Tabletop Augmented Reality Games: Play Outside the Display

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The current generation of handheld devices have substantially greater processor speeds and graphics capabilities than the previous generation. With these gains, handheld devices have crossed an important technological threshold. It is now possible to blend the methods and practices used to create larger scale Augmented Reality (AR) experiences with those used to design handheld games. Handheld Augmented Reality (HAR) games render rich graphical content into live video of the physical world, captured from the integrated camera and displayed on the handheld device. We are particularly interested in using HAR technologies that create a tight coupling between virtual content and objects in the physical world, enabling styles of interaction and types of play that leverage the clear relationships between the physical and virtual worlds. The resulting HAR games represent a new genre of gaming with its own unique set of affordances.

However, HAR applications do not fit neatly into the theories and practices of any of the disciplines that intersect this research space. For example, notions of “presence” typically used to evaluate the effectiveness of achieving non-mediation in AR applications are confounded by the handheld form factor and the mobility it entails. Conversely, the constraint of being coupled to objects and events in the physical world renders many of the practices and assumptions behind mobile computing (computing anywhere, anytime) inappropriate. Similarly, practices found in game design, such as paper prototyping, need to be updated to account for the unique interactive affordances of this new medium.

Our paper discusses a number of examples of the use of HAR technology in designing play experiences, with a focus on self-contained board-game style “tabletop” games. We analyze data collected from surveys, design portfolios, interviews and playtests of over a dozen tabletop HAR games we have created from the perspectives of both design and use. We identify and extract common elements of these play experiences and describe how these applications approach the blending of physical and virtual realities. In addition, we critically examine other examples of HAR games created in industry and academia in an attempt to formulate a design continuum, which can be used both to locate existing games and to inform the design of new ones. Subsequently, we outline some general principles for designing and building compelling HAR experiences and suggest how these might be extended to larger more open-ended outdoor play experiences. Finally, we reflect on some of the unique challenges, both technical and conceptual, faced by designers and users of HAR experiences; suggesting ways these might be minimized, and offering prescribed approaches for doing so.

At stake in this research space are questions which commonly face HCI researchers; such as, how to design effective interactions, create intuitive interfaces, and effectively adapt technology to the completion of specific tasks. We address these questions through an examination of the unique affordances and constraints of HAR technology, highlighting the

ways that the physicality of both players and game pieces can be effectively leveraged by the mediating technology. We also address issues of interest to game designers; such as, identifying what elements of traditional game play can be effectively incorporated into HAR games, what new types of games can be created through effective application of technologies unique to HAR, and insights gained through understanding these technologies as affordances for play. For example, creating a shared physical space overlayed with a private virtual space provides the opportunity to exploit the possibility of asymmetric information not typically found in digital games. Moreover, this blend of the physical and virtual creates social interactions which are at once unique to handheld games, and have correlates to more commonly experienced social interaction. Additionally, we intend our work to contribute to the theoretical discourses surrounding conceptions of experience in the physical world through technological mediation, the politics of privacy, the control of information and representation, and other areas of social interaction.

[1] McGonigal.This might be a game: Ubiquitous play and performance at the turn of the twenty-first century. PhD thesis (2006)
[2] Fullerton et al. Game Design Workshop: Designing, prototyping, and playtesting games. (2004)
[3] Szentgyorgyi et al. Renegade gaming: practices surrounding social use of the Nintendo DS handheld gaming system. ACM SIGCHI, Human Factors in Computing Systems (2008)
[4] Xu et al. BragFish: exploring physical and social interaction in co-located handheld augmented reality games. Proceedings of the 2008 International Conference in Advances on Computer Entertainment Technology (2008) pp. 276-283
[5] Nguyen, T. H., Raveendran, K., Xu, Y., MacIntyre, B., Art of Defense: A Collaborative Handheld Augmented Reality Board Game, to appear SIGGRAH Games Papers 2009