other worlds—either literally, as Alice did, or virtually, with the aid of special glasses like those developed by Professor Ludwig, which decades later became the go-to apparatus for virtual reality experiences. .. But as Parés and Parés (2010) note, Leibniz's concept stayed on paper until 1962, when it started to take shape as a developing VR technology. These literary examples, which predate the first virtual reality systems by a long shot, demonstrate people's fascination with the idea of "traveling" to other worlds—either literally, as Alice did, or virtually, with the aid of special glasses like those developed by Professor Ludwig, which decades later became the go-to apparatus for virtual reality experiences.

Virtual reality was extremely similar to literary and cinematographic fiction, as the preceding sections indicate. That is why we found examples such as William Gibson and his novel Neuromancer (1984), which explores cyberspace even before the emergence of the Internet and computer-generated artistic environments, and Neal Stephenson's Snow Crash (1992), which introduces the concept of the metaverse as a virtual world in which people can interact with each other without physical limitations.

The term virtual reality (VR) gained popularity in the late 1980s, and Jaron Lanier, the founder of VPL Research Inc., is credited with coining it. However, the term réalité virtuelle was originally used in 1938 by French playwright Antonin Artaud to describe theater in his essay Le théâtre et son doublé ("The theatre and its double"). Artaud described theater as a mirage that exists "between the purely imaginary and illusory world in which the symbols of alchemy evolved and the world in which the characters, objects, images, and in general all those elements that constitute the virtual reality of the theater develop" (Artaud 1978, p. 54). Despite the fact that Artaud used the term extremely differently from how VR is currently understood,

The audience is immersed in an imaginative world when viewing a theatrical representation, which makes comparisons to the theater intriguing. This immersion allows representations to bear similarities to A computer is not a virtual reality. We are talking about a technology that creates virtual reality using computerized apparel. It does not more nor less than reestablish our relationship with the physical world on a new level. It has no direct bearing on your internal mental processes and has no effect on
the subjective reality. It is limited to what your senses are able to perceive. Through these five holes—the eyes, ears, nose, mouth, and skin—you receive information about the external world, or what lies beyond your sense organs. You will notice a pile of clothes before you enter the virtual reality, which you must put on in order to glimpse a different world.
compared to the real world. The only items of clothes are a pair of gloves and glasses.
Lanier employs a multisensory strategy that connects virtual reality to the stimulation of all senses, not just vision. According to Lanier, VR is limited to the realm of the simulation since he associates it with the employment of various wearable objects that provide the user the impression of "being there" by enabling them to experience the virtual environment as if it were the real one. There are almost as many definitions of virtual reality as there are authors who have attempted to define it after him, albeit from different points of view. As a result, whilst some writers have concentrated on the technological aspect (mostly centered on hardware), others have taken a philosophical or psychological approach. In numerous situations, the definitions of these three dimensions converge. For instance, Brudniy and Demilh-anova (2012) contend that the interplay of various technological, psychological, and philosophical viewpoints creates the VR construct.

We may identify three characteristics that will define virtual reality (VR) that are widely acknowledged by authors based on the contributions made by the various authors who have examined this technology: immersion (multisensory), presence, and interaction. These components will directly influence how the user interacts with and participates in the virtual environment, even if they are not the only ones required for an experience to be considered VR.

PAST AND PRESENT: FROM OCULUS RIFT TO ALICE'S WONDERLAND ADVENTURES

Five great stages can be identified in the technological history of VR, from the oldest predecessors linked to the first theories of vision, stereoscopy, and anaglyphs, to the current devices on the market:

From 1833 to 1950: remote predecessors

Since the mid-19th century, there have been many inventions that contributed to the birth of VR technology as such. For example, British scientist Charles Wheatstone and his studies on vision gave rise to the invention of the stereoscope (in 1838), a device that creates the illusion of three-dimensional depth, which can be considered the first predecessor of the VR viewer, and the anaglyph process developed by German physicist Wilhelm Roll Mann in 1853 and later perfected by Louis Ducos du Hauron (1891), which enabled three-dimensional photography through the juxtaposition of two images with complementary colors (anaglyphs). Both stereoscopy and anaglyphs are strongly linked to the development of 3D viewers.

Twenty years later, Hugo Gernsback, the father of science fiction, invented the "teleyeglasses" (1936), a portable, battery-operated, head-mounted display that aimed to create

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"immersive" television, although it was not until 1963 when this invention was presented to the public (in O'Neill, 1963). Gernsback was certainly a visionary, and already in the 1920s, he studied the possibility of avoiding unnecessary travel through telepresence. In the February 1925 issue of *Science and Inventions* magazine, edited by Gernsback himself, he spoke of a future invention that would have applications in the field of medicine and would allow physicians to take care of their patients remotely by means of a device called "teledactyl" (Novak, 2012).

From 1950–60 to the first half of the 1970s: first devices

The first direct predecessor of VR is the *Sensorama*, a device created in the 1950s to provide simulated experiences through the stimulation of the senses. Its creator, Morton L. Heilig, was convinced of the pedagogical potential of this device, which was based on the idea that a person could learn more effectively by experiencing the situation rather than by reading or hearing about it (Heilig, 1962, p. 2). In appearance, the *Sensorama* reproduced the machines in recreational halls. It used three 35-millimeter cameras and projected the recorded images simultaneously to create the illusion of three-dimensional depth. Moreover, the device was able to reproduce wind, movement, and aromas, which created an even more realistic experience.

Heilig started with the idea of "immersive vision" of the first cinematographic inventions like Grimoin-San's *cinéorama*, 20th Century Fox's *cinemascope*, Walt Disney's *Circarama,* and the Soviet circular *Kinopanora-Ma* (Gubern, 1969:75–76). However, he went beyond and created an experience that cannot only be seen but can also be felt by stimulation of hearing, smell, and touch, retaking to some extent the idea of pioneering inventions from the 1950s, such as Lube's *Smell-O-Vision* and Castle's *Percepto!*. What Heilig proposed in the 1960s was a fully immersive experience, which was ahead of what the new VR systems of the 21st century offer. However, Heilig did not manage to get funding to shoot new films to test his invention, so he only filmed a motorcycle ride through the streets of Brooklyn. Thus, the *Sensorama* only became an anecdotal experiment in the history of the origins of VR (Rheingold, 1994; López, 2008).

In 1960, prior to the *Sensorama*, Heilig patented another device, the "Telesphere Mask," a head-mounted digital display that provided stereoscopic television (Rheingold, 1994, p. 64). This first head-mounted device did not evolve from its prototype form, so it is widely considered that the first VR headset display system was the one created in 1968 by Ivan Sutherland, the "Sword of Damocles." In 1965, Sutherland established the basis of a multi-sensory system, which he called *The Ultimate Device*, a new peripheral device capable of turning a computer into "the wonderland into which Alice walked."

Sutherland cited Carroll's book to discuss the potential for putting users in computer-generated graphic simulations—that is, to enter Wonderland akin to Alice's, but through a play created specifically for that purpose. After three years, he succeeded in making it happen by developing his VR headgear. A mechanical arm hung from the ceiling, bearing a visualization system made up of two miniature screens fixed atop the user's head, was the "Sword of Damocles." This helmet used sensors to detect the position and angle of the user's head and displayed three-dimensional graphics created by the computer; nevertheless, it could only replicate polygons and had a very limited graphical capacity.

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From 2012 to the present day: the boom of commercial VR visualization devices

In 2012, Google announced the launch of *Google Glass*, a wearable computer featuring AR eyeglasses capable of displaying information to the user. Google Glasses function as a hands-free smartphone that is controlled by voice commands and movements. The glasses incorporate a small screen at the top of the glass, above the natural line of sight, offering information that complements and does not change the reality of the user (Google Developers, 2015). The device was made available to developers in 2013, while the non-specialized public version was launched in 2014. Although the device had a lot of impact and good reception by the users, the company decided to stop production next year. In 2012, Palmer Luckey launched a campaign on the crowdfunding platform Kickstarter to raise funds to create an HMD for public sale called *Oculus Rift*. The crowdfunding campaign was successful, and the first version of *Oculus Rift DK1* went on sale in July 2014 and the second, *DK2,* in 2015. This device introduces a motion tracking system that allows the software to respond to the user's actions. In addition, 2016 saw the launch of *Oculus Touch*, a pair of small controllers for Oculus Rift that facilitate navigation in virtual environments (Oculus, 2017).

Facebook's acquisition of Oculus in March 2014 brought back interest in VR (Parkin, 2014), and in 2015, new proposals were put forward by big companies like Sony, Samsung, and Microsoft. The development of this type of device adopts a triple dimension:

1. HMD connected to the computer, such as *Oculus*.
2. Devices connected to the
3. Devices connected to a video game

Other systems that combine VR with AR were also launched during this time by different tech companies, including *Google Cardboard, Gear VR, HTC Vive, OSVR* (*Open Source Virtual Reality*), *ImmersiON Vrelia GO*, *FOVE VR*, *Gameface*, *PlayStation VR*, *Elf VR*, *HoloLens,* and *Magic Leap*.

VR is, therefore, a technology in constant evolution and growth that has managed to open a gap in the market. While in the 1990s low screen resolutions and poor graphic quality did not allow the creation of truly immersive and appealing experiences, in the new century technological improvements (in both software and hardware) experienced a significant breakthrough in the development of devices capable of producing more and more immersive experiences. It is at this time that commercial VR

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systems began to experience a real boom and regained the interest of the public while expanding the scope of their

application. Proof of this is the increase in the number of active users in VR, which, according to Statista (2019), went from 6.7 million users in 2015 to 171 in 2018.

FUTURE PROJECTIONS AND PROSPECTS FOR VR

In the first two decades of the 21st century, since the earliest beginnings of VR, it has been possible to observe the emergence of numerous studies that explore its application possibilities in a wide range of disciplines. As it is a technology that evolves very quickly, the fields that can be benefited by the employment of VR also increase as they incorporate new advances and improvements in terms of interaction and visualization systems (interfaces) and in relation to content presentation. In this sense, Sherman and Craig (2003:417) establish a classification of the "problems" whose solution can be benefited by the use of VR: those that cannot be reproduced in the physical world, those that cannot be studied safely or involve physical risks, those whose experimentation carries a high economic cost, and "what would happen if...?" kind of problems. Meanwhile, from a more specific point of view, Levis (2006) differentiates two basic categories in relation to the application of VR, separating the specialized technical fields, which require previous training to use VR and are aimed at specific users, from everyday life fields, which are aimed at the general public.

In order to highlight the importance and scope of this technology, below we present the results of the review of the scientific research carried out in the last twenty years. This review is not intended to be exhaustive, since it would be impossible to mention all the diverse studies and applications. We have selected those studies that are interesting due to their pioneering work in a given field, their specific or strategic importance, or their view in relation to a particular subject.

As Levis (2006) points out, more and more sectors are beginning to make use of technologies related to VR, with very specific applications, especially those linked to medicine, scientific simulation, culture, and education. Health sciences is the area where, more often, recent research has highlighted the potential benefits of using immersive environments. These studies range from patient rehabilitation, neurorehabilitation, and motor rehabilitation therapies (Adamovich et al., 2003; Bayón and Martínez, 2010; Burdea, Popescu, Hentz, and Colbert, 2000; Deutsch et al., 2004; Jack et al., 2001; Holden, 2005; Holden, Dyar, Schwamm, and Bizzi, 2005; Merians et al., 2002; Rizzo, Schultheis, Kerns, and Mateer, 2004) to the surgical training of health professionals (Grantcharov et al., 2004; Grottke et al., 2009; Jensen et al., 2015; Lim, Burt and Rutter, 2005; Seymour et al., 2002; Sturm et al., 2008). It is also important to highlight the works on the analgesic properties of VR for the treatment of pain in patients suffering from severe burns, both in adults (Hoffman, Paterson, and Carrougher, 2000; Maani et al., 2011; Sharar et al., 2016; Silva, Machado, Simões, and Do Céu, 2015) and children (Das, Grimmer, Sparnol, McRaee, and

Thomas, 2005; Moreno and Delgado, 2013), as well as in oncologic patients (Espinoza, Baños, García-Palacios, and Botella, 2013), by providing them with a distraction environment.

In clinical psychology, there are many works on the use of VR technology for the treatment of different types of anxiety and psychological disorders, especially those that delve into its use as a tool for exposure to psychotherapy. There are important works that have proven the effec- tiveness of VR in the treatment of acrophobia (Choi, Jang, Ku, Shin and Kim, 2001; Emmelkamp, Bruynzeel, Drost and Van der Mast, 2001; Emmelkamp, Krijn, Huls- bosch, De Vries and Van Der Mast, 2002; Rothbaum et al., 1995a, 1995b; North and North, 1994, 1996; North, North and Coble, 1996a), agoraphobia (North, North and Coble, 1996b), arachnophobia (Carlin, Hoffman and Weghorst, 1997; García-Palacios, Hoffman, Carlin, Fur- ness and Botella, 2002; Hoffman, García-Palacios, Carlin and Botella, 2003), claustrophobia (Botella et al., 1998; Botella, Baños, Villa, Perpiñá and García-Palacios, 2000; Botella et al., 2002), aviophobia (Baños, Botella, Perpiñá and Quero, 2001; Botella, Osma, García-Palacios, Quero and Baños, 2004; Brinkman, Van der Mast, Sandino Gunawan and Emmelkamp, 2010; Klein, 1997; Maltby, Kirsch, Mayers and Allen, 2002; Mühlberger, Wiede- mann and Pauli, 2003; North, North and Coble, 1997a, 1997b; Rothbaum, Hodges, Anderson, Price and Smith, 2002; Rothbaum, Hodges, Smith, Lee and Price, 2000; Wiederhold, 1999; Wiederhold, Gervitz and Wiederhold, 1998), vehophobia (Wald & Taylor, 2000; Wald & Taylor, 2003; Walshe, Lewis, Kim, O'Sullivan and Wiederhold, 2003) and clossophobia (Anderson, Rothbaum and Hodg- es, 2003; Harris Kemmerling and North, 2002; Pertaub, Slater and Baker, 2002; Slater, Pertaud and Steed, 1999). Also frequent are the studies of the application of VR in the treatment of social anxiety (García-García, Rosa-Al- cázar, Olivares-Olivares, 2011; Klinger et al., 2005; Roy et al., 2003), dissociations of the body image in eating disorders (Gómez et al., 2013; Myers Swan-Kremeier, Wonderlich, Lancaster and Mitchell, 2004; Perpiñá, Bo- tella and Baths, 2003; Perpiñá et al., 2009; Riva Bacchet-ta, Baruffi and Molinari, 2002; Riva Bacchetta, Cesa, Conti and Molinari, 2004; Riva, Melis and Bolzoni, 1997), addiction to certain substances (Bordnick et al., 2004; García-Rodríguez, Pericot-Valverde, Gutiérrez and Ferrer, 2009; Kuntze et al., 2001; Lee et al., 2003; Ne- mire, Beil and Swan, 1999) and compulsive gambling (Botella, 2004).

Another area in which numerous research works are

being carried out is the didactic possibilities of VR and the development of immersive learning environments (Bell and Fogler, 1995; Chen, 2006; De Antonio, Villalo-Bos, and Luna, 2000; Pantelidis, 2010; Pstoka, 1995; Thorsteinsson, 2013; Velev and Zlateva, 2017; Vera, Ortega, and Burgos, 2003; Zapatero, 2011). In this sense, there are outstanding specialized applications, such as Construct 3D, developed by Kaufmann, Schmalstieg, and Wagner (2000) for the learning of mathematics and geometry at secondary and university education levels, and

An approach to VR entertainment

As it has been shown in this study, the emergence of VR has been strongly linked to entertainment, so it is not surprising that this technology has been greatly exploited in this field. According to Levis's classification (2006), the use of VR in the entertainment industry reaches very different fields such as cinema, television, social net- works and video games, and has

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become the first access route to this technology for the non-specialised public. This new reality has given rise to a series of interactive narratives that are characterised for being produced in VR environments, which allows us to talk about a type of vir- tual and interactive leisure.

In cinema there are both small immersive experiences that act as promotional material that persuades the audi- ence to go to the movie theatre, and works that delve into narrative film production supported by HMD and VR cin- ema technology (Cortés-Selva, 2015, 2016; Martínez, 2015). Examples of feature films made to be viewed with VR goggles include Jesus VR: The Story of Christ (2016), which is the first production to use this immersive tech- nology in cinema; and Carne y Arena (2017), which pre- sents the real-life stories of immigrants and refugees in

VR. Moreover, in recent years there has been a prolifera-tion of companies and applications dedicated exclusivelyto VR cinema, such as the CINEVR-The Movie Theater app (2018). On the other hand, for the public who still prefers to go to the movie theatre, the first VR cinema was inaugurated in Amsterdam in early 2016, and soon after a similar cinema opened its doors in India. In Los Angeles, the IMAX Corporation has developed its own VR cinema. In these cases, the seats are accompanied by a pair of VR goggles and the spectator can select from a catalogue of movies. Finally, since 2014 there are compa-nies dedicated to the production of VR films, like OculusStory Studio and The VR Company.

Regarding fiction television, there is an increasingnumber of series that use VR technology, both new seriesthat were conceived as VR products since their concep- tion (native VR series), such as *Invisible* (Samsung ,JAUNT, CNÉ and 30 Ninjas) and *Halcyon* (Syfy), as wellas consolidated series that decided to integrate immersiveto attract new viewers (Paíno and Rodríguez, 2017). Ex- amples include *Game of Thrones* (HBO), which has two VR pieces, *Ascend the Wall* (for Oculus Rift) and *Defendthe Wall* (for HTC); *The Simpsons* (FOX), with its *Planetof the Couches*; *Sleepy Hollow* (FOX), with its *Sleepy Hollow VR* experience; the Spanish series *El Ministro delTiempo* (RTVE) and its VR spin-off *El tiempo en tus ma-nos* ("The time in your hands"); and *The Walking Dead* (AMC) and *Stranger Things* (Netflix).

Another area of application for VR is social networks. First, Facebook implemented 360-degree videos in De-cember 2016 (Facebook Live 360) and launched the Beta version of its VR social network *Facebook Spaces* in April 2017. Moreover, the vTime and BeanVR apps were also released also at the beginning of 2017. In all these examples the user can create a customisable digital avatar that will appear in the chosen meeting room or space to interact with his friends' avatars.

Lastly, in relation to VR video games, they are one ofthe main ways for the public to access this technology since VR video game development companies are the ones betting stronger in the creation of contents for VR devices oriented to the general public. Thus, there are many companies dedicated to the development of VR games for specific HMD, like Oculus Rift, PlayStation VR, HTC Vive and OSVR, but there are other companies that also develop content that can be viewed in smart- phones paired with low-cost VR goggles (cardboard type). Within this context of entertainment there are out- standing projects such as *Hellblade: Senua's Sacrifice* (2017), a dark fantasy action-adventure video game that deals with mental illnesses and has been developed by Ninja Theory with the collaboration of researchers spe- cialised in neuroscience.

CONCLUSIONS

Taking into account the aspects discussed above, it can be concluded that in order to understand how VR works and all the possibilities it offers, it is necessary not only to

take into account the different technological innovations of recent years but also the origins of the cinematographer, in which the idea of going beyond the limits of reality posed by the technology of that time was already present. What seemed to be science fiction today has become reality, and proof of this are the different contexts where VR is already being applied, as this study has shown.

In relation to the term VR, it was initially linked to literature and, more specifically, to the science fiction genre, where some authors began to talk about what is currently known to be the essence of VR: immersion. In short, one could say that the term was born linked to a narrative context, independent of the technological advances. The clearest example is the sequence in *Alice in Wonderland* where the protagonist's sister enters the same world that Alice just left. The development of the digital context is what allowed overcoming the narrative-conceptual plane and what gave way to the definition of what we currently understand as VR, which, unlike previous times, is now associated with a series of components (VR goggles, haptic devices, 360-degree video content) that enable users's real-time immersion.

The past and present of VR allow us to speak of five great stages that are linked to technological variables, which in turn involve a series of intrinsic social variables that derive from the historical context in which they are framed and are essential to understanding this evolution. These stages are characterized by the following issues:

1. From 1833 to 1950: There are inventions that can be considered remote predecessors of the first VR viewers related to the first theories of vision. The most important figures are Charles Wheatstone, Wilhelm Rollmann, Louis Ducos du Hauron, and Hugo
2. From 1950–60 to the first half of the 1970s, the first virtual reality HMD emerged, strongly linked to the military field and simulations. In this period, names such as Morton Heilig, Ivan Sutherland, and Miron Krueger stood
3. From the second half of the 1970s to 1990, VR and user detection systems experienced a significant improvement, and a second line of research on the detection of users's movements within the virtual world started to develop.
4. From 1990 to 2012, it was a stage marked by the release of films that began to explore virtual worlds and the development of computer VR games. The Cave Automatic Virtual Environment (CAVE) system also emerges during this stage at the hands of Carolina Cruz-Neira.
5. From 2012 to the present day: The Oculus Rift VR headset is released, and the first HMD systems begin to reach the non-specialized public. Especially from 2014 onwards, companies specializing in VR proliferate and revenues in the sector.

As shown in the last part of this study, interest in VR has been increasing. There are more and more areas.

of knowledge that have benefited, to a greater or lesser extent, from the application of this technology and the haptic and visualization devices that depend on it. It is precisely in this plane that we can see that truth is better than fiction and that it has been

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reflected
in the different areas where VR is currently used: education, medicine, journalism, engineering, and psychology, among others. In this sense, it is possible to argue that VR is reaching a consolidation phase in such a way that it has managed to overcome its perception as a "fad" and to make an important gap in the technological market and in the entertainment industry. In short, all these research works demonstrate the wide spectrum of possibilities that VR encompasses, which adapts to the specific needs of each knowledge area, making the study of this technology increasingly complex.

All these aspects that have been discussed above constitute a starting point for VR as an object of study, which in this case is understood from other perspectives that have not been addressed in this work, such as the user's narrative immersion and everything related to the acceleration of progress this technology is experiencing in the digital context.

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