

Paweł Stobiecki

War Studies University
Faculty of National Security
Department of Information Security and Communication
p.stobiecki@akademia.mil.pl

Augmented reality – challenges and threats

JEL codes: L86, L90, M00

Keywords: Augmented Reality, Mixed Reality, Technology, Threats

Summary. This article presents what is the essence of Augmented Reality and what kinds of reality we can list. What is more, article describes examples of Augmented Reality usage in everyday activities (both in professional way and in entertainment). Article shows also possible and probable ways of Augmented Reality usage, that may threaten human health and lives. Article points also to technology dual use problem and using the Internet for controlling devices which create Augmented Reality.

Introduction

Human beings have limited perception to 5 senses. These natural limitations can be enhanced with special combination of devices and computer software, which may enable humans to see something more than normally visible.

This extended perception can be called Augmented Reality, which may be created in many different ways. Possibility of extending human senses can bring many new challenges as well as some new threats. In this article author will describe some of them.

1. The idea of Augmented Reality

Augmented reality accompanies life's of modern-information societies, and it is already used for decades. As a matter of fact human beings already exist in augmented reality even if they are not aware of that.

One of the first scientist describing AR was Ronald Azuma, who defined it as “a variation of Virtual Environments (VE), or Virtual Reality as it is more commonly called. VE technologies completely immerse a user inside a synthetic environment. While immersed, the user cannot see the real world around him. In contrast, AR allows the user to see the real world, with virtual objects superimposed upon or composited with the real world. Therefore, AR supplements reality, rather than completely replacing it” (Azuma, 1997).

For better understanding of AR nature, it is necessary to mention, that AR is one of Mixed Reality (MR) types. The phenomenon of MR was described by Milgram and Kishino as a various ways of permeation real and virtual environments (see: Milgram, Kishino, 1994). What is more they have developed a concept of virtual continuum, which presents the mixture of classes of objects in different display situations. This concept is illustrated in Figure 1.

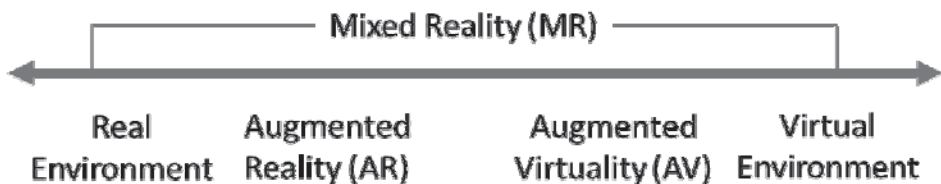


Figure 1. Simplified representation of a virtual continuum

Source: Milgram, Kishino (1994).

According to the figure above, AR is one of many options for reality enhancement. But for the purpose of this paper, author will focus only on Augmented Reality.

The general idea of AR is to display human beings virtual objects, so they can be seen in reality. But nowadays Augmented Reality means definitely a lot more. It is commonly used in aviation, sailing and driving as a navigation tool. Other way of use is connected to the video gaming. AR is used as gaming enhancement for Video Gaming Systems (Sony Playstation, Xbox, etc.), that helps user to get more realistic experience during gameplay. Both purposes of use may be applied on mobile devices like mobile phones, tablets and phablets. What means, they may be used in many ways.

One of first documented cases of AR application was the Head Up Display (HUD) mounted in aircrafts for enhancing the abilities of jetfighter pilots. It is quite normal, that new technologies are developed for military purposes and are transferred later to commercial market. We can assume, it is natural, that this technology evolves now in many different directions, which actually conducts whole world economy as it may be applied in every electronic mobile device.

2. Application of Augmented Reality

At this point it is worth to ask a question: Why do people use Augmented Reality? The answer may be quite simple: mainly to make their lives easier or more interesting and also to get more security.

Using AR, it is possible to make virtual maps of real world, which can be displayed with real pictures to help people in navigation. It is also possible to mark planets and stars on night sky or even during daytime. The AR gives user the possibility to enhance video gaming experience by eliminating the need for traditional screens and stationary game playing.

Other interesting application of AR may be interactive virtual instructions, used to help people understand how to fix some devices. On the other hand it may be just a simple addon used in social media to insert some virtual objects into camera image.

All examples mentioned above are already in use. The most interesting fact is, that many people are not aware of that. Augmented Reality came into our lives and will continue to affect many new areas of human activities.

3. AR application in everyday use

Basically AR is used in navigation systems on various platforms. Best known application is GPS navigation system used in vehicles. This useful enchantment may be installed on special platforms built in vehicle system or may be added as a separate device like tablet or mobile phone with proper software (Google Maps, etc.). But same functionality is also used in maritime. Navigation in XXI st century has never been so easy. Sailors can navigate using Mixed Reality tools combined with AIS¹ maritime navigation system. Using special software it is possible to identify approaching vessel via mobile phone. Good example of such software is OnCourse Plus, which enables users to see names of approaching vessels, their basic data: speed, length, nationality, vessel type and plotted course. Example use of this software is illustrated in Figure 2.

¹ Automatic Identification System.



Figure 2. Example use of Augmented Reality in OnCourse Plus software

Source: <https://play.google.com/store/apps/details?id=com.marinetraffic.iais> (19.01.2018).

As it is shown above, some virtual objects are inserted into reality via software. To use this program user must have compatible device with Android or IOS operating system, enabled data transfer, GPS location and camera.

Next interesting application of Augmented Reality is device called Google Glass. This special headset is a combination of headphones, microphone, camera, glasses and microcontroller. Such devices can be called Wearable Computing. Google Glass must be paired with compatible mobile phone, so it means, this device is a kind of mobile phone extension, which gives user the ability to see data displayed by phone directly on glasses. Device is controlled via voice commands and additionally by special touchpad (see: Mankar, 2015). Google Glass is illustrated on Figure 3.



Figure 3. Google Glass

Source: *Google Glass...*

It is worth to notice, that Google Glass is not the only one available device, which gives the ability to use Augmented Reality. Similar devices are also developed for professional use and military purposes.

4. AR application in entertainment

Other form of AR application is video gaming, which can be considered in two categories: stationary systems and mobile systems. Stationary systems connected mainly to leading brands in console gaming, Sony Playstation and Xbox have developed separately different systems of Augmented Reality for video gaming purposes. Both use camera to catch real world view and then add to this view virtual objects, which are displayed as one image of new reality (augmented one) on video screen or in special 3D glasses. Example use of AR in stationary video gaming is illustrated on Figure 4.



Figure 4. Example use of Augmented Reality in video gaming

Source: Hands-On with the Playroom Shows off the PS4 Controller and Camera, <http://www.gameinformer.com/b/news/archive/2013/09/21/hands-on-with-the-playroom-shows-off-the-ps4-controller-and-camera.aspx> (19.01.2018).

Example above shows people playing with virtual creatures displayed on real image of their room. Users can interact with them just like they were right in front of them in the room.

Another way of AR usage in video gaming applies to mobile devices. Best known example of mobile game with AR support is released in 2016 Pokemon Go. This popular game uses camera built in mobile phones and tablets to insert virtual creatures into real world captured on screen. In this case, virtual creatures are not designed to be realistic and are easy to distinguish from other real objects displayed on screen. On the other hand, to render realistic 3D virtual objects which could be displayed on real pictures, high computing power is strongly needed. Despite highly advanced mobile devices, technology used in their GPUs² is not sufficient yet to render such kind of graphics. Whole process of developing AR application for mobile phones was widely described by Peter Antoniac from University of Oulu (see: Antoniac, 2005). Sample screen of Pokemon Go is illustrated on Figure 5.



Figure 5. Example use of Augmented Reality in mobile video gaming

Source: Official Pokemon Go website, <https://www.pokemongo.com/en-uk/> (19.01.2018).

It is good to mention, that Pokemon Go is just one example of multiple kinds of suchlike games for mobile devices. And in some cases user can download and install unverified software with implemented malware³.

² Graphics Processing Unit.

³ Malware, short for malicious software.

3. Possible challenges and threats of Augmented Reality usage

Every new technology may be used dually in general. First way of using means, that technology is used for purposes coherent with inventor's intentions. Second one is the opposite, what means, that there are some other ways of using specific technologies, which were not intended during development process. This connects to the fact, that uncontrolled worldwide technology transfer becomes a growing security problem mainly because of unknown usage intentions. Almost every technology can be used dually, even if it was invented to rescue lives, same technology may be used to threaten them.

With no doubt also Augmented Reality can be potentially used in wrong ways even without its user's permission and knowledge. Almost every invention connected to ICT⁴ is automatically exposed to cyber-threats, especially if it uses Internet connection, because without it they are useless. As mentioned before, devices that operate with AR usually have Internet access, what means, they can be accessible remotely from any place in the world. This makes such devices vulnerable to whole spectrum of hacker attacks, including exploitation and remote administration. This means, hacker after successful access to the device can not only steal personal data, but may control the device remotely as well.

Such possibility could become a serious threat not only for device user himself, but also for his close environment. For example, if someone would hack into device controlling Google Glass, it could be possible to manipulate or change displayed information. Consequences of these actions could vary, but many of them will inevitably lead to an accident. It is possible to display special combination of colors and light beams which would blind the user or even induce epilepsy attack. If the user was affected during some key actions like driving a car or using some professional tools (chain-saw, etc.), he may also harm people near him.

The same method of remote control could be used to manipulate information displayed on navigation systems. In this case most threatening seems to be manipulating aviation and maritime systems, therefore so results of these actions could escalate even into form of local crisis. It is not only a hypothetical situation, unfortunately such accident has already happened. In February 2017 hackers took control of German container vessel's navigation systems for 10 hours (see: Blake, 2017). Luckily nothing bad happened this time, but the fact that the crew was not able to control ship and got displayed false GPS positions seems to be a major threat.

Some threats may also concern AR used in entertainment. Just like in case of Google Glass, it is possible to hack into computer entertainment systems like PlayStation and take control over it. But this is not the only fact that may concern. Fact of using Augmented Reality itself in entertainment computer systems may lead to spe-

⁴ Information and Communication Technologies.

cific forms of addiction in which user will lose the ability to distinguish what is real and virtual.

Conclusion

Undoubtedly new technologies have great impact on global market and standard of living among modern information-societies. Also in case of Augmented Reality it is quite clear, that it will become more popular and evolve in uncontrolled ways – just like other new technologies. That is why it is so important to raise user awareness of potential threats which may be connected to AR usage.

The Augmented Reality is not futuristic vision, it is already available for many people worldwide and may be used in various ways, not only to help people in their everyday tasks or to entertain them, but also to threaten lives. The dual use of technology is a still growing problem, which probably can not be controlled, but should be definitely monitored.

References

- Antoniak, P. (2005). *Augmented reality based user interface for mobile applications and services*. Oulu: University of Oulu.
- Azuma, R. (1997). A Survey of Augmented Reality. *Teleoperators and Virtual Environments*, 6 (4), 355–385.
- Blake, T. (2017). *Hackers took 'full control' of container ship's navigation systems for 10 hours*. Retrieved from: <https://fairplay.ihs.com/safety-regulation/article/4294281/hackers-took-%E2%80%98full-control%E2%80%99-of-container-ship%E2%80%99s-navigation-systems-for-10-hours> (24.01.2018).
- Bonnet, P., Ducher, P., Kubiak, A. (2014). A Brief Introduction to Augmented Reality. *Advances in Embedded Interactive Systems Technical Report*, 2 (4), 5–6.
- Google Glass Meets Prescription Lenses*. Retrieved from: <https://www.forbes.com/sites/johnnosta/2014/01/05/google-glass-meets-prescription-lenses-something-every-geek-will-love/#4c4a0212401b> (19.01.2018).
- Hands-On with the Playroom Shows off the PS4 Controller and Camera, <http://www.gameinformer.com/b/news/archive/2013/09/21/hands-on-with-the-playroom-shows-off-the-ps4-controller-and-camera.aspx>
- Mankar, P., (2015). Advance technology- google glass. *International Research Journal of Engineering and Technology*, 1 (2), 73–77.
- Milgram, P., Kishino, F. (1994). A taxonomy of mixed reality visual displays. *IEICE Transactions on Information Systems*, 12 (E77-D). Retrieved from: http://etclab.mie.utoron.ca/people/paul_dir/IEICE94/ieice.html (19.01.2018).
- Official Pokemon Go website. Retrieved from: <https://www.pokemongo.com/en-uk/> (19.01.2018).

OnCourse Plus Official product website. Retrived from: <https://play.google.com/store/apps/details?id=com.marinetraffic.iais> (19.01.2018).

RZECZYWISTOŚĆ ROZSZERZONA – SZANSE I ZAGROŻENIA

Słowa kluczowe: rzeczywistość rozszerzona, rzeczywistość mieszana, technologie, zagrożenia

Streszczenie. W niniejszym artykule zaprezentowano czym jest rzeczywistość rozszerzona oraz jakie mogą być jej rodzaje. Opisano także przykłady zastosowania rzeczywistości rozszerzonej w życiu codziennym (w życiu zawodowym i w rozrywce). Przedstawiono również możliwe i prawdopodobne sposoby wykorzystania rzeczywistości rozszerzonej, mogące stanowić zagrożenie dla zdrowia i życia ludzkiego. Zaznaczono także problem podwójnego zastosowania technologii oraz użycia Internetu do kontrolowania urządzeń kreujących rzeczywistość rozszerzoną.

Tłumaczenie Paweł Stobiecki

Cytowanie

Stobiecki, P. (2018). Augmented reality – challenges and threats. *Ekonomiczne Problemy Usług*, 2 (131/2), 197–205. DOI: 10.18276/epu.2018.131/2-19.

Społeczeństwo w e-gospodarce

Katarzyna Caban-Piaskowska

Akademia Sztuk Pięknych im. Władysława Strzemińskiego w Łodzi
Wydział Tkaniny i Ubioru
Katedra Ubioru
k.caban-piaskowska@o2.pl

Rola social mediów w działalności artystów i projektantów

Kody JEL: L86, Z11

Słowa kluczowe: social media, promocja, artysta, projektant

Streszczenie. Celem artykułu jest pokazanie jaką rolę odgrywają social media w działalności artystów i projektantów. W artykule opisano przyczynę zajęcia się problematyką, istotę mediów społecznościowych oraz powody ich rozwoju. W niniejszym opracowaniu przedstawiono wyniki badań wstępnych przeprowadzonych w latach 2016–2018 w Akademii Sztuk Pięknych im. W. Strzemińskiego w Łodzi na kierunkach tkanina i ubiór, wzornictwo i architektura wnętrz oraz rzeźba. Z analizy badań wynika, że 93% badanych artystów i projektantów korzysta z social mediów, aczkolwiek 40% z nich nie używa ich w celu promocji swojej działalności artystycznej i projektowej.

Wprowadzenie

W literaturze przedmiotu oraz w wynikach badań zauważalna jest tendencja wzrostowa znaczenia social mediów na rynku reklamowym. Ze względu na niskie koszty emisji i globalny zasięg, bardzo wiele firm decyduje się na taką formę reklamy. W związku z tym wydaje się, że logiczne jest, aby artyści i projektanci, tym bardziej tacy, którzy są na początku swojej kariery zawodowej, czyli studenci i absolwenci uczelni artystycznych, korzystali aktywnie z social mediów. Celem tego artykułu jest przedstawienie wyników badań na temat tego jaką rolę odgrywają social media w działalności artystów – projektantów.