Introduction to this Special Issue on HCI and Games

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FRAMING GAMES AND HUMAN–COMPUTER INTERACTION RESEARCH

Games have been part of human–computer interaction (HCI) research since the first CHI conference in 1982. At that gathering, Tom Malone, then at Xerox PARC, presented insights from the study of computer games to motivate a set of design principles for "enjoyable" user interfaces (Malone, 1982). Over the ensuing years, games-related HCI research has steadily grown as a subarea of CHI (e.g. Keeker, Pagulayan, Sykes, & Lazzaro, 2004; Pausch, Gold, Skelly, & Thiel, 1994), with more rapid acceleration in the last 10 years. A recent metareview (Carter, Downs, Nansen, Harrop, & Gibbs, 2014) analyzed game- and play-related content at CHI between 2003 and 2013, finding that the overall percentage of the CHI proceedings related to play and games rose from 2.5% to a peak of 9.5% in 2012. In the last few years, venues for game-related HCI work have expanded as well. From 2011 to 2013, two of this special issue's editors (Bernhaupt & Isbister, 2013) formed a Games and Entertainment Special Community devoted to game-related HCI research at CHI, leading to the permanent addition to CHI venues of a Student Game Design Competition. And in 2014, a new ACM-sponsored conference was created as a specialized peer-reviewed venue

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for the intersection of HCI and Games—CHI-Play. Game-related research is clearly a valued, integral, and growing segment of HCI research.

Despite this trajectory, there has been sporadic discussion about what role games research can and should play in shaping the larger field of HCI (Zaphiris and Ang, 2007). Here we outline some of the benefits that Games and HCI research brings to our field as a whole.

Understanding Interactive Experience and Motivation

First, there is the great and enduring appeal that games offer in providing compelling interactive experiences. Well-crafted games motivate players to persist for hours, to learn very difficult tasks with pleasure, and to form powerful communities of practice, gladly devoting a great deal of time, money, and attention. Tom Malone's (1982) CHI paper points to this aspect of studying games—asking what games can teach us about designing interactive experiences more broadly. What causes people to persist in and enjoy gameplay? Are there processes of design and evaluation that can be transferred to other software contexts? These questions turn out to be quite challenging to answer, pushing the limits of our capacity to measure interactive experience and throwing into question how we go about designing and developing truly compelling interactive experiences.

Motivating Behavior Change

Games and gamelike qualities can also solve practical problems and increase social good. This is a strong argument to take games research seriously for those who are not so engaged by entertainment applications. Not only are there challenges to creating such "serious games," but also there are many outstanding research questions arising from this approach (Marczewski, 2014). When is it a good idea to create a game to inspire behavior change? What sorts of gamelike elements will motivate a desired behavior, and why?

Exploration of New Interactive Methods and Techniques

Another clear value of games concerns how the "magic circle" of play offers a testbed for exploring new interaction techniques and experiences, enabling more rapid adoption of novel input techniques. The Kinect device and the Oculus Rift are examples—both were first deployed commercially with games as the primary use case. The widespread availability of these devices has enabled others working in HCI to expand the possibility space of interaction, for example, recent work examining the use of the Kinect in surgical applications (O'Hara et al., 2014).

Taken together, the articles in this special issue reinforce and elaborate how games-related HCI research contributes to the broader field of HCI. Game researchers study novel interaction technologies, tackle thorny design problems, and examine user

populations in ways that have applicability to other subdomains of HCI, as we hope the articles in this special issue will show.

Finally, however, we also firmly believe that not all game-related HCI research needs to prove obvious value outside the domain of games. Games are a growing category of interactive system with a huge end user population. They therefore merit study in their own right, and we also need to better understand the value and impact of games on the everyday lives of their users. How do games shape our daily experience and our long-term well-being? How do people play out their humanness in gaming situations? What are best practices in game design and evaluation, and why? A growing body of game research examines these concerns. We did not solicit this type of paper for the special issue, but we encourage the reader to seek out such papers at CHI-Play, as well as at CHI and in other general HCI venues.

ARTICLES IN THIS SPECIAL ISSUE

In our call for papers, we put forth several subthemes we were seeing in current Games and HCI research:

1. Design and evaluation of "serious" games and the relationship of these practices to best practices in HCI.
2. Novel interaction paradigms and modes of interaction arising from games (such as physical interfaces, natural user interfaces, crowd modeling of characters, augmented reality).
3. Innovation of methodologies and techniques for conducting game-related HCI research.
4. Studies of design and development practices and values from the game development community.

The final set of articles in this special issue cover these themes.

Iacovides, Cox, McAndrew, Aczel, and Scanlon take a close look at the connection between player involvement and learning. They use interviews, gameplay observations, and player diaries to develop a rich picture of how the process of learning and mastering a game modulates player involvement, generating a set of 14 theoretical claims concerning micro- and macroinvolvement; breakdowns in action, understanding, and involvement; progress; and agency, meaning, and compelling gameplay. Although they focus on entertainment contexts, the authors argue how their findings also apply to educational games. One could argue too that their theory has relevance for understanding the mastery of other complex interactive systems.

Alankus and Kelleher created a motion-based game to improve stroke survivors' rehabilitation when this is unsupervised by a clinician. In particular, their focus is on reducing the compensatory motions (improper movements that impede the full rehabilitation process) that patients tend to make when doing unsupervised exercises. The researchers introduced a technique to measure these movements and designed

a game that uses these measurements, along with appropriate incentives and disincentives, to reduce these kinds of movements. Along with promising new results, this work demonstrates the challenges in creating games for impact—the game itself must be compelling and engaging, and must address the impact goal in ways that are measurable and, ideally, broadly applicable.

Sim, Read, Gregory and Xu explore whether children can be guided through a participatory design process in designing serious games for children in other cultural contexts. The authors engaged 50 children in a UK primary school in designing mobile-based games to teach proper hand-washing technique to Ugandan children. The UK children used drawings to communicate their ideas, which were distilled into a single game by the authors and developed and taken to Uganda. They compared this game to Angry Birds, a popular mobile game, using simple survey-style evaluation tools aimed at children. Twenty-five children at a Uganda school took part in the evaluation. The authors found that both games were considered fun by the Ugandan children, with some mixed results from their survey instruments regarding which game was preferred overall. The authors conclude that participatory design can be effectively used to allow children to design serious game concepts that are implementable and that are enjoyable for children in another cultural group.

Deterding presents his "lens of intrinsic skill atoms"—a framework for understanding and engaging in what he terms "gameful design," more broadly known as gamification. Deterding reviews extant knowledge from research and industry contexts about this type of design as well as methods for achieving and evaluating results, identifying flaws that his framework addresses. He outlines a gameful design methodology that combines intrinsic skill atoms with Schell's concept of design lenses (Schell, 2008). As Deterding puts it,

> In pursuing her needs, a user's activity entails certain inherent, skill-based challenges. A gameful system supports the user's needs by both (a) directly facilitating their attainment, removing all extraneous challenges, and (b) restructuring remaining inherent challenges into nested, interlinked feedback loops of goals, actions, objects, rules, and feedback that afford motivating experiences.

Deterding argues for the benefits of his method in increasing rigor, effectiveness, and the capacity for evaluation of gameful designs. He has used this method in 19 design projects and training workshops with more than 300 participants to date.

Wadley, Carter, and Gibbs take a close look at the influence of voice on players' experience of online gaming environments with the aim of understanding best practices for incorporating voice into design of these "virtual worlds." This article summarizes over a decade of research presenting a comprehensive picture of the impact of voice across a range of game genres. To properly grasp the impact of voice on gameplay, the researchers focused on gathering data from players in their "real-world" locations, engaging players in diary keeping and interviews to get a long-term sense of how voice input affected their play. The authors also examined shifts in the use of voice in games from a radio metaphor (as if speaking to team members on a

radio) to a proximity-based metaphor (hearing only those nearby). Their findings range from the benefits of voice for coordination of teams to a sense of awkwardness about how voice reveals a player's social identity, diminishing the ability to role-play. Overall, their research paints a nuanced picture adding complexity to the naïve assumption that voice will be more fluid and effective for players, instead presenting the trade-offs involved in evoking voice as a modality.

Isbister and Mueller's work targets games that use movement sensing as input—something that all major gaming consoles now offer in addition to buttons and joysticks, and that is incorporated into many modern mobile and tablet platforms. They present 11 guidelines for designing movement-based games, distilled from their own research and design practice and validated through interviews with movement-based game design and evaluation experts. The authors extend the application of their guidelines into the broader HCI field by providing conceptual links and references accompanying each guideline. For example, one guideline is "celebrating movement articulation"—designing a game's movements and reward structures to encourage players to pay attention to the manner in which they execute a particular gesture or motion. The authors point out that this guideline has relevance to home-based gestural systems, which could attend to and adapt to the style in which movements and gestures are performed—for example, raising the volume of music higher if a gesture is performed in a more rapid and intense manner. The authors note that professional game designers rarely record this kind of practitioner knowledge, instead transmitting it orally to others on their development teams, and occasionally giving presentations at conferences. Thus this article also has value as a snapshot of expert practice in handling movement-based interaction in games, which can be applied to other movement-based contexts in HCI.

LOOKING AHEAD

An Emerging Research Agenda

There are many open issues and challenges remaining in Games and HCI research, some of which we touched on earlier. There are basic questions about the nature of games and play and the application of games and game-like qualities, as well as the impact and experience of games in everyday life. As new input, display, sensing, and networking technologies emerge, the possibility space of games and play expands, generating further research, and exciting new applications.

Linking Between Games Research, HCI, and Application Domains

There are logistical challenges as well. The breadth of work at present, and the proliferation of presentation and publication venues, can make it difficult for researchers working in the games area to keep up with one another's work. We believe it would be helpful to create an up-to-date taxonomy of game research subareas, with linkages back to related fields helping all to draw upon extant literature. For example,

game researchers aiming to measure enjoyment or flow should refer back to work in the larger field of HCI operationalizing and measuring these constructs. And Serious Games researchers might look to capitalize on HCI research methodology as well as the methods of the target domain (e.g., health, education, conservation) (Games for Change, 2014).

Synergy Between Researchers and Practitioners

There is also room for increased integration of practitioner and researcher knowledge and efforts (as is true for HCI in general). A good model for this is the yearly Game User Research workshop at CHI, which attracts a good mix of industry- and research-based attendees. At present, there are still very few active game designers and developers who attend CHI and other HCI conference venues—their presence would help to enrich and validate research approaches to games.

Although there is much work yet to do, it is clear that Game and HCI research is a vibrant area, and an enduring and valuable part of the HCI landscape. We look forward to the continued evolution of this exciting subfield.

NOTES

Acknowledgments. We thank Steve Whittaker for his tireless support and patience in putting together this special issue, through illnesses and job changes and other challenges that slowed the process.

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