

PEDRO M. AZEVEDO ROCHA

pedro.ma.rocha@gmail.com

UNIVERSIDADE DO MINHO (PORTUGAL)

AUGMENTED REALITY: THE AUGMENTED CONSTRUCT OF COMMUNICATION

ABSTRACT

Augmented reality (AR) is becoming more than a virtual simulating hyper-reality of cognitive sensitivity of a life's situation. It may be considered a type of nature transforming into a mediator of worlds, increasing the perception of reality in real time within the medium that surrounds us. Augmented reality makes use of some smartphone technology, in conjunction with camera, video and positioning system for information visualization superimposed into real image. Now with AR we see-through information in radiographic surfaces of reality, it is becoming transparent. Since 1985 the access to goggles and gloves that interacts with virtual reality established as the gateway to an experience of our senses that would go beyond our imagination. We literally were stuck through gloves to a world that could be seen with the aid of special glasses (Google Glass, Facebook Oculus VR, Microsoft HoloLens). With promise of design creativity several technological companies (Garmin, Atheer Labs, Space Glasses, Ydreams, Total Immersion, Metaio, Layar) invested in new instruments and applications that would mediate and serve the frontier between the real and the digital information world. Through AR we are reflecting our transcendence and communication, beyond Kant and Husserl, bodying it with a strange normality.

KEYWORDS

Augmented reality; construct; vision; information; transcendence

AUGMENTED REALITY AND INFORMATION TECHNOLOGY

Augmented reality (AR) presents itself as more than virtual, by its juxtaposition to the real world, as if our mental information about a given subject assumes a real representation out of mind momentarily turning real space in an extension of this, simulating a hyperreality of cognitive sensitivity

in some life's situation. Augmented reality may be considered another type of life, directly or indirectly, whose elements are sensory stimuli generated by computer in form of images, sounds, images or positioning data which are linked with information layers of different types. AR becomes a mediator of worlds, its own reality, increasing the perception of reality in real time and in a meaningful semantic context with the world that surrounds us, within a mental "computer", a space where you can interact with and manipulate requests and static actions in overlapping graphics to the real world.

In an article by Drew Bartkiewicz¹, "APIs in Your Eyes with the Augmented Reality Bigger Wave of Data", of March 2013, he writes that AR is increasingly possible to implement and to blend in our day-to-day due to an "overload of big data bombarding the human mind, in work and in our lives" (After-Labs, 2013). Since 1995 the data have been increasing "being produced, processed, and aggregated at such volumes" (After-Labs, 2013) whose "average company doubles its data every year" (After-Labs, 2013), however people have not followed this increase not duplicate the "cognitive and critical thinking capacities at the same rate" (After-Labs, 2013). We arrived to 2013 a turning point for high-volume databases, it is believed that this will be the "trigger that drives a massive adoption to Augmented Reality, where the display of data and the capture of content are delivered in more natural and hands free methods" (After-Labs, 2013). In part, it is believed that this change will happen due to an "American productivity in the workforce" (After-Labs, 2013) requirement, nevertheless it an understatement, there's a lot more to the reason of such change.

Augmented reality, for now, makes use of smartphone technology (and the like), in conjunction with camera, video and positioning systems (GPS), for information visualization superimposed in real image, currently contained in a small screen. But to become one with a real environment it needs a projection technology. One of the first videos broadcast massively in which we saw a coexistence with the projection in real space was the "Star Wars - The Return of the Jedi" hologram in 1983, where we could observe in the center of a conference room a colorful transparent planetary simulation in proportional size and its relationship with the surrounding elements. We infer that might be the beginning of the viewer's mind transformation and the population future imagination of what was to come in the next half century in terms of how information would interact or be perceived. There was another one before in a previous movie, "Star Wars – A New Hope" in

¹ See <http://drewbartkiewicz.sys-con.com/node/2569342>

1977, but compared to the 1983's projection it's limited to a faint resolution "3D" image of a character communicating through "live" recording, nevertheless it was in those days that creativity began to work and to materialize through the cinematic screen magic, bringing new worlds to the imaginary of society.

According to an article, by researcher, of Management Information Systems, Ahmed Elmorshidy, published in 2010, about the observation of changing the world through the influence of the emerging holographic projection technology, its declared this will represent a "new wave in the future of technology and communications, in different application of technology, dramatically affecting areas of life, including business, education, telecommunications and health". This technology, rapidly growing, is expected to change "the way we see things in the new era" (Elmorshidy, 2010). Speaking of technological visions, in 1964, the famous English writer and inventor Arthur C. Clarke (1917 – 2008) made a prediction of the future in an episode of the documentary "The Knowledge Explosion", broadcasted on September 21st². Clarke said that in 50 years from that day, we would make part of "a world where we can be in immediate contact (...) wherever we are", a time when "we can call our friends, even though we did not know of their actual physical location", where it would be possible to a man to run "a business from Tahiti or Bali, as well as from London". A time when "almost the entire executive ability, (...) even any physical ability could be made regardless of distance". Clarke must have looked through a crystal ball because of the certainty which predicted correctly almost everything. Anyhow we believe that we will not be able to know if we run behind those words in search of that "dream", where life imitates thought. Today it is a fact that we are in immediate contact anywhere, and through a touch of a screen we can decide on almost any action or business remotely. We are living in a kind of a "new world" dreamed or imagined by someone or by many in a collective consciousness that expresses itself in what we are and what we do.

"Augmented reality" it's, in general, an evolution of "virtual reality" extra space needs. However, each person knows his own real, and no other truly understand the vision of the first if she doesn't reveal it, since the reasoning is peculiar from person to person and the way they look, design and understand their own judgments, it's what builds us the sense that contributes to its formation of its unique existence in this incomprehensible whole. The reality, or the real, the natural real (Husserl's), in addition to sensory

² See <https://www.youtube.com/watch?v=aajlLeTgrEg>

palpable, is everything that makes up the stability of individual reason, beyond that the reason is lost and the sense of consciousness sinks for lack of gravitational force of some referential. Nevertheless, taking into account the underlying disagreements that come from the habit of assuming that the individual perception of a given knowledge is the same, one can establish a common basis of understanding of reality taking two given observations: divisibility of reality in elementary pieces (signs), possibly modular, and the perception of a dimensional transformation (given by Kant's sensitivity to time and space).

We see, immediately we believe in the realism of the seen. A healthy person rarely questions what the vision, or any other sense, hands her to interpret and process. We see, immediately we accept the realism of the seen. The brain is eager to fill it with information, affecting everything that curls inside the eyeball as an observer actively passive transparent to its reader role. The perception of the essence of each element observed in a process in which knowledge is apparently given to us, and its implicit contextualization in space that includes it, is received with open arms as a longtime friend. According to Edmund Husserl, the

giving itself up, whether it manifests something of simple representation or something of true existence, something of real or something of ideal, something possible or something impossible, it is always a giving up onto the knowledge phenomenon, onto the thought phenomenon in the broadest sense of the word. (Husserl, 2008, p.104)

The innocence of a newborn that looks at the moon for the first time is staggering in the sense of not being surprised by the huge pebble hanging out among some bright spots in a dark immensity – sees everything as normal, just sees and accepts the phenomenon.

As stated by Kant (2001, p. 79), “it is completely unknown to us the nature of the objects themselves”. The primordial nature, of its not perceived and timeless state, we do not materially possess its pure *percept*, and in for the mental shape its pure *construct*. We perceive their existence completing it with the realization of being real for its allocation and expressed by its equivalent in thought in a *construct*. As discussed by Paul Carus, (1852 – 1919), writer and German-American philosopher, the

“sensory impressions are data, they exist before ideas, being these constructions that are produced from sensory impressions. Sensory impressions are facts, but the ideas are from deductive nature; they are (to use the excellent

term of Conway Lloyd Morgan [(1852-1936), English psychologist and ethologist] *constructs*.” (Carus, 1892)

Through perception we transform the knowledge of reality by changing the perspective depth of objects, both from the side of details as from the context of its finite totality in the space to which they belong.

INFORMATION SEEN IN RADIOGRAPHIC SURFACES OF REALITY

The see-through, or transparent, screens although there are already here at least a decade, only around 2012 have begun to have a bet by companies from the IT branch, such as, for example, the “Smart Window” Samsung³, exhibited at the CES (Consumer Electronics Show) 2012, due to its attractive appearance specifically the effective use of applications for augmented reality. While smart devices observed the real world indirectly from a camera, which transmits the image and subsequent composition with other information on the device’s screen, in case of transparent screens the space around us it’s observed directly which it’s only interrupted by a radiographic “film” introducing graphic information in real time in conjunction with what you see.

Perhaps the first manifestations of this technology have been before, shy or sporadically fruit of creativity, but the most important have been the use in the animated film *Ghost in the Shell* in 1995, from there arise rhythmically in other films, such as *Minority Report* (2002), *Paycheck* (2003), *James Bond – Quantum Solace* (2004), *Iron Man* (2010), *Avatar* (2010), and recently included a vision of the near future given by Microsoft⁴ in the project “Future Vision” of 2008 or through the experimental innovation project of the company TAT⁵ in 2010.

The technology application of transparent screens/glasses in conjunction with augmented reality concept which currently it’s slowly mas-
sifying it’s the one related to the smart glasses (goggles with access to the internet or in contact with local devices). Its origins go back a few decades ago. In 1985, Lanier, a pioneer in the field of virtual reality (a term for which he is credited to have popularized), left Atari to found the VPL Research, Inc., together with Thomas G. Zimmerman (researcher at IBM), the first company to provide goggles and gloves interacting with virtual reality. This

³ See www.youtube.com/watch?v=m5r1TrdF5Cs

⁴ See www.microsoft.com/office/vision/ | www.youtube.com/watch?v=w-tFdreZB94

⁵ See www.youtube.com/watch?v=g7_mOdi3O5E

way we would have at our homes our own visionary device of visionary view, all this in an accessible way. We were literally stuck through the gloves to a world that watched for some special glasses – our own world and extra-sensitive personal experience.

Garmin⁶, a previously American company, is since 2010 a Swiss company that develops GPS applications for the consumer in the field of aviation and marine technologies. With this experience and the concept HUD (Heads-Up Display), with enough use in the front area of fighter planes cockpits, they took the initiative to apply it to car windshields in terms of information and entertainment⁷. The system works with a proximity sensor and embedded buttons on the steering wheel, allowing to activate routes, check traffic information, radio stations or initiate a call, without taking the eyes off the road due to information being placed right in front of the driver on the windshield. Currently, the features of the Google glasses (Google Glass), promise to revolutionize the use of Internet in day-to-day, with the incorporation of a camera with high resolution, where there's not need of headphones to hear the sounds produced by the glasses, these are through audible sound waves transmitted by the bones of the face, coming through into the inner ear. To communicate with the glasses, just say some preprogrammed commands that are recognizable by the device, allowing you to view e-mails, browse directions and receive calls directly from the specifications of other technologies. This device is attracting interest from more companies, which in the case of Atheer Labs⁸, of Mountain View, California, according to Mashable⁹, will, as a competitor to Google glass, "touch" the digital world and switch from a passive viewing to an active and an immersive interaction, providing another vision of augmented reality¹⁰. As the case of the company Space Glasses¹¹, a team of New York researchers with their eye device version MetaPro¹², which has a stereoscopic 3D vision and gestural interaction with high accuracy together with a multitude of applications ("apps") for augmented reality, promoting itself as the first holographic interface. Not only small and medium-sized enterprises are interested as also the largest, for example, on one hand, Facebook which has

⁶ See www.garmin.com | www.youtube.com/watch?v=QxezE59vudo

⁷ See www.engadget.com/2014/01/07/garmin-hud

⁸ See www.atheerlabs.com | www.youtube.com/watch?v=ToonzbGNJIQ

⁹ See mashable.com/2013/12/19/atheer-google-glass-competitor,

¹⁰ See www.youtube.com/watch?v=ToonzbGNJIQ

¹¹ See www.spaceglasses.com | www.youtube.com/watch?v=LuMv29nKo2k

¹² See www.youtube.com/watch?v=8Faotn4G2no

purchased for \$2 billion¹³ the Oculus VR, a company founded in California in 2012 that created a head-mounted display, a helmet that one experience the visual interaction with a virtual reality; and on the other hand, Microsoft has submitted in April 2013 a patent for augmented reality glasses, called Microsoft HoloLens¹⁴. However, they all are still waiting for the reaction of the general public against these new technologies and the confidence of their achievement in dealing with the management and handling of a world that physically does not exist and which is invisible for who observes from the outside the user of it.

EXAMPLES OF CURRENT AUGMENTED REALITY TECHNOLOGY

Of Portuguese origin, under the direction of António Câmara (b. 1954), professor at Universidade Nova de Lisboa, stands out YDreams (founded in June 2000 as “Ideias Interactivas” and renamed in 2002) based in interactive environments development, particularly in the area of Augmented Reality (AR), producing new trends sustained in research and intellectual property obtained from it dividends of acquired knowledge. In 2009 joined the AR Consortium and in 2010 attending the first AR conference held in California, with the aim of promoting existing projects internationally in this field, YDreams wins the Auggies Prize (an “Oscar” of the AR) dedicated to the best of AR demonstrations, among 10 named, with the work “Touching Augmented Reality”¹⁵. Among some of their projects we can distinguish the “Aquarium” (imaginative experience with the user), the “Boxfall” (environment that triggers interaction with multiple users) and the “Orbit” (application that benefits from the intuitive interaction in three-dimensional perception). As spinouts we highlight e.g. YVision (result of 10 years of research in HCI and the whole interface nature AR) and Yinvisible (based on product design to promote interaction with the environment diversity).

A couple of years before, in 1998, Valentin Lefevre and Bruno Uzzan co-founded Total Immersion¹⁶ in Paris, France. This company is a software solutions provider that through augmented reality technology integrates 3D objects into live video: digital video is processed and “augmented” with the components in 3D and with the D-Fusion software, proprietary software, which allows the fusion of reality and animation.

¹³ See www.businessinsider.com/why-mark-zuckerberg-bought-oculus-for-2-billion-2014-3

¹⁴ See www.youtube.com/watch?v=aThCroPsyU4

¹⁵ See www.youtube.com/watch?v=qXclZ1R68SQ

¹⁶ See www.t-immersion.com

Later on, Metaio¹⁷ was founded in 2003 in Munich, and in 2006 launched the first browser plug-in for AR applications based on the network, and shortly after, launched the first fully integrated application for mobile devices AR and the Junaio browser¹⁸ providing an information display in a completely new way. Because for Gartner Inc., the AR is one of the top 10 IT technologies of our time, Thomas Alt, co-founder and CEO of Metaio, believed that by 2014 the AR would be in all smartphones. For Metaio “we are at the dawn of a new technological revolution as the world and the digital space merge with the AR to become the user interface in the future”. The purpose of this company is the desire to bring promising technology with augmented reality accessible to the masses¹⁹ everywhere. As the Junaio, another company of Italian origin, the Mixare²⁰, a project of Peer Srl (Peer internet solutions), currently promotes the product of a mixture of a search engine (browser) in AR in open source (Open Source Augmented Reality Engine).

The Layar (www.layar.com), a software company from Amsterdam, founded in the summer of 2009, creator of the first augmented reality platform in the world, defined a technology that allows a digitally enhanced view of the real world, linking it with the most significant contents of the daily life of every person. With the camera and the sensors from a smartphone or tablet, the AR adds layers of digital information – videos, photos, sounds – directly “on top” of elements in the world around us, interweaves computerized data with real life thus becoming an almost direct extension of the body or some other object, bringing life to those objects, which may be from a cup to a building, from a finger or a brain.

GESTURAL MOVEMENTS IN REACHING TO THE INVISIBLE

Augmented reality with information lies in space, in the atmosphere that surrounds us, where the medium is its own message. When this symbolism takes manly over our visual perception, immediately we establish it as an integral part of the element we observe in a sense of belonging implied in the depth of the place that information appears. And so we see it as such, connoting with a world that doesn't exist physically but it is accepted as normal in the same way as mental imagery, only this time this imaginary

¹⁷ See www.metaio.com

¹⁸ See www.junaio.com

¹⁹ See mashable.com/2013/06/19/metaio-augmented-reality

²⁰ See www.mixare.org

we see it “really” in a space before us, that only we see it. Digital information takes over and becomes “form” in an existence which hitherto did not exist, thus becoming the latest “species” of the natural world, but still is only a “spirit” of what can possibly be. Interaction with this information produces through physical form like if you’re really there, which is performed by speech or gestural movements in a certain own language. The movie “Minority Report”, of 2002, did the chores of the house and introduced the topic publicly in the media, and from here on there would be no turning back – life would want to imitate art. Director Steven Spielberg to the design and discussion of producing this movie, brought together a “think tank” (a team of thinkers and consultants) to build the image of a near real world 50 years from there. Among them was Jaron Lanier, already mentioned, but in particular John Underkoffler.

John Underkoffler designed the computer interfaces that appear in the movie “Minority Report” which are notoriously gestural based systems. However they do more than simply pointing, it allows users move their hands to interact with the images produced by computers. Underkoffler led the team that produced this interface, called “G-speak Spatial Operating Environment”, allowing applications to be developed and implemented on multiple screens and multiple devices in the resolution and processing of large databases, providing effective collaboration, transforming the action of a user (or more) on a screen (or more) in a fully interactive and shared experience, to combine data presentation features and analysis and to allow real-time insight and intelligence development. His company, Oblong²¹, was founded in 2006 to transfer the “G-speak” to real world, and with the aim of creating the next generation of computer interfaces. In February 2010, Underkoffler gave a presentation at TED²², with the theme “Pointing to the future of UI”, which was received with great interest. It began thus concretely the interaction of the human being (or user interaction – UI) with the spatiality of the information world around him, by that moment long was the time of the article “A hand gesture interface device” published by Thomas Zimmerman and Jaron Lanier, among others, in 1987.

Currently gestural interaction in the same fashion is connected to the multi-touch technology on screens and several international companies are currently investing in this field due to the use and existence of smartphones, tablets and tables of the same application. A Portuguese case is

²¹ See www.oblong.com

²² See www.ted.com/talks/john_underkoffler_drive_3d_data_with_a_gesture

represented by Edigma²³, a technology company founded in 2000, under the guidance of Miguel Peixoto de Oliveira, specializes in developing hardware, software and interactive systems based on multi-touch and gesture recognition. Edigma through Displax²⁴ develops a multi-touch layer, adding more features and use of new materials, and through Unedged²⁵ develops sensory experiences by touch via a tailored software to all Interactive hardware, having been awarded several awards in recent years.

Although with all these devices, to complete the actual interaction with the emptiness of that available information, there's still a need to give the "sense of touch" to these projections making it possible handling them. With this in mind a team of Japanese scientists at the University of Tokyo, conducted by Hiroyuki Shinoda, created touchable holograms. In an interview in September 2009²⁶ to NTDTV, Shinoda said that by "now, holography was only for the eyes and if one tried to touch it the hand would pass through. But now we have a technology that also adds the sensation of touch to holograms". The technology consists of software that uses ultrasonic waves to create the feeling of pressure in his hand that touch the projected hologram. Its applicability was produced thinking in light switches, devices that could not interact directly or in hospital environments to prevent contamination by touch. Only later, in 2012, Professor Shinoda was invited by TED to present the work²⁷. Our pace in this technology is slow but we, humans, are also the result of a long path.

COMMUNICATION IS A FORM OF TRANSCENDENCE

"The taste of people for bright material can be rooted in a basic instinct", says science writer Eric Jaffe, an article in Co.Design (2014), writing about behavioral science related to the attraction of a human being by the brightness, something very present in the imagery augmented reality environments. His statement is supported by research where PhD in management and biochemistry Vanessa Patrick of the University of Houston collaborates with colleagues from the University of Gent. In a couple of researches they have established that adults and children, aged four to five

²³ See www.edigma.com

²⁴ See www.displax.com | www.youtube.com/watch?v=1slu9p-5s1o

²⁵ See www.unedged.com

²⁶ See www.youtube.com/watch?v=3seTlvQtIgc

²⁷ See www.youtube.com/watch?v=gLC7LNAXOo4

years old, preferred a bright brochure rather than one with a matte finish. “Children as they are too young to understand the marketing efforts to call that glitters with wealth, in a way their preference had to be innate”, concludes Jaffe speaking with Patrick. With the “virtual reality” and recently the “augmented” one, knowledge appears in an apparent world where one challenges and refutes what appears, we can say that came into existence a phenomenology of another reality. As Husserl said, in “perception, perceived thing must immediately be given. Here’s the thing before my eyes that they perceive; I see it and I grab it. But perception is simply a living of my subject, the subject that perceives it” (Husserl, 2008, p.40). So far we saw and clung the said real “thing” physical and mentally, from now on we will see and grab projections of apparent images to a limit that we consider them almost real, belonging and participating in the real world.

For Husserl the “experienced provides empirical motives, i.e.: rational reasons of probability in favor of untested, but then, of course, just for the sake of the experimental. Transcendent, in principle, is not experimentable” (Husserl, 2008, p.114). Thus, by inferring “transcendence, through reasoning we passed the immediately given, is generally the work of inferences / the grounding the not-given through the given” (Husserl, 2008, p.114). Reflects transcendence, and its eagerness, so it would be achieved directly or through emulators and couplers of realities psychedelically virtual and apparently perceptive, staring at her with all normality, receiving what it is given and inferring from that point onwards. There are non-physical multiverses still to be (re)discover – at least space embraces this imaginary allowing its viewing. Let this be clear.

BIBLIOGRAPHIC REFERENCES

- Bartkiewicz, D. (2013). *APIs in Your Eyes with the Augmented Reality Wave of Bigger Data*. Retrieved from <http://drewbartkiewicz.sys-con.com/node/2569342>
- Carus, P. (1892). What does anschauung mean? *The Monist*. 2(4), 527-532. Retrieved from <http://www.jstor.org/stable/27897002>
- Elmorshidy, A. (2010). Holographic Projection Technology: The World is Changing. *Journal of Telecommunication*, 2(2), Retrieved from <http://arxiv.org/ftp/arxiv/papers/1006/1006.0846.pdf>
- Husserl, E. (2008). *A Ideia da Fenomenologia*. Lisboa: Edições 70.

Jaffe, E. (2014). An Evolutionary Theory For Why You Love Glossy Things. *Co.Design*. Retrieved from <http://www.fastcodesign.com/3024766/evidence/an-evolutionary-theory-for-why-you-love-glossy-things>.

Kant, I. (2001). *Crítica da Razão Pura*. Lisboa: Edição da Fundação Calouste Gulbenkian