Social Affordances at Play: Game Design Toward Socio-Technical Innovation

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ABSTRACT
In this paper we propose that game design strategies and theories can be useful tools for supporting the design of innovative socio-technical systems aimed at supporting social co-presence. We support this proposal with an annotated portfolio of a series of research prototype games that investigate sensor affordances and configurations to sustain and enhance social co-presence. We introduce relevant theory from game studies (the magic circle; the MDA (mechanics/dynamics/aesthetics framework)) to help ground and guide the use of game design in HCI practice. We conclude with recommendations for adopting game design as a supplementary research technique, with caveats about the limits of the approach.

Author Keywords
Game design; magic circle; MDA framework; research through design; annotated portfolio; social affordances.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
A core premise of this paper is that game design theory and practice is still a largely untapped resource for HCI researchers and practitioners in developing visions and prototypes for future technologies and services. Specifically, in the research described here, our team has made fruitful use of game design theory and practices to envision, iterate, and produce prototypes of alternate futures for playfully supporting social co-presence in shared physical environments. As part of this line of argument, we present recurring concepts about social affordances for co-presence that are embodied in these game exemplars, in the form of an annotated portfolio [5,15].

What is advantageous about drawing upon game design practice and theory? What we do *not* propose here is something along the lines of 'gamification'[31]—infusing a software-based task with game-style motivators and rewards. Instead, we propose that game designers have developed useful theory and have been engaging in design strategies that can supplement the current set of techniques and theories within HCI. Specifically, 1) game designers use strategies that are fundamentally *activity* focused rather than technology- or object-focused [30], and that allow for broader consideration of the overall socio-technical situation of play and player(s) [20]. Game designers ground the definition of what they are doing in the creation not of software, but of rule-sets and goals, as well as the shared activities and experiences that arise from those rule-sets and goals [29]. 2) We posit that game design has from its beginning been focused on so-called 3rd wave challenges [3], with end-use taking place in the home, in the arcade, and in other leisure contexts, and premised on the pleasure and engagement of end users voluntarily interacting with systems. Thus, game designers put extensive attention into the *feel* of gameplay—the moment-to-moment responsiveness of the system that creates desirable aesthetic and emotional responses in players [28].

Because of the emphasis on activity design, and on finely honed moment-to-moment feel as well as overall experience, we believe game design theory and practice can help HCI practitioners to envision and create compelling experiences with near-future technologies. In particular, we find the game design approach useful in thinking through and prototyping ubiquitous computing scenarios that involve multiple people in interactions that are dependent upon both social and spatial context. We will demonstrate this with an annotated portfolio [5,6] of three games that our lab created using a research-through-design approach [6,32,33], each of which explores social affordances for enhancing co-presence.

In this paper we discuss key game design concepts and practices, situating them within relevant discourse in the HCI community. We present an annotated portfolio of games that we created, and discuss the insights about social affordances for physical co-presence that arose from using game design methods and theory in the creation of these games. Finally, we make recommendations for how others might adopt the game design approach and address limits of the approach. It is important to note here that the primary contribution of this work is not the particular design

CHI 2018, April 21–26, 2018, Montréal, QC, Canada. Copyright is held by the owner/author(s). Publication rights licensed to ACM.
ACM ISBN 978-1-4503-5620-6/18/04...$15.00.
https://doi.org/10.1145/3173574.3173946

insights that we had, but rather, an illustration of the benefits of drawing up on game design theory and practice.

RELATED WORK AND CONCEPTUAL FRAMEWORK

HCI practitioners have long been interested in the impact of taking a playful/ludic approach to designing technologies meant to be woven into the fabric of everyday life [7]. Researchers have drawn upon practices in game design in order to formulate useful concepts and theories for non-game HCI, for example the concept of 'temporal trajectories' in shared interactive narratives [2], or the explication of designing the spectator experience that arose out of the creation of a series of public play experiences [23]. Researchers have also used games and play to explore the relationship of users to technological issues such as locational uncertainty [1]. And, there is a vibrant community of researchers devoted to games-and-play-specific HCI concerns, with a Subcommittee at CHI devoted to the topic and the founding of the ACM CHI-Play conference in 2014.

To our knowledge, however, there has not been explicit propagation of useful game-design-specific theories and strategies back into the broader HCI design community. Here we introduce two theoretic constructs, demonstrating in the remainder of the paper how they can be used in practice to generate new ideas for enhancing social co-presence.

The Magic Circle

Play scholar Huizinga originally introduced the notion that all gameplay takes place in "a play-ground marked off beforehand either materially or ideally," one term for which he offered was 'magic circle' [9]. Essentially, he points out that games are by their nature to some degree socially demarcated as separate from other non-game everyday activity. Game scholars Salen and Zimmerman took up and expanded this notion, articulating the ways in which the rules and setting of any given game can become a context from which meaning emerges [29,34]. Their general argument is that a game sets a frame from which alternate meaning and relations can arise among players than might otherwise occur. Their point is that games by their nature provide a 'magic circle' of context and support for activities that organize social engagement and interaction.

We propose that this conceptual understanding of games plants the seeds for a novel way to think about the crafting of prototypes and sketches of interactions with technologies. What if we shift the notion of what we are trying to do from creating a prototype to creating a magic circle within which novel and engaging interaction takes place? Thinking like a game designer in this way centers design around activity support rather than artifact creation [30]. And, it presumes that we will be constructing not just the technologies, but also, the performed rules and norms around the use of these technologies that deliver shared social value. As prototypers we then must think from the beginning about the emergent social context and experience that will occur, and consider this part of the designed material. This approach also puts the burden on us to think through the mechanisms for bringing people into the shared experience successfully. We redraw the bounds of the prototyping process in a way that can encourage better thinking from the beginning about the social situatedness of the technology use, as well about how the experience will unfold over time.

It's important to note the relationship of this approach to the notions of user enactments [21], embodied sketching [27], and other non-game efforts in the HCI community to systematically involve users in the design of collocated embodied experiences. In the case of applying the magic circle, our assertion is that demarcating what is happening as collective play, and designing what will happen for people in the ways that game designers do, can provide additional value and complement these other approaches.

Mechanics Dynamics Aesthetics (MDA)

As was mentioned in the introduction, game designers conceive of games as constructed of moment-to-moment lived experience. A player is in some sense always re-deciding whether to continue to participate in a play experience, by gauging how it feels to play 'right now'. The player may be driven by gameplay goals, but the meta-goal of play is pleasure in the experience itself, as it arises in each moment. Thus game designers must focus their attention in a primary and fundamental way upon the immediate felt experience of gameplay. This is in contrast to many non-game HCI application areas, where end goals are vitally important and primary, though felt experience is of course also important.

To aid in the delivery of moment-to-moment engagement, game designers have built theories and practices aimed at centering the design and development process upon moment-to-moment felt experience of play. One well-regarded example is the Mechanics Dynamics Aesthetics (MDA) framework [10]. This framework emerged from the authors' multiple years of teaching a workshop at the primary game design conference (GDC). Hunicke et al. decompose games into rules, systems, and 'fun.' They establish design counterparts to these elements as mechanics, dynamics, and aesthetics. From the player point of view, they argue that the primary value is aesthetics—how it feels to play. They eschew 'fun' as an overly simplified aesthetic goal and explore various emotional/aesthetic subgoals. An example relevant to the focus of this paper is the aesthetic goal of 'fellowship:' thinking of a game as a 'social framework.'

The authors explain that game designers must build up sets of mechanics ("actions, behaviors and control mechanisms afforded to the player within a game context" p. 3, [10]) that lead to emergent system dynamics, that are more likely to evoke a given aesthetic response in players. They see game design as a heavily iterative process of creating mechanics, arranging them and trying them out to generate

and tune dynamics; testing out these systems upon players to gauge aesthetic response. Swink has elaborated upon this tuning process, exploring how small changes in mechanics can lead to very different dynamics and 'game feel' for players [28]. In both of these works, there is an emphasis on how player response arises in, and must continue to be nurtured in, moment-to-moment action and feedback.

Combining these theoretic constructs from game studies has been powerful for our research group in exploring potential futures for enhancing social co-presence with technology.

ANNOTATED PORTFOLIO

As Bowers and Gaver put it, "An annotated portfolio… is a means for explicating design thinking that retains an intimate indexical connection with artifacts themselves while addressing broader concerns in the research community" [p. 44, [5]]. Here we present an annotated portfolio of three movement-based games designed to enhance social co-presence.

In each case, the design of the game was guided by the desire to create an alternate set of social relations between players. This was done through a combination of technology and rulesets/mechanics for engagement, both with the technology and with one another. We strove to perturb social relations within the magic circle of play.

Each game's design was shaped by aesthetic goals that were referenced all along the way, to guide decisions made about both technological configurations and game mechanics. We expected to engage in frequent iteration, and tuning these games did require such iterations. Each of the three games went through months of playtesting and tuning, culminating in public exhibition of the work. For more complete description of the iteration and testing of these games please see our prior publications [11,13,25].

In the end, these games can be seen as a body of work that can be collected into an annotated portfolio because they share several designed qualities. These designed qualities, which were scaffolded by the use of game design theory and practices, worked well to support collocated interaction within the play context, and we believe they may also hold some promise as useful constructs for technology aimed at enhancing social co-presence outside the realm of games. We present them as evidence that using game design theory can add value to HCI design practice. We will first introduce the shared qualities, and then elucidate how each game demonstrates these qualities. We note here that these designed qualities have also been deeply informed by extant HCI work both within and outside game-specific research. We include reference to related papers when describing each quality.

Shared Qualities

1. *Shaping of proxemics* [8,16,18]. Each of the three games makes use of sensors to shape the flow of interpersonal distance (proxemics) in pro-social ways, and guides mutual attention through strategic use of feedback to players.

2. *Affording individualized performances and social flexibility* [4,17,22]. Each game has flexibility inherent in both the sensing strategy and game rules to allow for a range of individual improvisations in bodily performance. This flexibility enables a broader spectrum of social encounters that can build from these individual performances, leading to unexpected performances and shared meta-games; ultimately providing rich opportunities for self expression.

3. *Amplifying feedback strategically* [22–24,26]. All three games are designed with spectators as well as players in mind. Feedback on the game state is provided to spectators in order to enhance the pleasure of witnessing the game, as well as to provide information about how to play and incentives for playing, which encourages the flow of new players into the game.

Yamove!

The first piece in our annotated portfolio is a multi-player dance battle game that uses mobile devices as primary input. Two pairs of players strap a mobile device (iPhone or iPod) to their wrist (see Figure 1). The pairs take turns in short rounds performing improvised dance moves to music that is curated by a live DJ/MC. The goal of the game is for each pair of players to come up with movements they can perform as perfectly synchronized with one another as possible. The game scores each round based on synchrony (determined by comparing accelerometer signal from each person's device), on keeping the pace of movement rapid, and on varying moves within a round (e.g. not doing the same thing over and over). The winning pair is determined based on which team gets the highest score in 2 out of 3 short rounds.

Figure 1. In *Yamove*, two pairs of players perform improvised moves in synchrony, in a three-round dance battle.

Players get feedback about how well they are dancing from the live MC, who calls out tips for the team to improve their performance—'stay in synch! Pick up the pace! Change it up!' This allows the players to keep their eyes on each other's changing moves so they can improvise fluidly while moving together. There is also a large shared screen that displays the status of the team's performance in real-time,

which is primarily aimed at spectators during gameplay. At the end of each round, the large screen gives both players and spectators a read-out on how things are going, and it shows the final winners and final tallies at the match's end.

The magic circle premise of this game is that players are b-boys/b-girls, improvising moves in a dance battle. The players' goals are not just to stay in synch, keep the pace up, and mix up moves, but also to look cool doing so for the crowd, and to act out rivalry with the other team, for example by striking skeptical poses while the others dance. The guiding aesthetic goals for the game were for players to enjoy dancing, feel in synch and connected to their dance partners, and feel (and ideally look) cool while performing.

In order to accomplish these aims, we made many strategic design decisions, and engaged in a long iterative process, outlined in a prior publication [13]. We consider the final design here through the lens of this portfolio's shared qualities/annotations:

1. *Shaping of proxemics*. In contrast to other commercial dance games such as *Dance Central* or *Just Dance* for the Kinect, which require all players to stand at a fixed distance from the game sensors and collectively face a large screen to perform dance moves, with *Yamove* we focused players' attention upon one another, and arranged players to encourage real-time social interaction. Players can look at each other the entire time to tune their mutual performance, because they are getting auditory cues from the MC during active rounds, about how they are doing. When we stage *Yamove*, we create a dance floor and indicate clearly where pairs should stand. Each dance pair stands close together, facing one another, and these two pairs are faced toward one another for the duration of the match, in front of the large shared screen (but not facing it). The DJ/MC is set up alongside the screen, and spectators are arrayed around and behind the player teams. Thus we've created a physical situation in which teammates feel close because they are near each other and facing each other, and pairs feel a sense of competition by being arranged across from each other and separated, while spectators get a satisfying sense of spectacle by viewing the entire thing from around the action, with a large screen to amplify game feedback.

2. *Affording individualized performances and social flexibility*. In console-based dance games, the usual strategy is to have players mimic pre-created dance moves as precisely as possible, which washes out individual variance in style. Because *Yamove* uses accelerometers to sense player movement and grades performance based on synchrony, players can freely improvise movements that suit them in that moment. In practice, this allows for a very wide range of dance moves, which can be attuned to players' skill level. It also allows dancers of different ability levels and styles to compete with one another, in essence leveling the playing field. Finally, because people choose moves together, they can select moves that they perform well. This makes the spectator experience of the game more pleasurable than console dance games where people are struggling to master hard moves. Instead of watching someone clumsily imitate a move that is tough for them, the crowd sees people do moves they look great doing, with their own personal style and flair.

3. *Amplifying feedback strategically*. *Yamove* gives players just-in-time auditory feedback from the MC to help shape their mutual improvisation without distraction. The MC can adjust their tone based on what is happening nonverbally between players—they can strike an encouraging tone if the team is flailing, or a teasing tone if the team is confident and could juice it up a bit. This works well functionally for players, and also provides entertainment value for spectators. Meanwhile, the large screen in front of the players acts as a real-time score board, helping spectators understand how moves are being judged and heightening the sense of competition and suspense.

Yamove was a Finalist at the IndieCade Festival, and has been staged at multiple public events. We are pleased with the game's capacity to support joyful and flexible close coordination between a wide range of players, and to create a high energy and pleasurable spectacle. The game draws new players in readily, creating an ongoing flow of participation.

Pixel Motion

The second piece in our annotated portfolio is a multi-player game that uses a surveillance camera and motion flow detection software as game input (see Figure 2).

Figure 2. *Pixel Motion* game progression. First: the heads-up display counting down to a round. Second: in-round gameplay, players move through the play space to clear pixels from the screen to reveal the live camera feed. Third: when a round is won, props appear on-screen for players to pose among while a snapshot is captured. Fourth: an example of the postcard snapshot image. Fifth: the leaderboard.

Pixel Motion was developed in collaboration with Alcatel/Lucent Bell Labs, who were interested in exploring use of surveillance cameras as a public utility. Our research team proposed creating a game that used their motion flow software as a game mechanic to get unacquainted people to play together, reshaping social dynamics in a public setting. We targeted *Pixel Motion* at a local science and technology museum. Based on our own observations and those of the museum's staff, we discovered that typically small groups would take turn with the exhibitions, rather than trying things out together. The magic circle premise of this game was the notion of 'the more the merrier'—encouraging freeform, pile-on interaction between groups at the museum. The guiding aesthetic goals for the game were to create lightweight and joyful social encounters among visitor-players.

The core game mechanic of *Pixel Motion* is moving one's body around in the field of view of the surveillance camera to 'wipe off' pixels from the screen, uncovering the video image feed from the camera. If enough pixels are wiped off during the timed round, then the assembled crowd 'wins' the game. Winning allows the group to pose with digital props on-screen, to create a digital postcard. This postcard is added to a Flickr stream from the museum, and the postcard can also be tweeted to others from a kiosk next to the game. Highest score rounds (most pixels wiped in the timed round) get their postcard added to a leaderboard that shows on-screen between rounds of the game.

There is more detailed information about the design context and outcomes of *Pixel Motion* in another publication [25]. Here we consider the final design here through the lens of this portfolio's shared qualities/annotations:

1. *Shaping of proxemics*. Many of the museum's other exhibitions had control schemes that only allowed a few people to impact what was happening with the experience. Some had physical controllers; others relied on motion-sensing that aimed at a tight coupling between one or two individuals and the sensing technology. These input strategies created proxemics arrangements whereby a few people would actively operate the device(s), and the rest would peer over their shoulders to observe. Or, in the case of camera-based motion sensors like the Kinect, non-interacting people would watch while trying their best to stay out of the sensing envelope, so as not to confuse the equipment. In contrast, *Pixel Motion's* sensing strategy and game mechanics encouraged everyone within the camera's field of view to get involved. There was no such thing as being a nuisance—more people moving meant a quicker win. In practice, this meant that we observed museum visitor groups freely intermingling spatially [25].

2. *Affording individualized performances and social flexibility*. Pixel Motion was tuned so that a few visitors could run around vigorously to wipe off enough pixels within the timeframe, or a large group of people could quickly wipe off enough pixels with less movement. We observed children and adults engaging in a variety of moments—running in circles, waving their arms, doing anything they liked as they moved through the space. The system did not require specialized gestures that would homogenize this kind of personal expression during gameplay. Some players would wait out a round and then run in to 'photobomb' the moment at which the postcard image was snapped, engaging in a playful meta-game around the game itself. All of these activities were acceptable forms of engaging the game, allowing for a range of social performances and experiences.

3. *Amplifying feedback strategically*. *Pixel Motion* gave feedback to players through a very large projection of the gamespace on the wall in the public hallway. Passersby were drawn into playing the game by catching glimpses of their own video image as pixels were wiped off the gamescreen when they walked past, and all players (and spectators) could readily see the impact of their own actions on the game display. We used appealing audio feedback to trumpet when wins occurred, and to create a sense of urgency around the count-down to the next round, to pull participants in.

Pixel Motion was on display for several months at the museum, and generated a steady stream of active participation. We believe the game's core mechanic illustrates the notion that adopting alternate sensing strategies can lead to different sorts augmentation of collocated experience, for example encouraging lightweight and joyful comingling of unacquainted groups.

Hotaru

The third piece in our annotated portfolio is a wearables-based collaborative game called *Hotaru*. To play this game, two players put on custom-created wearable devices that are interdependent in function. Player one wears a backpack, and player two a gauntlet. Both players also have sensor-enabled gloves (sees Figure 3 and 4).

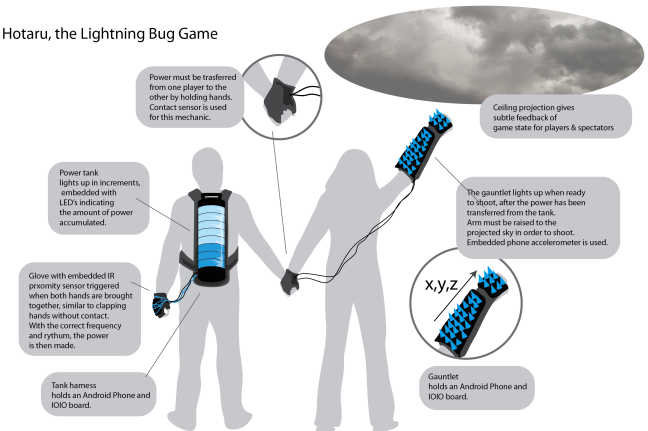

Figure 3. Gameplay overview for *Hotaru*.

The magic circle premise of the game is that the two players are the last lightning bugs on earth, and must fight together to ward off an evil smog. The aesthetic aim of the

game is to create a sense of camaraderie and connection between players, and to give them a feeling of transformation into a magical and powerful team.

Player one uses a two-handed gathering gesture to 'collect' energy. This causes their backpack to illuminate. Player two must watch the backpack to see when it is full, then let player one know so they can join hands to 'transfer' the energy. Then, player two's gauntlet slowly illuminates, while making a charging sound. When all of its lights are on, player two can raise their arm in the air to 'release' the energy and send light to fight off the evil smog. This causes a dramatic laser pulsing noise to happen, indicating to both players that they have successfully released the energy out into the atmosphere.

Figure 4. Players trying out Hotaru.

The game's design process and player outcomes are described in other publications [11,12]. Here we consider the final design through the lens of this portfolio's shared qualities/annotations:

1. *Shaping of proxemics*. *Hotaru* requires players to be in close proximity—in fact they must actually touch, holding hands, to successfully engage the game's core mechanic. In addition, players must keep close attention upon one another. Player one is dependent upon player two to let them know when the backpack has been filled, so they can move on to the next step. All of this means that playing the game brings people into close connection and coordination with one another. This is quite different than most controller-based commercial games, which typically provide each player with a separate and identical controller, and which do not demand physical contact or close coordination among devices. In addition, all feedback on the status of the game was contained within the wearables, allowing players to keep their attention upon one another rather than on a screen.

2. *Affording individualized performances and social flexibility*. While *Hotaru* players do need to engage in particular gestures (energy gathering for player one, handholding for both, and light shooting for player two), there is significant latitude in the manner in which these gestures are performed. We observed players varying tempo and amplitude of these gestures, putting their own 'spin' on the performance of heroic lightning bugs. Players who knew each other well might stand closer together and easily hold hands, whereas strangers who played together might keep more interpersonal distance and hold hands tentatively. The game allows for nuanced negotiation of social relationship as well as providing for a range of personal expression in playing the game roles.

3. *Amplifying feedback strategically*. *Hotaru's* wearables have brightly illuminated elements that look quite dramatic in a darkened room. The game has been installed in public night game festivals, where spectators are drawn to the illuminated bodies and the dramatic sounds that occur as the players release energy into the dark. The illumination on the wearables heightens the spectacle of the performative gestures. This puts the spectators' focus on the players' bodies during gameplay. It also provides an intuitive tutorial for people considering playing the game, who can jump in when ready, knowing what to expect.

SOCIAL MECHANICS AND DYNAMICS DISCUSSION

Through the creation of these games, we began to see some general patterns that worked at a mechanics/dynamics level from the MDA framework perspective, to create interesting and valuable augmentation of collocated experience of play.

1. *Using proxemics as design material for heightening co-experience*. As others have pointed out [8,14,16,19], proxemics theory provides a valuable lens through which to understand the design of ubiquitous computing systems. We found ourselves returning again and again to conscious shaping of the relationships between and among players spatially, to impact their aesthetic experience with one another. Creating concrete spatial mechanics (such as holding hands, or moving around freely within a boundary) and then tuning the ensuing dynamics among bodies, was a powerful way to shape the collocated play experience.

2. *Letting go of the notion of tight coupling with a system and building in room for improvisation.* All of the games we designed benefited from a looser hand in coupling players' actions to game responses, to allow for personal and collaborative improvisation and performance. With *Yamove* in particular, we saw the great benefit of allowing for a range of bodies and combinations of bodies to perform joyfully and appealingly when given latitude in what is sensed and how it impacts outcomes.

3. *Designing for the engagement and enlightenment of spectators.* Collocated social gameplay can be seen as taking place not just between active players, but also in the context of the pleasure and potential future participation of spectators [22–24,26]. We found that it was crucial to make gameplay both legible and pleasurable to watch, to keep new players flowing into the game.

4. *Allowing for bricolage and difference among devices.* In designing and iterating our games, we found ourselves pushing against boundaries of existing devices to put together optimal combinations of sensing and feedback that

traversed device boundaries, or that required custom devices. For example, with *Yamove*, we adapted mobiles into wearable devices, using them for their movement sensing and communication capability, but taking players' attention away from their tiny screens and onto one another. We were able to do this by adding a live MC into the mix. We introduced a large shared screen into this game, but for the purpose of amplifying the experience for spectators, and making a win or loss seem more dramatic to players. *Hotaru* was a radical reimagining of game controllers from identical self-contained units, into interdependent and complementary custom wearables that evoke a fantasy backstory. Players reported that the combination of these custom controllers with the gestural performance took them deeper into the roles they were meant to be playing in the game's framing story [12].

Throughout the development of this body of design work, putting a continued emphasis on moment-to-moment shared experience of players helped us to move away from some hidden assumptions embedded in technologies for collocated play (and work) that we feel may be barriers to designing effective augmentation of co-presence. These assumptions include:

- More screens are better. Everybody needs one (or more!) and should bring them to the group interaction.
- Each person should have an identical device to use in a shared interaction.
- Shared attention on a screen is good.
- Sensors should try to tightly couple with one user at a time in ongoing interaction.
- Designers should create tightly pre-formulated interactions for people to learn and perform with the system.

MERITS OF ADOPTING GAME DESIGN THEORY AND PRACTICE

We realized through the iterative design process of creating these games that the magic circle of gameplay was not just helping us to think outside the box in terms of creating novel technological approaches. It was also a liberating force that enabled players to readily try out and try on our technological and social experiments. Knowing it was 'only a game' freed people to act like lightning bugs and hold hands, run madly about in front of a surveillance camera, or dream up and perform dance moves together. Players were willing to try out the activities we provided them, testing out new configurations of technology and socio-spatial arrangements without shyness or reluctance. We believe this has given us useful insights into how to augment social co-presence, which could have merit outside the realm of games, which we couldn't have come to without the enthusiastic participation of players.

We see the game design theory and practice we have brought forward in this paper as useful and synergistic with the research-through-design approach to developing systems outside of games. The magic circle construct foregrounds what other HCI researchers have characterized as activity design [30], putting the designer's attention upon the technology, the figures of the users involved, *and* the social frame. In this way, the designer stays focused on innovating the entire socio-technical system rather than getting focused on the technology as such.

Designers are usually already committed to engaging in an extended tuning process through which they learn what works and what doesn't, as they explore any given design space. We feel the MDA framework offers a valuable thought tool for examining the impact of technology and interaction choices upon end experience as this tuning takes place. The notion of particular dynamics arising out of mechanics keeps the designer's focus on tuning emergent aesthetics through the shaping of these materials. Dynamics are a more fluid construct than something like 'goals.' The notion of dynamics better expresses ongoing moment-to-moment experience, acknowledging that this is fleeting and co-arises between the system and the player/user. The MDA framework helps the designer not just to hold aesthetic goals in the mind, but also to give a name to the materials from which the end experience arises, adjusting and tuning these materials. We would argue that most HCI design theory focuses more heavily on mechanics, which we might also conceive of as affordances, rather than on the second-order concept of dynamics. We see dynamics as an especially valuable construct in the context of designing systems aimed at enhancing social experience, because it better supports thinking well about the complex interplay of actions among people and technologies.

To give an example from recent HCI research on social co-presence, Krogh et al. introduce "sensitizing concepts for socio-spatial literacy in HCI" [14]. These include proxemic malleability, proxemics threshold, and proxemics gravity. The authors have observed social relations as they are mitigated by spatial configurations, and have introduced these terms to express tendencies they have observed. If one were to conceive of these tendencies as a combination of mechanics and dynamics, which could be used to tune end aesthetics for office workers in a mutual shared experience, then one could conceive of interventions that are fundamentally activity-based and systemic, with a focus on felt experience. This would help ground technological ideation and intervention at a fine-grained design level throughout the process of innovation, and ensure that the end result worked for users in a robust way on a moment-to-moment basis to create the target felt experience.

SUGGESTIONS FOR APPLYING GAME DESIGN THEORY AND PRACTICE

Here we offer two practical suggestions for others interested in incorporating game design tactics into their design process. First, we recommend embracing game designers' frame of designing activities that comprise

systems and people, toward creating particular aesthetic experiences. This includes considerations of mechanics and of dynamics that arise as a result of mechanics, and commits the designer to doing enough iteration to tune these dynamics well.

Second, we recommend committing to the production of fully forged activity prototypes that can sustain vigorous engagement from users, and allow them to inhabit and provide resistance to the designs. This is why our research team develops work that can be taken to festivals, museums, and other active and self-contained social contexts outside the lab. We learn a tremendous amount from the labors that take us all the way to this polished, robust engagement with the public.

As a caveat, the game design theories and techniques discussed in this paper are more likely to be useful when the frame of the end experience is meant to be coherent and shared among people. The magic circle and MDA cannot be as useful in supporting a design process for applications or services with diverse and disparate constituencies using them in different ways across multiple asynchronous sessions. There are other theoretical frames from game design that could speak to these types of situations, but they are outside the bounds of the present work.

CONCLUSIONS AND NEXT STEPS

In this paper, we claim that game design theory and techniques can be of value in tackling the design challenge of developing technologies to support and enhance co-presence. We introduced a concept ('the magic circle') and a framework (MDA) from game studies, and used an annotated portfolio of our design work to illustrate some insights we gleaned from developing collocated social games while making use of these ideas. We concluded with some general patterns that were extrapolated from this body of work, which of course drew upon extant HCI research and theory as well. We do not mean to propose that game design theory and techniques could or should supplant what is already known, but instead, propose that they can be useful additions to a designer's toolkit.

We are currently taking what we've learned from this cycle of research-through-design into the creation of non-game technology to support collocated social engagement. We are constructing technical prototypes nested in activities that draw upon the design insights as well as the general patterns for creating viable support for robust and pleasurable moment-to-moment felt experience. We have come to realize many non-game encounters are 'magic circles' in their own right—spaces in which people engage in collective action that sustains experiences which may be instrumental, but which also are weighed and valued for their moment-by-moment texture. We are especially interested in developing co-presence support technologies to enhance mutual attention and connection, and see the work described in this paper as useful for breaking away from embedded technology biases to move toward achieving these aims. We hope our results and recommendations will be useful to others investigating ways that interactive technology can enhance the fabric of everyday co-present social life and activity, whether for work or for play.

ACKNOWLEDGMENTS

We are grateful to Yahoo Research, the Rockefeller Cultural Innovation Fund through Eyebeam gallery, and Alcatel/Lucent Bell Labs for support of the research projects described in this article. Thanks also to the many students, artists, and designers who worked on the games and research described in this article.

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