Taking Motion Controls to the Next Level: Interactions in the Metaverse

Mitchell McEwan
School of Computing
Macquarie University, NSW, 2109
mitchell.mcewan@mq.edu.au

Keywords
control interfaces, natural mapping, motion controls, virtual reality, metaverse, video games

INTRODUCTION
As the Wii took hold as a gaming phenomemon late in the first decade of this century, it became clear that gaming had changed forever. Codenamed 'Project Revolution' by Nintendo, the Wii controller allowed players' real-world motions to be used in game in an accessible and 'intuitive' way (Rosmarin 2006). The other major console manufacturers quickly released their own devices to capitalise on the popularity of motion controls, *PlayStation Move* and *Xbox Kinect* (MacDonald 2014). Microsoft later announced that their next console, *Xbox One*, would launch with an always online motion sensor at the heart of its proposed living room experience (Werner 2017). There was widespread gaming community backlash and Sony responded with a pitch targeted at hardcore gamers that wanted physical media and traditional controls. In the gaming generation that followed, motion controls were seemingly all but abandoned by the major manufacturers and this era of gaming was classified as 'dead'. Or at least that is what you might assume based on the rhetoric of the media and online gaming communities (Totilo 2013; MacDonald 2014; Tranch et al. 2013).

Motion controls did not die; rather designers and developers got better at integrating them into games in a way that better suited core mechanics and minimised player fatigue. The tracking sensors at the core of Nintendo and Sony's motion gaming systems remained in their primary controllers for subsequent generations, utilised in more subtle and holistic ways, and later became the basis of interaction technologies for the companies' Virtual Reality (VR) systems (i.e. PlayStation VR and Nintendo Labo VR). Similar technologies also supported the development of a growing VR market on PC, with the release of systems from HTC and Oculus (now Meta), amongst others. Motion controls thus evolved in a way that maximised the design of control interfaces and schemes not only for standard games but for the coming heralded future of gaming – Virtual Reality.

While this narrative unfolded in the games industry, I conducted doctoral research focused on different types of naturally mapped control interfaces (NMCIs) for video games and their influence on player experience and intuitive interaction (McEwan 2017; McEwan et al. 2020; 2014). Some of the key findings were that more natural (motion) controls generally provided a more positive player experience, and were generally also more accessible and intuitive for casual gamers, compared to less naturally mapped or traditional controls. I proposed a framework for assessing NMCIs using three factors: realism, bandwidth and naturalness. Realism covers the physical properties of the controller (size, shape, haptics, etc.), and the extent to which it matches the object it is mapped to in the virtual environment. Bandwidth

Proceedings of DiGRA Australia 2023

covers the channels of communication between the control interface and the game, and the extent to which they can used for relevant, accurate and seamless tracking. Naturalness covers the extent to which the controls match players' mental models and enable them to interact with the game in the same way they would with the equivalent real-life activity. Assessing a control interface mapping for a particular game using the framework indicates its overall level of natural mapping, and therefore the extent to which players using it might leverage some of the corresponding usability and experiential benefits.

Natural mapping controller research has been shifting towards exploring the use of these technologies for Virtual Reality platforms (Shafer 2021; Seibert and Shafer 2018; Rogers et al. 2019; Ali and Cardona-Rivera 2020). While it is assumed that many lessons learned through studying motion controls will apply to Virtual Reality, that is not yet clear. Will realism still play as important a role with players vision obscured by a head mounted display, and does this heighten the importance of haptic feedback? Refresh rates have proven to be critical to the accessibility of VR, so is high bandwidth a requirement? Are one-to-one controls and a completely natural mapping of motion inputs assumed in this domain, or is there still a place for abstract gestures and mappings, like stick and button inputs?

More broadly, with all the varied VR headsets and controllers emerging with our impending and much hyped ascension into the 'Metaverse' (Dwivedi et al. 2022), what are the minimum requirements for an accessible and complete experience? The Metaverse is heralded not just as the future of gaming but of all online social activities (Marr 2022). If that is the case, what channels of communication do our control and user interfaces need to support meaningful and engaging social experiences? These questions form the basis of a new research programme that myself and a team of researchers at Macquarie University are embarking on. We aim to develop a new research platform for testing various combinations of control interfaces and VR environments, to extend NMCI research into VR and evaluate the accessibility and potential of interactions in the Metaverse.

BIO

Mitchell McEwan is a Lecturer in Computer Games and Deputy Director of the Games User Research Lab at Macquarie University, with research focusing on video game design and production, virtual reality, natural user interfaces, player experiences, serious games, game ethics and accessibility, and intuitive interaction. Mitchell earned a BFA in acting from Rutgers University, and an MIT in Game Design from QUT, before undertaking his PhD at QUT. Interested in emerging gaming technologies, his work aims to explore new opportunities for interactivity, improve accessibility, and develop techniques to evaluate and expand the expressive, affective and connective powers of the medium.

ACKNOWLEDGMENTS

I would like to thank my colleagues at QUT and Macquarie University for their support and involvement in the discussed programmes of research. Particularly, I'd like to thank Macquarie University for providing seed funding for future research through the MQ Research Acceleration Scheme grant 212479769 - *Control and User Interface Design Factors for the Metaverse–Supporting Meaningful Social Interaction in VR*. Macquarie University colleagues on this project include Malcolm Ryan, Patrick Nalepka, Nick Caruana, Michael Richardson, Rachel Kallen and Kim Curby.

BIBLIOGRAPHY

Ali, Monthir, and Rogelio E. Cardona-Rivera. 2020. “Comparing Gamepad and Naturally-Mapped Controller Effects on Perceived Virtual Reality Experiences.” *Proceedings - SAP 2020: ACM Symposium on Applied Perception*. https://doi.org/10.1145/3385955.3407923.

Dwivedi, Yogesh K., Laurie Hughes, Abdullah M. Baabdullah, Samuel Ribeiro-Navarrete, Mihalis Giannakis, Mutaz M. Al-Debei, Denis Dennehy, et al. 2022. “Metaverse beyond the Hype: Multidisciplinary Perspectives on Emerging Challenges, Opportunities, and Agenda for Research, Practice and Policy.” *International Journal of Information Management* 66 (July): 102542. https://doi.org/10.1016/j.ijinfomgt.2022.102542.

MacDonald, Keza. 2014. “Motion-Controlled Gaming Is Flailing.” Kotaku. 2014. http://kotaku.com/motion-controlled-video-games-are-over-1576471250.

Marr, Bernard. 2022. “The Future Of Social Media In The Metaverse.” Forbes. 2022. https://www.forbes.com/sites/bernardmarr/2022/08/24/the-future-of-social-media-in-the-metaverse/?sh=799ca9fe1023.

McEwan, Mitchell. 2017. “The Influence of Naturally Mapped Control Interfaces for Video Games on the Player Experience and Intuitive Interaction.” *PhD Thesis*. Queensland University of Technology. https://doi.org/10.5204/thesis.eprints.107983.

McEwan, Mitchell, Alethea Blackler, Daniel Johnson, and Peta Wyeth. 2014. “Natural Mapping and Intuitive Interaction in Videogames.” In *Proceedings of the First ACM SIGCHI Annual Symposium on Computer-Human Interaction in Play*, 191–200. Toronto, Ontario, Canada: ACM. https://doi.org/10.1145/2658537.2658541.

McEwan, Mitchell, Alethea Blackler, Peta Wyeth, and Daniel Johnson. 2020. “Intuitive Interaction with Motion Controls in a Tennis Video Game.” In *Proceedings of the Annual Symposium on Computer-Human Interaction in Play*, 321–33. CHI PLAY ’20. Virtual Event, Canada: Association for Computing Machinery. https://doi.org/10.1145/3410404.3414242.

Rogers, Katja, Jana Funke, Julian Frommel, Sven Stamm, and Michael Weber. 2019. “Exploring Interaction Fidelity in Virtual Reality: Object Manipulation and Whole-Body Movements.” *Conference on Human Factors in Computing Systems - Proceedings*. https://doi.org/10.1145/3290605.3300644.

Rosmarin, Rachel. 2006. “Nintendo’s New Look.” Forbes Media LLC. 2006. http://www.forbes.com/2006/02/07/xbox-ps3-revolution-cx_rr_0207nintendo.html.

Seibert, Jonmichael, and Daniel M. Shafer. 2018. “Control Mapping in Virtual Reality: Effects on Spatial Presence and Controller Naturalness.” *Virtual Reality* 22 (1). https://doi.org/10.1007/s10055-017-0316-1.

Shafer, Daniel M. 2021. “The Effects of Interaction Fidelity on Game Experience in Virtual Reality.” *Psychology of Popular Media*. https://doi.org/10.1037/ppm0000298.

Totilo, Stephen. 2013. “Motion Controls, the Most Popular and Most Broken Idea Gaming Ever Had.” Kotaku. 2013. http://kotaku.com/motion-controls-the-most-popular-and-most-broken-idea-1445766816.

Tranch et al. 2013. “So the Era of Motion Control Gaming Is Basically Dead |.” IGN Boards. 2013. https://www.ignboards.com/threads/so-the-era-of-motion-control-gaming-is-basically-dead.453112817/.

Werner, Nicholas. 2017. “Everything Microsoft Did Wrong With The Xbox One.” SVG. 2017. https://www.svg.com/101430/everything-microsoft-wrong-xbox-one/.