

Designing Unconventional Use of Conventional Displays in Games: Some Assembly Required

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ABSTRACT

Game design is experiencing a renewed interest in co-located games and the social play it facilitates. Specifically, public settings such as game exhibitions and parties are the host of games with unique experiences supported in part by custom and unconventional hardware design. These installations of custom hardware can create barriers for distribution and facilitation. However, it is possible to create both similar and novel and installation-like experiences with ephemeral DIY-installations. We investigate two games that create such novel experiences. These games explore ephemeral installation design through the unconventional use of displays, but using only conventional and commercially available hardware. Our investigation reveals six themes, providing an understanding of how to utilize this design space related to the social, spatial, and tangible aspects of these game designs, such as creating movement and aggregated spectatorship. We present unconventional use of videogame hardware in public settings as an underexplored design space.

Keywords

Game design, co-located play, social play, socio-spatial, embodied interaction, magic circle

INTRODUCTION

Games for shared or public spaces benefit in being designed for the space and context in which they are played in. Game designers and games curators are pushing out how we think about using that space and context, highlighting how games can be played in new ways, in new spaces, and with new hardware. Game jams, exhibitions, and curatorial collectives such as Hovergarden¹, The Wild Rumpus², and Babycastleles³ are providing new socio-spatial contexts for designers to explore. These contexts expose public spaces to unusually large amounts of co-located players interested in videogames or novel interactive experiences. The magic circle provides a considered view on the social contexts in which games are played and designed for, and ubiquitous and pervasive games have tested these theoretical boundaries of the magic circle. However, such discussions have evolved almost to suggest a that a game is either pervasive or that its design has ignored its socio-spatial context. Similarly, games are often framed as rigid systems (videogames) or co-designed by players (e.g. folk games). Within the boundaries of either of these extremes we take a more particular look at two social arcade-like videogames that each in ways investigate how videogame design need not be as presuming of limitations with conventional hardware

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as it once needed, and that the new possibilities exposed by this consideration may be passed not only onto the game designer, but onto the player, curator, or party-goer. In this paper, we investigate designing videogames as makeshift installations, focusing on their interaction with space and social context. We investigate two games that are unconventionally played and co-designed, but make use of conventional hardware and interfaces. Specifically, we take, *Turnover* and *Where's My Spaceship*, under investigation and we identify ways in which conventional consumer games hardware can be used in unconventional ways, highlighting underexplored design space for playing games in shared social spaces.

Both *Turnover* and *Where's My Spaceship* use conventional hardware: game controllers, computers, monitors and projectors. Although there is nothing unconventional about the hardware used for these games, their uses of space create unconventional player experiences. With some setting-up required to play, both of these games empower players to act on part of the game's design. Although inexplicitly, *Turnover* encouraged players to get involved in part of the greater design process through its design for an unconventional hardware configuration—a display mounted horizontally. Players designed custom cabinets and projector arrangements to set up the game. Furthermore, *Where's My Spaceship* encourages re-designed arrangements of the hardware which affects the spatial dynamics of the game. Players can seek to create new challenges by rotating, moving, or changing displays, even to a monitor in another room.

In this paper we take the perspective of game designers, drawing on our findings through the design and evaluation of these two games, neither of which were initially intended as research projects. We situate these games as an in-between of installations and software-only distributed game titles. These games share similarities with arcade cabinet games, party games and other installations, but are still distributable, requiring only conventional commercial hardware. Theoretically we investigate these games drawing principally on embodied interaction and designing game dynamics, but we focus our investigation on these being a *type of game* rather than a specific theoretical topic. We identify how these dynamics integrate with the space in which they're played further brings player to physical movement through limited information and information asymmetry. Furthermore, making apt use of their public settings, these information problems afford an informal participation in play by the spectators.

In the next section, we discuss some related games, also as *types of game*. In the section following that we introduce the games in this study, explaining how they are played and the settings in which they are played. We subsequently provide context for our process of ideation, initial prototyping and design and the research we have followed up with. This leads on to the findings of our investigation, highlighting themes of movement in space affecting videogame dynamics, ambiguity, clustering players and spectators, DIY in installation and asymmetry through multiple displays and perspectives. In our discussion we put these findings into the context of game design, making a case for this game design space as categorized by the socially frenetic play experienced both in players and spectators. This design space contributes designing co-located play and presenting an inspiration for game designers exploring unconventional play with conventional technology in shared and public spaces.

RELATED WORK

The focus on designing with space overlaps with discussions on ubiquitous and pervasive games, installation games, and physical games, however, we situate our work within

emerging local multiplayer videogames, specifically indie games for public settings, such as party games and arcade-experience games, and game design pushing unconventional hardware within conventional game design. Within this context, we are addressing the concerns of game design and consequently focus on how these many theoretical aspects integrate into cohesive played artefacts, decidedly not taking a specific theoretical focus.

The topic of multi-screen asymmetry is evident in multiplayer games at large that provide players with their own viewport of the game world (e.g. split screen, multiscreen, networked multiplayer). As an inspirational design resource, screen asymmetry has seen a revival of interest, perhaps most explicitly with Nintendo's *Wii U*. The *Wii U* provides a platform for game designers to exploit the possibilities of two displays: a standard television/monitor, and a tablet controlled independently. Specifically, we look to games producing asymmetry without a designated platform for it, such as *Spaceteam* (Sleeping Beast Games 2012) which uses the ad-hoc networking between multiple mobile devices to create a co-located experience benefiting from asymmetry which has been previously studied (Goddard et al. 2015). More recently, we can see *Keep Talking and Nobody Explodes* (Steel Crate Games 2015) taking advantage of the multiple screen in virtual reality setups using the Oculus Rift to create asymmetry not just of information, but the type of display technology it is conveyed through. Similarly, other games have been making use of a mixture of different devices to create a "game master/player" or "server/client" asymmetry in a local multiplayer setting such as *Fibbage* and *Jackbox Party Pack* (Jackbox Games 2014). Common in the design of this multi-screen co-located games is that a player each "owns" an independent display or viewport. Both evidencing and challenging this, the game *Screencheat* (Samurai Punk 2014), highlights how players each get their own viewport of information, distinct from other players, where the asymmetry resolution is sanctioned with cheating. With respect to this, our design investigation has deviated in suggesting multiple displays can be used and create asymmetry in local multiplayer games for broader dynamics, but without giving each player a designated viewport.

Conversely to multi-viewport games, we also observe games moving away from screens. Through the use of DIY hardware such as Arduinos, and other unconventional (or unconventionally used) interfaces in co-located party games that have taken focus away from the screen and put it back onto co-players and bodily interactions in space. This includes games such as *JS Joust* (Die Gute Fabrik 2013) and *i-identity* (Garner et al. 2014) which have made use of the PS Move controller as both motion sensors and the display itself, simplifying output and removing a monitor or television from the equation. Similarly, *Slam of the Arcade Age* (One Life Remains 2015) uses a custom controller which is not held by a single player, but navigated between several players who may bump into each other and need to create a greater physical awareness of their co-players. New interfaces provide a means for designers to create novel interactions or play and contextualize that in space through the physicality of their interfaces. Such games take the focus off of the screen, allowing players to be more aware of their spatial context. However, such hardware can present a barrier for distribution and play. We investigate how games may use conventional displays and interfaces, while maintaining an engagement on spatial contexts by using displays in unconventional ways.

GAMES UNDER INVESTIGATION

Turnover

Turnover (Quigley et al. 2013) is an award winning game with an arcade-like experience. Four players compete for possession of a ball in a seemingly conventional retro platformer.

Players start by rushing to claim the ball in the middle, which is followed by trying to steal the ball from other players. When a player holds onto the ball, their timer counts down, bringing them closer to victory while they attempt to avoid all of their opponents.

Beyond this seemingly conventional style, an interesting property is created through the game's self-described 'multigravity' (Quigley 2014). In *Turnover*, each player has their own gravity vector, each pulling players against one of the four sides of a screen (played commonly with either a standard project or computer monitor). *Turnover* is a game of multiple perspectives in one undivided screen; each player is arranged perpendicular around the screen with their own unique sense of what's up and down. Despite sharing the same game world on the same game screen, each player controls their avatar against their own gravity. A more challenging optional mode is also included in the game. In this 'rotation mode' the camera for the screen rotates periodically clockwise and counter-clockwise, introducing a challenge for players and spectators following a particular perspective.

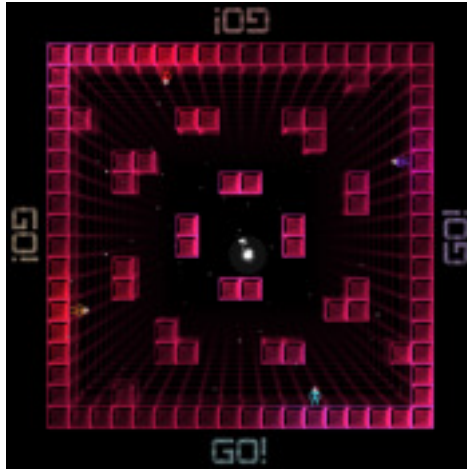


Figure 1: A starting scenario in *Turnover*. Four perspectives, one for each of the players.

Where's My Spaceship

Where's My Spaceship (WMS) (Dawson et al. 2015) is a multi-display game designed as part of the 9th Annual Brisbane IGDA 48 Hour Game Making Challenge. WMS was designed as a makeshift four screen installation using the game jam and physical context to facilitate spectator-play and play crossing the boundary between physical and digital. The motivation behind the design was to take advantage of the event: open spaces, large audiences of game makers, players, and others, and to explore physical game design with an explicit de-emphasis on the digital, despite its room for inclusion.



Figure 2: A *Where's My Spaceship* setup. Four screens facing perpendicular around a square and with space to circumnavigate.

Where's My Spaceship is a four screen competitive multiplayer game installation. Players pilot a spaceship using a wireless controller with the goal to mine and pirate asteroids and return them to their base. Each screen faces outward and perpendicular to its neighbors and represents a different quadrant of space. These quadrants are connected only through wormholes. Players navigate to the other quadrants by travelling through wormholes. When players take a wormhole, they are randomly teleported to another quadrant and as these quadrants are screens spaced apart they need to physically move around to locate the ship. Players use a grappling hook to grab onto the asteroids which are generated on three of the four screens. Players can choose to stay at the base, located on the fourth screen, in order to pirate the asteroids of those attempting to return with asteroids. Whichever player manages to drop the asteroid in their color coded section of the base scores the points.

DESIGN & EVALUATION

The games investigated in this paper are the results ongoing iterative design. Both of these games were initially conceptualized and prototyped during “indie game jams” (Goddard et al. 2014). Specifically, *Turnover* started through collaboration (Beckwith et al. 2013) during the Melbourne Global Game Jam in 2013 and was followed by an iterative design approach (Zimmerman 2003). *Where's My Spaceship* (WMS) started through collaboration (Dawson et al. 2015) during the Brisbane IGDA's 48 Hour Game Making Challenge in 2015. WMS was followed up within a research-through-design approach (Zimmerman et al. 2010), focusing on the social and contextual elements in design. Together these investigations work towards an annotated portfolio of creative works (Gaver 2012). As both of these games were made during game jams, they emerged under the influence of their public game-making settings with shared spaces. It was the intent of each of the groups of game designers to take advantage of the space in this setting and to challenge themselves into unconventional design space, however, it was not initially the intent of the game designers for these games to evolve into research or design research projects. Subsequent to the game jams, these games have each independently been refined, tackling hardware and design issues, and getting the games suitably playable for exhibition. During this ongoing development, the opportunities for these games to contribute to the scholarly game design community were identified.

We have studied the games in innumerable playtests and public settings. Our analysis of these games has been sensitized by the Mechanics-Dynamics-Aesthetics (MDA) framework (Hunicke et al 2004) and theory on embodied interaction (Dourish 2004). While Salen and Zimmerman's designerly interpretation of the magic circle (2004) is useful in considering play as within a context, we have opted to investigate these games with the systemic perspective of game design through MDA, but marrying this with a perspective of embodied interaction as a more fruitful means for generating our designerly understanding. The MDA framework has been criticized for its systems focused perspective on game design. Consequently, this framework may not sufficiently take into account socio-spatial context and other aspects of play. This is significant considering that the games under investigation evoke play that is not part of the digital system. For the purpose of studying these games, we have taken liberty with interpretation of mechanics in the MDA framework to address this concern. In particular, we have opted to include actions taken by players directed toward the game, but not necessarily the interface, and actions that have been evoked because of the game as part of the 'mechanics' order of abstraction in MDA. From this perspective we broaden the analysis to consider embodied interaction in play as part of the 'mechanics' perspective of game design, and consequently their effect on second order interactions, or dynamics.

Although MDA framework provides a means to codify game design, it is our interest in this design paper to make a generative contribution, and to avoid taking a reductionist perspective or turn the games into scientific experiments. Consequently, the findings in this paper while anchored in this investigation are presented in a discursive fashion, useful particularly for influencing game design. Theory broadly informing our practice and investigation includes Salen and Zimmerman's Rules of Play (2004), however as noted this design research came "practice first". For *Turnover* play(testing) has included private get-togethers, exhibitions, formal curated parties, and similar events. Our studies have focused on these games in public and open settings, where typically each game will occupy a space of 20 meters squared. This larger space is implicitly used in three layers: the setup or DIY installation, the space for the players, and then space for spectatorship and informal spectator-players. While we have also prototyped and developed the games in smaller settings, we have not evaluated the games within this space. It has been our intention to make these games accessible and easy to set up by anyone. They require only conventional digital game hardware, which in our studies has included common grade laptop or desktop computers, 24" monitors or projectors, XBOX 360 and DualShock 4 game controllers, and speakers. However, despite this, the games have not, as of yet, been published or otherwise made publicly accessible. Consequently, our evaluation does not include playtests without our direct involvement or facilitation.

THEMES

In this section we present themes identified through the previously discussed process of design and playtest evaluation of the games. The themes connect to the core design aspects of the games: public settings, use of displays, inclusion of spectatorship. Though in each of the dynamics that emerged in the games, we highlight a specific lens on understanding how these games are played, taking different perspectives on gameplay, space, body, spectatorship, and set up.

Use of Space by Screens and Moving Bodies

These games design to use the space they are played in. The arrangement of hardware, and the space for movement of players directly affect both the experience and the dynamics of the game. One way the experience is affected is through social dynamics. For example, the

inward looking arrangement in *Turnover* creates a juxtaposition of players with their opponents; they are no longer side to side in sharing the same screen, as conventional to other shared screen multiplayer games. This can create an undertone of tension and conflict, while providing players the opportunity for antagonistic interactions and horseplay. Similarly, in *Where's My Spaceship*, the arrangement of displays creates physical pathways. In the “square” setup illustrated in Figure 2, a quasi-circle emerges when players bi-directionally circumnavigate the game setup on desks. The shortest path from one screen to another is tightly around the desks. The players want to follow this optimal path creates opportunities for players to bump into one another, chase each other, and find other playful uses of their physical closeness. In both cases, players are anchored around screens, and tightly drawn inwards and in varying arrangements, such as across from one another, side-by-side, or perpendicular.

The means in which players can, or can not move around is implicated in the digital dynamics of the game, even though there is no interface to be aware of a player's body or presence. If a player must physically move to access a different screen, they might choose to avoid moving altogether as an alternative strategy. In WMS this creates a new strategy of piracy; players wait for others to bring the resources to the main screen with the intention to try to steal the resource for themselves. However, such strategies are balanced out, not all players can be pirates—someone must bring the resources through the wormhole. A similar dynamic is exposed in *Turnover*. In the rotation mode, players can choose to stand still as the screen rotates around. However, this may expose them to unintuitive physics. What these players see as “up and down” will no longer match their perspective, potentially causing disorientation or increasing the difficulty in interfacing with your avatar. This has even caused on many occasions a motion sickness. The flexibility within these dynamics further exposes new possibilities, both within intended design, and with serendipitous co-design amongst players. What if a setup involved moving a monitor to a different room, in between revolving doors, a control room for spectators, or beamed a projection onto the wall? Even the size of a screen or the length of its cord can create interesting scenarios, such as one player being able to physically block out the display from others.

Clustering and Layering Players

The playtests and exhibitions the games included spectators. Both of the games are designed for four players, but the social experience emerges when a dozen or two players and spectators form around the games. In order to achieve this the games were broadly visible and required larger spaces affording spectators and moving players. Depending on the relationships between players and their personalities, different social behaviors would emerge. Closer friends are more likely to want compete against each other and win the games, while unfamiliar players focus on enjoying themselves and learning how the play the game.

As we noted how the screens anchored players and brought them inward toward the setup, this affected the ways players and spectators interacted with each other and not just toward the game. In WMS, one of the screens contained games elements and information unique to it. It functioned as the scoreboard, the drop off point for scoring, and because of its function as a drop off point, it doubled as the main screen in which piracy and activity in general occurred. The basic perpendicular-sided square setup exposed a full 360 degrees of visibility for playing and spectatorship, which was actively used by both spectators and players, but the game naturally drew players to aggregate around the scoring screen. For more casual spectatorship this provided a richer view into what was going on in the world for those less interested in the subtler plays on the other screens. This aggregation of players

further created opportunities for horseplay or moments of intimacy, perhaps by bumping into other players on purpose and playfully shoving down their controllers. Furthermore, this coming and going of players would constantly allow players to re-evaluate who their threats were and who they might form micro-alliances with, potentially ‘limelighting’ players (Avedon 1971) by drawing attention to both their avatars or themselves. Where player’s avatars came together on one screen, so did the players themselves.



Figure 3: Spectators taking an active role in *Where’s My Spaceship*, pointing out activity and location to other players.

Similarly, in *Turnover* another spectator aggregation would occur. Spectators could only share the same perspective of one player at a time. This would usually mean spectators would opt to follow the one player currently holding the scoring ball, effectively lime-lighting the scoring player. Alternatively, spectator would follow an acquaintance. Spectators would move around the screen in order to share the perspective of other players or to get a better understand of how a level is played out from the different perspectives.

Related to the aggregation, in *Where’s My Spaceship*, we also observed people informally discretize into layers. Each of these layers corresponded the physical proximity with the screens of the game. The inner layer, the layer closest to the game, contained the players, who were the most inclined to be frantically moving around. Around this emerged a layer of spectator-players, or active spectators. These informal players were not players of the digital game, but played within the larger social setting of the game. These spectator-players were inclined to move around, checking out each of the screens. With what information these players would learn, they could share it the core players. For example, as seen in Figure 3, a spectator-player is trying to help a core player find which screen their spaceship arrived at after entering a wormhole. Otherwise the spectators might inform the players about the score screen, who is winning and who they need team up to work against. In any case, these spectators would give the players misinformation, or lie to them playfully, depending on their social relationship with the player. Finally, in the outer-most layer we would see spectators who were more casually involved and less ready to take action about the game. They would not be as inclined to move around or share information. The strong divide of information and player control created with the four screens created

asymmetry that provided spectators a socially meaningful way to play and get involved in affecting the digital system.

Ambiguity in One and Many Screens

In *Turnover*, multiple perspectives on one screen give multiple meanings to the same objects. The multiple meanings are in the game mechanics; the affordances of the physical world changes against the same mechanics of movement with differing perspectives. Each perspective against the screen changes the direction of gravity, which in turn changes the game-physics affordances of a block. For one player it might mean the ceiling, for another the floor. A floating block might mean the possibility of moving laterally, or advancing vertically. This opens a way of thinking about level design and its equitability. Levels will require symmetry along two axes to be identical across perspectives.

WMS provided a wormhole on each screen that teleported players between one of the four screens. The wormholes used in *WMS* used a random number generator in this teleportation, so players would not be able to anticipate or predict their destination (except for the designed bias for returning players to the score screen). Without seeing or knowing the screen, they weren't able to intelligently control their spaceship. Consequently, players would run around to identify their spaceship, and get control over the game again. Coupled with a single audio play device, mixing the audio sources from all of the game's screen, players could listen and know what was going on, but not exactly where and by who, creating ambiguity, but limiting its sense of randomness. Within this randomness, there were only so many possibilities: the screen to your left, to your right, and across from you, allowing players to not feel too cheated or frustrated out of a sense of pure randomness. Furthermore, any of the non-scoring screens didn't intrinsically have an advantage or disadvantage, which screen you arrived only had serendipitous value in what asteroids or other players might happen to be there in that moment you arrive.

Asymmetry and Multiple Displays and Perspectives

In *Turnover*, we identified how each player's world has their own affordances based on their gravity vector. This creates a perspective, defining the way in which they see their game world. However, players are able to empathize with the other players' perspectives, necessary to manage risk and anticipate conflict. In double-axes symmetrical levels, it is easier to understand the relative patterns from one player to another, but still challenging. Initially the strategy is simply keep moving away from players, though that can mean moving into open paths. As players develop mastery they can better understand each of navigable space of their three opponents. In the rotation mode, players further navigate the broken perspective relative to their avatar as the rotating camera moves your up-down perspective to another side of the screen. Here players can either choose to move around to align their position with the camera perspective or take on the visual processing load of understanding an upside down world for their own avatar.

In *Where's My Spaceship*, each of the four screens used are positioned with a different perspective. The basic arrangement for each screen to face out at 90 degrees to each other, each forming a side of a square when viewed from the bird's eye. Any number of alternative arrangements creating spatial asymmetry, and further taking the environment into account as possible. Each of these screens contains its own "universe" connected by wormholes. Information on score is contained in only one screen, and each of the screens have no shared knowledge between one-another, though players can bring asteroids and other players through the wormholes. The restricted information is reminiscent of real time strategy (RTS) games both in the ways information can be shared, and that spectators have access

to more of it. Similar to navigating the mini-map, in *WMS*, the player can “peek” at any location of the game by simply moving around to a different screen, and without moving their spaceship. The asymmetrical information opens up the possibilities for spectator-players. Spectators, who are unbound by following a specific spaceship, are free to look onto any of the screens. Any information of the game is accessible to anyone, but players are anchored on their own spaceships and are consequently unable to regularly peruse other space quadrants. Spectators, on the other hand, are able to follow the meta-game by hopping between screens, bringing them a broad overview of how the whole game is being played. They might not follow the exact play-by-play of each spaceship, but they are better able to follow the winners and losers.

Screen Agnosticism or Shared Displays

These games exhibit a screen agnosticism. The screens don’t belong to any of the players and none of the cameras are manipulated by characters, neither directly or by following an avatar. In *WMS* at any time, a screen could contain any or many spaceships, or not. These screens belong to the space in which they are played within and are shared by the players and spectators. Anyone can rightfully stand in front of any of the screens, including spectators and enemies. Some players playfully or competitively block other players from accessing a screen. Along with sharing the space, this sometimes creates a grid-lock in *Turnover* where it might be ideal for players to orbit the game, tracking the rotating camera, but are forced to stop if one player blocks their path. With attention shared on the same screen and in shared space, players become more aware of each other within that space, and sometimes develop strategies of using their bodies in that space to strategic advantage out of playfulness.

DIY / Democratization

These games embody a theme of DIY and democratized game design. In *Turnover* this is seen in its throwback to digital arcades. Although it has been repeatedly played with simple projectors aiming on the ground or screens placed on tables or the ground, it has enticed the makers in the game playing communities within which it has been played. The game’s uniqueness in required hardware configuration has drawn people to want to create their own cabinets for the game. For example, Figure 4 shows a custom cabinet made for exhibition during IndieCade 2014. Each of these embodies a uniqueness and ephemerality matching the events and communities they have been part of. As part of this players more consciously the greater context in which the game is played and how casual of a setup it will be played as.

Similarly, *Where’s My Spaceship* exposed a flexibility to game players to nuance the spatial and hardware setup of the game. As we’ve highlighted how this arrangement affects the dynamics of the game, it can be seen as a kind of modding or level design. There are no designated or required specific hardware, like a standardized game platform. All of the hardware required is conventional consumer gear. Whatever is available to run the game can be used, even if only out of necessity, with the possibility of leading to new arrangements. Details such as the size and type of screens and other hardware brought in for a setup all affect the experience or dynamics of the game in some form encouraging unconventional arrangements.

Challenges of Unconventional Setups

Although these games focus on reducing hardware barriers to playing unconventional games, they also have introduced their own challenges. The requirement for unusually large amounts of space, for comparatively arcade-like games, and autonomy over that space has

proved the biggest barrier to setting up and playing these games. As we operate in an inner-city university, space is scarce and space that might be available is usually saturated with desks or other equipment. Moving that equipment around, if possible, and then setting up installations only temporary is burdensome to play. “Starting the game” has a tangible form, much more than plugging in a controller and this creates friction.



Figure 4: At exhibition at Wild Rumpus #5, *Turnover* in a custom splintercade⁴. Photo by Robin Baumgarten, used with permission.

The policies over space can also be inhibitive, where justifying a game and overcoming health and safety concerns of frenetic movement can also prove difficult, or justifying playing a game as part of our work. Unfortunately, it’s only getting more difficult to play these kinds of setups in increasingly urban spaces, but this does not preclude their design and play and the value in that. These games are marked by barriers of space, but not distribution of hardware and software. In their uniqueness they re-introduce the challenges that software distribution and standardization have overcome.

DISCUSSION

Social Play and Gameplay in Tangible Circles

What we see from a theoretical perspective on our work is a tacit re-visitation of the concept of play, or more importantly its distinction from gameplay, and its diffused nature. The gradient of layers between ‘game-players’, ‘player-spectators’, and ‘passive spectators’ is a reinforcement in ways of the magic circle (Stenros 2014), at least for our perspective on looking at game design. In a public setting, these games are not so readily dichotomized between players and non-players, but instead better resemble “many layers of an onion” (Montola et al. 2009). But what of the ‘player-spectators’? Are these players tacit, unofficially recognized players of the game, (informal game-players), or are they engaging in free-play, playing a social game of their own construction anchored around a game little more than child’s games to a playground? We can see this as a gradient of play between Caillois’ continuum of ludus and paidia (1961). Players, perhaps those more familiar with one another, accustom themselves to winning and drive their play toward the ludus end of continuum. Conversely, players casually involved with each other and the game tend

toward more playful socialization. However, the limited depth to the games, their social settings in which they are played, and perhaps most importantly markedly sporadic facilitation of these games has framed these games against a more hardcore arcade or sporting mastery, and framed the games as part of social play.

These games also evidence *paidia*, or free play, within the physical activity that we have highlighted. The movement of these games was the emergent result of a rule or a digital mechanic directly affecting the game. It is clear that these games evoked social and physical interactions, but within the algorithmic constraints common to videogames in general. Looking through the lens of the MDA framework, these games evoke played usage of their context through second order design. The dynamics of these videogames in tandem with their physical contextualization evoked physical and social interactions ultimately affecting the game states, but they do not achieve this directly. This contrasts the digital pervasive games and exergames which directly use context sensor data, such as locative or motion data, as part of their game mechanics to evoke a tangible and context sensitized play. *Turnover* and *Where's My Spaceship* expose alternative strategies to introduce movement, social play, and context sensitive play by placing the onus of context awareness to players, and not technology. Without the need for designed mechanics or explicit instructions, players of both of these games would move around frenetically for the intrinsic joy of it. It was not perceived as instrumental to the game, such as “having to” exert oneself for an end outcome, but as playful action, or play, evoked as part of the larger process of playing the game. We see as game design that is not seeking complete systems of full control. This contrasts perspective on game design focusing on interfacing, measuring and controlling everything, including the body, such as exergames. In this way, there is a parallel in with ‘broken games’ (Wilson 2011) in the way these games do not measure and control all interactive elements in the game, but in a more limited way; *Where's My Spaceship* does measure, control and act as the unyielding authority in the digital system, but where its game dynamics intersect with space and play outside of the digital, it is equally unconcerned about authority as a broken game.

DIY Screen Installation as an Anchor for Frenetic Play

Turnover with its throwback to arcade setups with twist of maker spirit and *Where's My Spaceship* with its multi-screen DIY-installation setups highlight the values of fixed screens in creating their own experiences. The shift away from screens in games like *JS Joust* and *i-dentity* have proven their own ways of creating social experiences unconventionally using PS Move controllers as both the input and the only source of output in place of screens. However, the separation of screen and controller, combined with the player-agnosticism of screens, in these games has shown ways of anchoring both players and spectators around focused points of interest. The arrangement of screens in these cases is not simply functional, but playful, and can be manipulated by players for their own amusement, exposing a degree of autonomy over the games more akin to toys.

Akin to *JS Joust* and *i-dentity*, the mobile game *Spaceteam* also captures a social experience of togetherness and camaraderie in co-located settings. *Spaceteam* similarly makes ample use of information asymmetry over multiple screen as our games, however despite this, it produces a markedly different experience. In an exemplary session, play in *Spaceteam* is filled with energy and players shouting at each other. However, unlike *JS Joust* and our games, *Spaceteam* doesn't bring players to move. The combination of both displays and their fixation (as an ephemeral installation) creates an anchor for not only play, but energetic movement. This movement is constrained by the limitations of the game setup, such as the placement of hardware and the shape of the room, but also implicitly

constrained by the gravity of the game, as it draws players inward and motivates them to take the shortest path of circumnavigation. These constraints contrast the free movement in *JS Joust* and *i-dentity*, but provide a means to aggregate players into inner rings of intimacy. The shared critical paths and pacing of the game facilitates a frenetic play, a type of play marked by energetic and excitable movements in a tacitly confined intimate space where players are juxtaposed, bumped, and jostled among one another.

Although designing for mobility may overcome the challenges of DIY installations we mentioned, such design inherently lacks the fixation that can create the type of frenetic play seen in *Turnover* and *Where's My Spaceship*. Though anchoring players to screens isn't inherently interesting, the unconventional use of those screens can open up new design space. Conventional games can give meaning to their setup, or their anchoring, in terms of it affecting how the games are played, ultimately empowering a type of tangible level design to the players or those setting up these types of games.

CONCLUSION

In this paper we introduced the design space of unconventional use of displays in conventional games, established through the examination of two games: *Turnover* and *Where's My Spaceship* (WMS). These games are marked by their shifting design focus from player interaction, into space, while maintaining player focus on the screen and using otherwise conventional local multiple, arcade like, game mechanics and experiences.

We identified 6 themes salient in playtest evaluation. The games make novel uses of ambiguity, marked by the multiple affordances of levels based on multiple gravity vectors in *Turnover* and mixed multi-screen audio channels in WMS. We observed a frenetic play marked by physical movement and interaction facilitated without the use of exertion interfaces measuring bodily interactions, but through the design of dynamics enveloping space. These games include a lack of ownership in the display output: players don't have authority over a quadrant, viewport, or side of the screen, or a particular screen, but share the screen(s) with others within shared space. We identify a dynamic information asymmetry created over multiple displays in shared space that facilitates informal play from spectators in providing (mis)information. Furthermore, we identify how the information on these displays can be used to limelight players and cluster spectatorship, where they too must move around. Finally, we identify a space of "DIY" or level design extended to players of these digital games that is beyond the digital game or its level editors. Players are able to create their own set ups, installations, or "spatial levels". However, although there is a democratization in the way these games can be played and an intent to avoid inhibitive hardware requirements, we also discuss some of the challenges of working with these games, namely the difficulties of working on games requiring substantial space, players, and spectators for the intended experience.

We leave on a note encouraging game designers to empower players to get involved in game design by designing their use of space, specifically looking toward how hardware is set up in space, and the dynamics of play in space that subsequently emerges. Videogame designers can explore socio-spatial sensitized play without the use of custom or context sensing hardware. Finally, we suggest that presenting games as, "some assembly [is] required"—reframes videogames, for their players, as more than software packages to be distributed in app stores, but as media part of an interactive system of their own co-design.

ENDNOTES

- ¹ Hovergarden. <http://hovergarden.org>
- ² The Wild Rumpus. <http://thewildrumpus.co.uk/games>
- ³ Babycastles. <http://www.babycastles.com>
- ⁴ Splintercade. <http://www.copenhagengamecollective.org/2013/06/27/excessive-stimulation-go-nuts-at-wild-rumpus/>

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