

COMP210 - Research Journal

1507729

November 11, 2017

1 Putting Man above Motion

Virtual reality (VR) isn't a new idea, with some even claiming it's been around since the 1950s. [1] There have been many attempts at getting VR into the public however each time the technology to support VR hasn't been able to keep up. While developments happen in VR technology it's popularity has grown within the gaming community however recent VR devices can cause users to feel ill for a number of reasons. [2] The term used is called cyber sickness though it's also been called simulator sickness [3] previously.

There have been many studies around how to deal with cyber sickness and even with knowledge of what effects it there is still the question of what interface users find to be the best to help dealing with the disparity between a head mounted display (HMD) some of these studies even go so far as to show rankings between various methods and how it affected users. [4, 5] Of course changing how you interact with an avatar isn't just one of the variables you can alter. It's also possible to alter the user experience by experimenting with unique non-standard avatars [6], which as users begin to embody could help to immerse them into the behaviours which could help to reduce their cyber sickness for certain actions. This is largely due to what psychology call plasticity, saying

that the human mind can adapt and change to it's circumstances. [7]

2 Realities Heuristics vs Virtual Realities Heuristics

It's also worth mentioning that the definition of virtual reality can be questioned as to the true extent of which the technology and software need to reach before they can be considered as VR. One could consider a statement made by Lanier [8] Virtual reality was originally conceived as a digitally created space that humans could access by donning sophisticated computer equipment as an acting definition for VR however this would mean that augmented reality (AR) is also VR, Rosa et al. talks about exactly where the definition for AR should be made to distinguish between the core concept of VR and that of reality making a point of mentioning if you have a digitally captured and displayed element is real or virtual. [9] Though Milgram et al. [10] show the virtuality continuum as a clear line from reality to virtual and the steps between. The need for a clear definition is obvious when it comes to creating a heuristic model and means that the model is fit for purpose rather than containing non-relevant requirements.

For some the heuristic model proposed by the Nielsen [11] is the model to use, however it's been called into question by many over the years as to how fitting the model is for a variety of industries. [12, 13, 14, 15] The question of Human Computer Interaction (HCI) techniques being out-dated, is something that has to be addressed properly [16]. Although the Nielsen model covers many of the requirements for users it was made many years ago, and although the core principles remain the same the ways in which technology interacts with people certainly couldn't have been predicted when the paper was originally written.

One issue with not having a more concrete model means that there is there enough work in the field of HCI beyond that of debating the heuristic model which should be used. Glass et al. [17] looked at papers within the fields of computer science, information systems and software engineering with only a collective 5.7% of the over 1000

papers published across all three fields were to do with HCI. With people still publishing papers on the topic of HCI and how to enhance a users experience it's possible that this field hasn't been as fully explored and with video games and virtual reality being both relatively new and rapidly advancing fields establishing a strong foothold could make a huge difference in shaping future research and development within both industries.

3 What in Reality Looks Best Virtuality

While it's easy to assume how information could be displayed in both VR and within AR it's worth noting what information should be display. Vent-Olkkonen et al [18]. performed a rudimentary study, where they simulated a mixed reality application, which shines some insight into what a user initially believes they want likely based on a precursor study they carried out [19]. This however doesn't consider if user preference changes after prolonged use Karapanos et al. [20] created a framework around the idea of measuring a user experience after the initial experience.

References

- [1] "How did virtual reality begin?" [Online]. Available: <https://www.vrs.org.uk/virtual-reality/beginning.html>
- [2] T. M. Porcino, E. Clua, D. Trevisan, C. N. Vasconcelos, and L. Valente, "Minimizing cyber sickness in head mounted display systems: design guidelines and applications," in *Serious Games and Applications for Health (SeGAH), 2017 IEEE 5th International Conference on*. IEEE, 2017, pp. 1–6.
- [3] D. W. Gower Jr and J. Fowlkes, "Simulator sickness in the uh-60 (black hawk) flight simulator," ARMY AEROMEDICAL RESEARCH LAB FORT RUCKER AL, Tech. Rep., 1989.

- [4] K. Benzeroual and R. S. Allison, “Cyber (motion) sickness in active stereoscopic 3d gaming,” in *3D Imaging (IC3D), 2013 International Conference on*. IEEE, 2013, pp. 1–7.
- [5] M. Mentzelopoulos, F. Tarpini, A. Emanuele, and A. Protopsaltis, “Hardware interfaces for vr applications: Evaluation on prototypes,” in *Computer and Information Technology; Ubiquitous Computing and Communications; Dependable, Autonomic and Secure Computing; Pervasive Intelligence and Computing (CIT/IUCC/DASC/PICOM), 2015 IEEE International Conference on*. IEEE, 2015, pp. 1578–1583.
- [6] A. S. Won, J. Bailenson, J. Lee, and J. Lanier, “Homuncular flexibility in virtual reality,” *Journal of Computer-Mediated Communication*, vol. 20, no. 3, pp. 241–259, 2015.
- [7] M. Madary and T. K. Metzinger, “Real virtuality: a code of ethical conduct. recommendations for good scientific practice and the consumers of vr-technology,” *Frontiers in Robotics and AI*, vol. 3, p. 3, 2016.
- [8] J. Lanier, “Virtual reality: The promise of the future.” *Interactive Learning International*, vol. 8, no. 4, pp. 275–79, 1992.
- [9] N. Rosa, P. J. Werkhoven, and W. Hürst, “(re-) examination of multimodal augmented reality,” in *MVAR’16: Proceedings of the 2016 workshop on Multimodal Virtual and Augmented Reality*. ACM, 2016.
- [10] P. Milgram and F. Kishino, “A taxonomy of mixed reality visual displays,” *IEICE TRANSACTIONS on Information and Systems*, vol. 77, no. 12, pp. 1321–1329, 1994.
- [11] J. Nielsen and R. Molich, “Heuristic evaluation of user interfaces,” in *Proceedings*

- of the *SIGCHI conference on Human factors in computing systems*. ACM, 1990, pp. 249–256.
- [12] D. Pinelle, N. Wong, and T. Stach, “Heuristic evaluation for games: usability principles for video game design,” in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM, 2008, pp. 1453–1462.
 - [13] D. Pinelle, N. Wong, T. Stach, and C. Gutwin, “Usability heuristics for networked multiplayer games,” in *Proceedings of the ACM 2009 international conference on Supporting group work*. ACM, 2009, pp. 169–178.
 - [14] A. Sutcliffe and B. Gault, “Heuristic evaluation of virtual reality applications,” *Interacting with computers*, vol. 16, no. 4, pp. 831–849, 2004.
 - [15] C. John, “Why’ttraditional’hci techniques fail to support desktop vr,” in *The 3D Interface for the Information Worker (Digest No. 1998/437), IEE Colloquium on. IET*, 1998, pp. 1–1.
 - [16] E. T. Hvannberg, G. Halldórsdóttir, and J. Rudinsky, “Exploitation of heuristics for virtual environments,” in *Proceedings of the 7th Nordic Conference on Human-Computer Interaction: Making Sense Through Design*. ACM, 2012, pp. 308–317.
 - [17] R. L. Glass, V. Ramesh, and I. Vessey, “An analysis of research in computing disciplines,” *Communications of the ACM*, vol. 47, no. 6, pp. 89–94, 2004.
 - [18] L. Ventä-Olkkonen, M. Posti, O. Koskenranta, and J. Häkkinä, “Investigating the balance between virtuality and reality in mobile mixed reality ui design: user perception of an augmented city,” in *Proceedings of the 8th Nordic Conference on Human-Computer Interaction: Fun, Fast, Foundational*. ACM, 2014, pp. 137–146.
 - [19] L. Ventä-Olkkonen, M. Posti, O. Koskenranta, and J. Häkkinä, “User expectations of mobile mixed reality service content,” in *Proceedings of the*

11th International Conference on Mobile and Ubiquitous Multimedia, ser. MUM '12. New York, NY, USA: ACM, 2012, pp. 52:1–52:2. [Online]. Available: <http://doi.acm.org.ezproxy.falmouth.ac.uk/10.1145/2406367.2406430>

- [20] E. Karapanos, J. Zimmerman, J. Forlizzi, and J.-B. Martens, “User experience over time: an initial framework,” in *Proceedings of the SIGCHI conference on human factors in computing systems*. ACM, 2009, pp. 729–738.