Wpływ rzeczywistości wirtualnej na stan człowieka

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Streszczenie: Celem artykułu było ukazanie wpływu rzeczywistości rozszerzonej na stan człowieka. Przytoczono wyniki badań udowadniające wpływ wirtualnej rzeczywistości na stan emocjonalny człowieka, wpływ na przyswajanie wiedzy czy też możliwość wpływania na poziom doczuwanego bólu. Do celów badawczych stworzona została aplikacja z wykorzystaniem Unity 3D. Wyselekcjonowano grupę aplikacji oraz przygotowany został zestaw dwóch badań ankietowych. Przeprowadzone zostały badanie na grupie 10 osób.

Słowa kluczowe: wirtualna rzeczywistość; Unity 3D, Oculus Rift; stan człowieka

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Analysis and evaluation of impact virtual reality on human state

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Abstract: The main purpose of this article is to show impact of virtual reality on human state. Results of study shows impact virtual reality on human state, for example impact on human emotions, impact on learning or impact on pain perception. Additionally, this article describes virtual reality as a tool in phobias treatment. For the research application in Unity 3D was created. Study conducted on a group of 10 people confirmed impact of virtual reality on human state.

Keywords: virtual reality; Unity 3D; Oculus Rift; human state

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1. Entry

Virtual Reality is the most popular science and technology thing nowadays. VR can give people a lot of opportunities in top of fields of knowledge. Oculus Rift DK2 are one of goggles created for Virtual Reality by Oculus Company. They can be used not only for games and fun, but a lot of things to help people in normal life. For example, people can use VR goggles to, learn other languages or learn about medicine, explore new things or even learn about construction and appearance of objects [1]. What is more we can also train our behavior in emergency situation [2]. It can be also used to reduce stress [3]. VR goggles gives opportunity to view objects in all sides of view like in real life. By using VR goggle with controller called Leapmotion person who used VR goggles can also touch virtual objects and move them because Leapmotion offer possibility to view real hands and moving them in virtual world (Fig. 1).

Goggles with Virtual Reality can be used also by scientists in medicine or building for learn about human anatomy or testing some objects and reactions for physical aspects. Medicine and surgery can be easier by development of Virtual Reality goggles. Students can simulate surgery accidents and make virtual surgery to improve his skills while experienced doctors can surgery with VR remotely by using goggles. Technology of Virtual Reality and controllers using VR gives big chance to human development.

Fig. 1.   Leapmotion controller in VR application [4]

In this all opportunities about Virtual Reality and fact that VR googles and controllers can trick human labyrinth there is one important question to answer – Can Virtual Reality manipulate human and may impact to human behavior?

2. Purpose of Work

The main purpose of work was to find answer for question about Virtual Reality. Analysis and evaluation of impact virtual reality on the human state.

New application called "Arachnofobia" using virtual reality goggles (Oculus Rift DK2) was created also for research. "Arachnofobia" was created in Unity 3D and Blender for research to check and possibly cure fear against spiders.

3. Range of Work

Range of work was related in main research of impact to human behavior, creating application for VR goggles using platforms called Unity 3D and Blender, exploring and choose application for Oculus Rift DK2 to analysis, creating questionnaire for research and conclusion of research results.

4. Virtual Reality History

The beginnings of Augmented Reality were year 1838 when Charles Wheatstone discovered machine called stereoscope. Stereoscope uses two pictures of the same photography in different points of view [5]. The same method was implement in Google Cardboard. Next innovations discovered in 1959 was "Sensorama" where user using this machine could watch some stereoscopic television with synchronized sound, smell, vibrations and even wind. Next innovations in this field leading to discovered Virtual Reality goggles which were called HMD (Head Mounted Display). Head Mounted Display since 1965 evolve to first goggles for Virtual Reality called Sega VR in 1990. Crucial for Virtual Reality technology was XXI age where one of companies created Oculus Rift – virtual reality goggles with two lens (Fig. 2) dedicated to virtual reality applications.
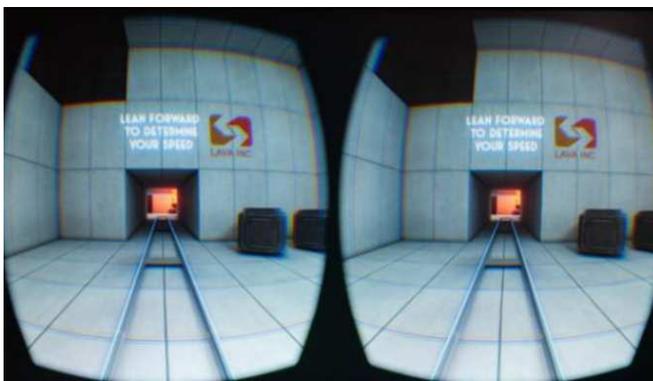

Fig. 2.   View divided into two lens - Oculus Rift DK2 [6]

Nowadays Oculus Rift has got version called DK2 and consument version CK1 without a lot unnecessary wires and with special controllers for the users. More companies offer his goggles for virtual reality for example: Oculus Rift, HTC Vive. Popular were also VR goggles for smartphones which using view from android applications not from computer. Examples of mobile goggles for VR are Google Cardboard, Samsung Gear VR. For the best feelings while using VR goggles companies created additional controllers, for example virtual track called Virtuix Omni (Fig. 3) which allow users to better running in virtual reality world without moving around in reality at the same time.

Fig. 3.   Presentation of VR platform called Virtuix Omni [7]

5. Impact of virtual reality to emotions

First of all, we focused on human psychology. If it is possible to manipulate of human's emotional state? This same question was asked on Vienna University [8]. Scientists create 5 virtual park scenarios. Then they examine if these scenarios can have impact of feelings like happiness, sadness, tiredness, anger or violence. They take a group of 120 students. Students were divide to 5 groups. Each of them was assigned to one of the park scenario. Next, everyone take part in virtual reality sessions which take 5 minutes. After that participants were asked to complete surveys. The research has shown that almost all of the parks were able to achieve their goals. Only scenario which should induce sadness did not cause significant increase of sadness feeling. The greatest increase of sadness was recorded on tiredness scenario.

6. Virtual reality in arachnophobia treatment

Virtual reality can be great tool for medicine. It can be used to cure a lot of phobias [9,10], for example arachnophobia. From statistics, we knew that 11% of United States society have some phobias at certain point of life. 40% of them can be assigned to group called bugs [11]. Arachnophobia is a part of this group.

Arachnophobia is a medical term for the fear of spiders. One of the most popular ways of treatment this disease is treatment by exposure. Exposure therapy involves exposure of the patient to the feared object. Of course, there is no dangerous for the patient. This therapy is intended to overcome patient anxiety.

In 2011 some study took place by Garcia-Palacios, Hoffman, Kwong, See, Tsai and Botella. They gave to group of 777 students leaflet about exposure therapy. Next, they asked them which way of treatment they prefer, the conventional or with using virtual reality. Almost 80% students preferred therapy supported by virtual reality. Researchers asked also students about taking part to 3 hours' treatment sessions. Only 8% answered "definitely no" in context of treatment in virtual reality. This same answer was chosen by 32% investigated in context of conventional therapy.

To the proper research selected 23 persons. They were divided to two groups. One of was control group. Second group took part in virtual reality sessions. The main aim of virtual reality session was to encourage patients to take to hands big virtual spider. The average number of session to achieve that aim was 4. The smallest number of session to achieve result was 3 and the biggest number was 4. Virtual reality session greatly reduced the fear of spiders. People who participated in virtual reality treatment achieved better results in conventional therapy than members of control group. 83% of members of VR group showed clinical progress. Additionally, it should be mentioned that no one from this group discontinued treatment.

7. Virtual reality and pain reduce

We can find a lot of proofs that virtual reality can have impact on human state. One of them are study with burn victims [12]. They are suffering from great pain. This pain accompanies them during daily activities, treatment and rehabilitation. Very often their pain is so great that they refuse rehabilitation, because it.

Researchers Hoffman, Patterson and Carrougher are creators of virtual reality system that should reduce feeling of pain. Feeling pain is strongly connected with attention of it. Pain signals entering the brain can be interpreted as more or less painful. It depends on what patient think about it. The more patient is focused on his pain the more he feels the pain. During a few control studies in the burn center Hoffman and his team noted that using virtual reality signified decrease patients pain. Hoffman to determine the strength of pain used a 100-point scale. In one of his group virtual reality reduced pain strength from 60 point to only 14 points. Patterson drew attention to the high potential of this observation. It is believed that the burns are among the most painful injuries what a person can endure. So we can conclude that if presented results are so good in this case we

also can use virtual reality to reduce pain during painful procedures for the treatment of cancer and in other situations where for some reasons we cannot use a general anesthesia.

Hoffman and Paterson created virtual reality application called "SnowWorld". In this application patient take control on fighter and fly above snow-covered canyon. "SnowWorld" was used also in other studies. Two version of "SnowWorld" were prepared. One technically more advanced, and second simpler. Conclusion on this studies is that more realistic simulation is, the pain is more reduced.

8. Impact virtual reality to society

Most of people assume family. It is one of the most important elements all cultures in the world. What will happen when this experience will be moved to virtual reality. Nowadays, we do not have any long-term study in this matter [13]. Despite this we should considers such interesting case. Popularity of computer game "The sims" shows as that people like try alternative, virtual simulation of live and relationships.

In future, such type of simulation probably will be more advanced. That can be very dangerous for society. We should consider situation when in addition to standard equipment we add private virtual reality set. People after work will launch their VR and will move from their small apartments to big houses with Olympic swimming pools. In virtual world people can have partners and children. Simulation can be connected to Internet and other players can have impact to shape of simulation.

We should consider consequences of simulation like this. First of all, it can have negative impact to number of marry and new families. Starting family is not only a pleasure, but above all a responsibility for its members. On the other hand, virtual reality can provide simulation of no-stress life. Our partner can be programmed in a way that perfect meets our needs. Our virtual children will be smart, polite, nice, distinguished by intelligence or sport achievements. Virtual life like this could tempt a lot of people. In long-term such situation can be a great danger for social relations.

9. Research

Group of ten volunteers were using VR googles from Oculus – Oculus Rift DK2. Every one volunteer will able to watch all three applications prepared before for research.

Fig. 4.   View of virtual carousel called Cyber space [14]

Virtual reality applications for Oculus Rift DK 2 used in research are "Oculus Rift Demo scene", "Arachnofobia", "Ocean Rift" and "Cyber Space" (Fig. 4). Every one of them is different application using different potential of Virtual Reality and googles for VR. Application "Oculus Rift Demo scene" is default application offered together with Oculus software. In this application user can see desk with plant, lamp and other office tools in different points of view. Next application "Ocean Rift" is application where user can swim in the ocean and look up to the underwater nature – fish, underwater plants. In next application called "Arachnofobia" created for research and to learn about development VR application. In this application volunteer was inside classrooms of building Lublin University of Technology. Inside rooms there is a lot of spiders so user can interact with them. It is also good for people who are scared of spiders to get used to this animal. Another and the best application for research was "Cyber Space" – virtual carousel with semi graphic but good dynamic application. Research show human behavior on virtual reality. During study, there was few physical aspects that should be important to find answer for question about impact to human behavior like pulse before and after (Fig. 5), discomfort (Fig. 6), dizziness (Fig. 7), sickness, headache and stomach discomfort (Fig. 10).
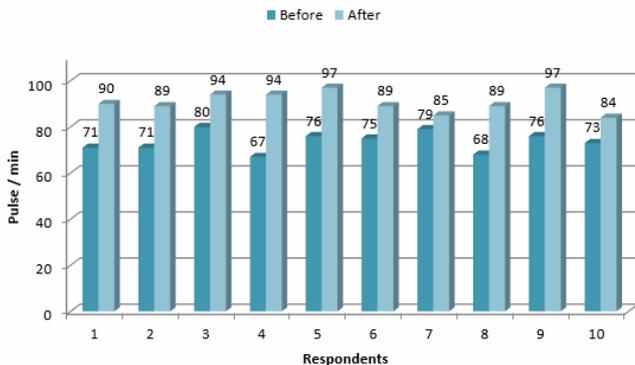

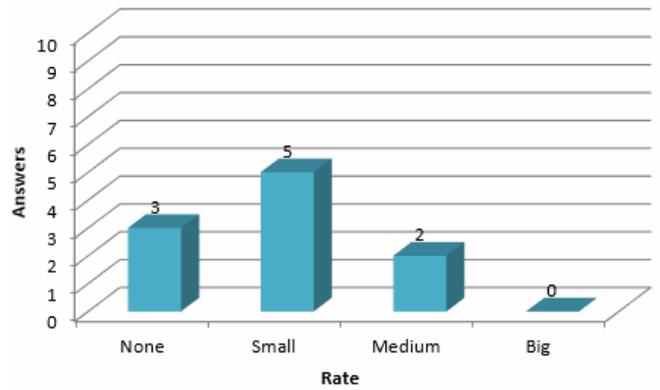Fig. 5.   Pulse before and after using Oculus Rift

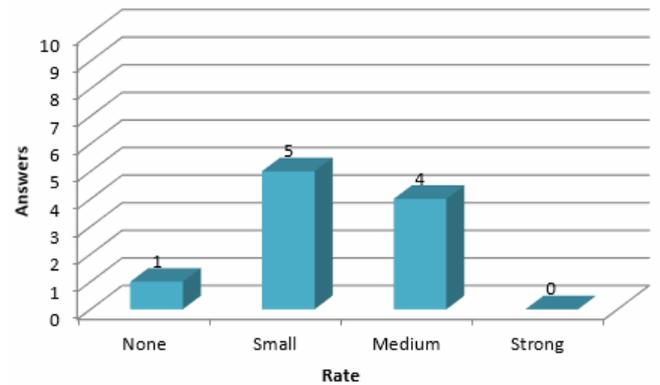Fig. 6.   Level of discomfort after Oculus Rift - "Cyber space"

Fig. 7.   Level of dizziness after using Oculus Rift

Another important aspect was opportunities inside Virtual Reality world like level of exploring world (Fig. 9), level of exploring things, method of getting around in VR, level of disorientation and similarity between real and virtual world (Fig. 8).
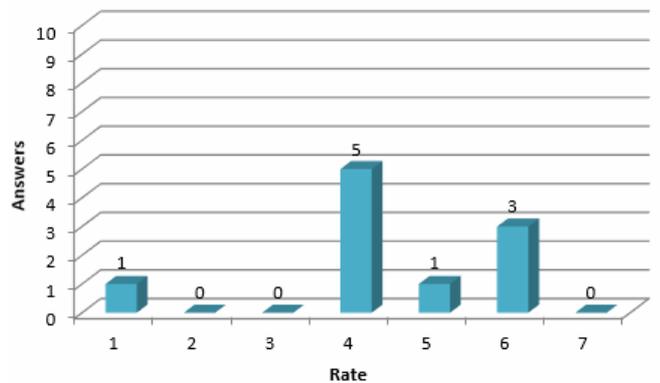

Fig. 8.   Similarity level between VR world and reality
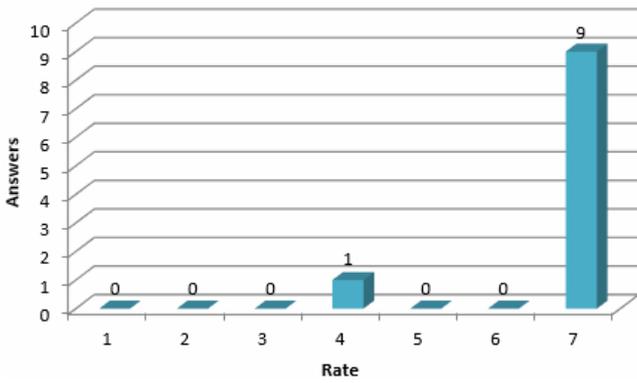
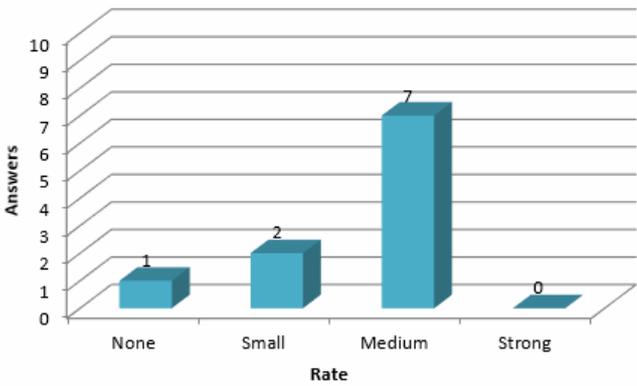Fig. 9.   Possibility level of exploring world in VR

Fig. 10.   Level of stomach discomfort after VR session

All those things getting answer to question about Virtual Reality and possibilities to using VR for manipulating people and impact to human state or human psychology.

10. Conclusion

Virtual Reality can be very important technology XXI century because it could be helpful in every kind of fields – medicine, learning, prototyping, fun, history. Research show that Virtual Reality may impact to human state. It is very helpful information because scientists can include inside people psyche and cure diseases and fears. It also might be dangerous if it will be used in negative things.

Bibliography:

[1] Fengfeng K., Sungwoong L., Xinhao X.; Teaching training in a mixed-reality integrated learning environment, Computers in Human Behavior 62, 2016

[2] Gamberini L., Chittaro L., Spagnolli A., Carlesso C.; Psychological response to an emergency in virtual reality: Effects of victim ethnicity and emergency type on helping behavior and navigation, Computers in Human Behavior 48, 2016

[3] Crescentini C., Chittaro L., Capurso V., Sioni R., Fabbro F.; Psychological and physiological responses to stressful situations in immersive virtual reality: Differences between users who practice mindfulness meditation and controls, Computers in Human Behavior 59, 2016

[4] http://indiecade.tumblr.com/post/107696116381/leap-motion-announces-the-winners-of-the-3d-jam

[5] http://www.vrs.org.uk/virtual-reality/history.html

[6] http://blog.pclab.pl/yosi89/Oculus.Rift.DK2.Recenzja.i.wra%C5%BCenia.z.u%C5%BCywania.okular%C3%B3w.wirtualnej.rzeczywisto%C5%9Bci,487

[7] http://virtualrealityhq.nl/

[8] Felnhofer A., Kothgassner O. D., Schmidt M., Heinzle A. K., Beutl L., Hlavacs H., Kryspin-Exner I.; Is virtual reality emotionally arousing? Investigating five emotion inducing virtual park scenarios, Int. J. Human-Computer Studies, 2015

[9] Parson T. D., Rizzo A. A.; Affective outcomes of virtual reality exposure therapy for anxiety and specific phobias, Journal of Behavior Therapy and Experimental Psychiatry 39, 2008

[10] Wrzesien M., Botella C., Bretón-López J., Río-González E., Burkhardt J. M., Alcañiz M., Pérez-Ara M. A; Treating small animal phobias using a projective augmented reality system: A single-case study, Computers in Human Behavior 49, 2015

[11] Garcia-Palacios A., Hoffman H., Carlin A., Furness T. A., Botella C.; Virtual reality in the treatment of spider phobia: a controlled study, Behaviour Research and Therapy 40, 2012

[12] Hoffman G. H., Chambers G. T., Meyer III W.J., Arceneaux L. L., Russell W. J., Seibel E. J., Richards T. L., Sharar S. R., Patterson D. R.;Virtual Reality as an Adjunctive Non-pharmacologic Analgesic for Acute Burn Pain During Medical Procedures, The Society of Behavioral Medicine, 2011

[13] Koltko-Rivera M. E.; The Potential Societal Impact of Virtual Reality

[14] https://ejmudrak.wordpress.com/tag/vr/