How User Modified Controllers Overcome Design Limitations to Create Competitive Advantage in Super Smash Bros. Melee

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INTRODUCTION
Esports elevate video game controllers beyond simple tools of play, with prominent contemporary esports tournaments placing million-dollar prize pools at stake. A major driver of innovation in sports equipment development is the pursuit of competitive advantage (Odenwald 2006). The same occurs in esports, with feature-rich 'professional' grade gaming peripherals entering the consumer market (Canning and Betrus 2017). However, as esports are highly reliant on computerised systems (Hamari and Sjöblom 2017), they are unwilling subjects of technological impermanence (Tsaknaki et al. 2016). Although most contemporary esports titles have yet to face this issue, *Super Smash Bros. Melee* (henceforth *Melee*) (HAL Laboratory 2001) is an exception. The nearly two-decade-old title offers present-day insights into issues that newer titles may encounter as they age and face platform obsolescence. Designed solely for play using the no longer produced[1] GameCube controller (GCC), user modifications instead drive controller innovation for competitive advantage in *Melee*. This research seeks to explore how *Melee* players create competitive advantages through controller modifications and the implications these modifications have for competitive play. The work featured in this abstract begins to address the first half of this objective by presenting a pattern language of design limitations relating to the GCC based on modifications performed by members of the competitive *Melee* community. A pattern language is a compilation of design patterns, each pattern describing "a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem" (Alexander et al. 1997). Although originating from architecture and urban planning, design patterns have been applied to human-computer interaction and game design fields (Bjork and Holopainen 2004; Kahn et al. 2008; Allison et al. 2018).

Contemporary esports titles offer a great degree of interoperability with a wide range of gaming peripherals and often allow commands to be remapped to different keys or buttons, allowing user customisation (Witkowski 2018); both things that *Melee* lack. Without comprehensive customisation options, mastery of the GCC has become central to the esport of *Melee.* Despite the iconic status of the GCC in competitive *Melee*, it has received a reputation of having poor ergonomics (Khan 2017) and suffering from loose manufacturing tolerances (Myers 2017). Modern third-party alternatives have been met with controversy and debate within the community, with some widely

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accepted tournament rulesets banning non-GCCs, placing much of competitive *Melee*'s integrity on the GCC (Melee It On Me 2017).

The lack of a currently produced official controller and uncertain tournament legality of third-party alternatives makes GCC modifications a remaining way for players to gain competitive advantage from their equipment. This movement shares similar tenants with maker and hacker communities, redetermining mass-produced consumer goods to do things they were never intended to do (Rosner and Bean 2009; Jordan 2017). In doing so, user modifications offer insight into the limitations that competitive *Melee* players perceive in the GCC and the solutions they implement to overcome these limitations for competitive advantage. To develop a pattern language of design limitations, examples of GCC modifications were gathered from Smashboards and the r/smashbros subreddit, two prominent community forums used in previous research regarding *Melee* communities (Jakobsson 2007; Ford 2017). Posts containing cases of controller modification were subjected to a thematic analysis from which themes characterising controller limitations and modifications were generated and categorised. Analysis is ongoing, with preliminary findings indicating 5 limitation pattern categories:

Feedback: The GCC struggles to provide feedback to the user when performing certain actions. Users rely on cues from the controller to confirm whether they have successfully performed the intended input. Example: The *Z* button provides little tactile or audible feedback when actuated. Modification: A microswitch with a distinct tactile bump and click sound when actuated is soldered in place of the *Z* button's original microswitch on the GCC's circuit board.

Consistency: Certain precise actions can be hard to perform consistently on the GCC. Consistently performing these precise actions is paramount to high-level, technical play. Example: The octagonal "gates" surrounding the analogue sticks are slightly asymmetrical on the horizontal and vertical axes, making it difficult to input specific angles needed for certain techniques. Modification: Notches are made in the gates at the angles desired by the user, helping guide the analogue sticks.

Performance: Several design elements of the GCC that are inconsequential in casual play are suboptimal at high-level play. Users "tune" their controllers, like a motoring enthusiast tunes their car for performance. Example: The *L* and *R* shoulder triggers require an undesirable amount of force to actuate, limiting rapid inputs. Modification: The triggers' springs are shortened or removed, lightening their actuation force.

Mechanical quirks: Some components in the GCC suffer from unintended mechanical quirks. Certain quirks are detrimental to competitive play. Example: Momentum produced by springs in the analogue sticks when returning to a neutral position is strong enough to make the sticks briefly travel past this point into the opposite direction, registering as an unintended input. Modification: A capacitor is soldered in line with the potentiometers that measure the analogue sticks' positions, filtering spikes in the analogue signal that would normally register as unintended inputs by the controller's microprocessor.

Ergonomics: *SBBM* professionals report strain and injuries from extended use of the GCC, with extreme cases leading to surgeries and forced retirement (Khan 2017). Ergonomic modifications are performed to help users play for longer, both in the short- and long-term. Example: Griping the GCC for extended periods of time causes strain and discomfort to the user's wrists. Modification: The GCC is attached to the top of a guitar stand with cable ties, allowing use of the controller without having to grip and physically support it.

These findings demonstrate that user modifications largely increase the GCC's capabilities to meet the specific competitive demands of *Melee*. Through modification, the controller is transformed from a generic interface device to a highly specialised piece of equipment tailored to provide competitive advantage in *Melee,* allowing players to perform feats that are difficult or unachievable on an unmodified GCC. This raises questions regarding the legitimacy of modified GCCs in competitive *Melee*. If third-party controllers are disallowed for having a set of capabilities different from that of an unmodified GCC, to what extent can the same reasoning be applied to a modified GCC? Should the controller play a role in dictating what is possible to do in an esport? Correspondingly, how would the use of a controller with a set of capabilities different to an unmodified GCC affect the way that *Melee* as an esport is played? These questions will be visited as this work continues.

ENDNOTES

1 Although the GCC ceased continuous production following the discontinuation of the GameCube console, Nintendo produced and sold new batches of GCCs to coincide with subsequent releases in the *Super Smash Bros.* series on their Wii, Wii U, and Switch consoles. Nevertheless, these post-GameCube GCCs were released intermittently and are currently not in production.

BIBLIOGRAPHY

Alexander, C. 1977. *A pattern language: towns, buildings, construction.* Oxford University Press.

Allison, F., Carter, M., Gibbs, M., & Smith, W. 2018. Design Patterns for Voice Interaction in Games. In *Proceedings of the 2018 Annual Symposium on Computer-Human Interaction in Play* (pp. 5-17). ACM.

Bjork, S., & Holopainen, J. 2004. *Patterns in game design Hingham*: Charles River Media.

Canning, S., & Betrus, A. 2017. The Culture of Deep Learning in eSports: An Insider's Perspective. *Educational Technology*, 65-69.

Ford, C. M. 2017. Virtuosos on the Screen: Playing Virtual Characters Like Instruments in Competitive Super Smash Bros. Melee. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (pp. 1935-1948). ACM.

HAL Laboratory. 2001. *Super Smash Bro. Melee*. Digital Game. Nintendo

Hamari, J., & Sjöblom, M. 2017. What is eSports and why do people watch it? *Internet research*, 27(2), 211-232.

Jakobsson, M. 2007. Playing with the Rules: Social and Cultural Aspects of Game Rules in a Console Game Club. In *Proceedings of DiGRA 2007 Conference.*

Jordan, T. 2017. A genealogy of hacking. *Convergence*, 23(5), 528-544.

Kahn, P. H., Freier, N. G., Kanda, T., Ishiguro, H., Ruckert, J. H., Severson, R. L., & Kane, S. K. 2008. Design patterns for sociality in human-robot interaction. In *Proceedings of the 3rd ACM/IEEE international conference on Human robot interaction* (pp. 97-104). ACM.

Khan, I. 2017. *Control Freak: How an injured esports athlete got back into the game*. CUNY Academic Works.

Melee It On Me. 2017. 2017 *Melee Recommended Ruleset*. Retrieved from http://www.meleeitonme.com/ruleset/

Myers, M. 2017. *Time Is Running Out For The Super Smash Bros. Scene's Favourite Game Controller.* Kotaku. Retrieved from

https://www.kotaku.com.au/2017/09/time-is-running-out-for-the-supersmash-bros-scenes-favorite-game-controller/

Odenwald, S. 2006. Test methods in the development of sports equipment. In *The engineering of sport 6* (pp. 301-306). Springer, New York, NY.

Rosner, D., & Bean, J. 2009. Learning from IKEA hacking: I'm not one to decoupage a tabletop and call it a day. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 419-422). ACM.

Tsaknaki, V., Cohn, M., Boer, L., Fernaeus, Y., & Vallgårda, A. 2016. Things fall apart: Unpacking the temporalities of impermanence for HCI. *In Proceedings of the 9th Nordic Conference on Human-Computer Interaction* (p. 141). ACM.

Witkowski, E. 2018. Sensuous proximity in research methods with expert teams, media sports, and esports practices. *MedieKultur: Journal of media and communication research*, 34(64), 21-p.