Waggling[1] the Form Baton[2]: Analyzing Body-Movement-Based Design Patterns in Nintendo Wii Games, Toward Innovation of New Possibilities for Social and Emotional Experience

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1.1 Abstract

This chapter describes research conducted to analyze and better understand what is compelling about particular body-movement-based design patterns in Nintendo Wii games, towards innovating new possibilities for social and emotional experience with movement-based games and other interactive experiences. The authors analyzed games from diverse genres, to generate a bottom-up set of dimensions and characteristics of the mechanics, that can help build a foundation for heightening social and emotional engagement and enjoyment through design of novel mechanics, and/or through combining and extending successful existing mechanics. Key findings include the prevalence of kinesthetic mimicry, the value of whole body versus piecemeal movement, tensions between precision and loose movement in design, and the value of using Laban's dimensions of Effort as a lens through which to understand which sorts of movement patterns are more engaging.

1.2 Introduction

The Wii gaming platform, released in December 2006, has been lauded in the gaming community and in the popular press for introducing physical play to a broader gaming audience [7]. Attention has been devoted to the health benefits of the additional movement, and the value of the platform to nontraditional audiences such as senior citizens, but there has not been systematic and detailed analysis of the kinds of design choices that are being made in crafting game gestures themselves.

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[1] Waggling is a derogatory term for swinging the Wiimote back and forth as a game mechanic.

[2] Wario Ware Smooth Moves christened the Wiimote the 'form baton' in their humorous instructions to players about how to hold it in various positions (see http://www.youtube.com/watch?v=ab4dse9AMPM).

Recently, researchers in the CHI community have begun to conduct studies demonstrating that physical games increase engagement [1] and social interaction [9]. These studies point to general effects based on presence or absence of body movement in gaming, but do not dissect at a finer-grained level of detail what sorts of motions create what sorts of effects and why.

Our research approach is to use an understanding of social psychological and communication findings about sociality and emotion as a lens for better understanding how specific design choices can impact players [5]. In the present project, we are working to create a taxonomy of the sorts of body movements and gestures employed in popular and well-regarded Wii games, toward building a more detailed understanding of what seems to be effective and why. In particular, we are interested in which sorts of movement mechanics create social and emotional engagement and enjoyment for players.

Game designers have known for many years that engaging the whole body in thoughtfully crafting game mechanics can lead to powerful social connections and positive emotional experiences [3; 12] In recent years, game studies scholars [2] have begun to articulate a framework for understanding how game mechanics can promote certain beliefs and worldviews. It is our belief that game designers can consciously craft whole-body interactions that encourage social and emotional engagement and connection, and we are interested in uncovering any existing patterns along these lines toward advancing them in our laboratory with our own game mechanic explorations.

1.3 Research Strategy

We examined games that were best sellers and/or well reviewed by the gaming press. We also asked Wii developers to recommend games with interesting movement mechanics that we should examine. The games we analyzed were: Wario Ware Smooth Moves, Mario Party 8, Boogie Superstar, Wii Cheer, Boom Blox, Star Wars: The Force Unleashed, Wii Sports, Super Mario Galaxy, and Super Monkey Ball: Banana Blitz. The games represent a mix of genres—rhythm games (Wii Cheer, Boogie Superstar), party games (Wario Ware Smooth Moves, Mario Party 8, Wii Sports, Super Monkey Ball), and action/adventure games (Star Wars: The Force Unleashed, Super Mario Galaxy).

For each game, we used a combination of user manuals, web-based walk-throughs and press explanations (e.g. Figure 1.1.b.), and play of our own, to create a list of the movement-based mechanics in the game. Then we made notes during play-through, about each movement mechanic. We described the mechanic itself, how the particular mechanic fit into the overall game feel, goals, back story, and any underlying rhetoric that could be discerned (using Bogost's notions of procedural rhetoric [2]). For example, here is a brief initial description of a specific movement-based mechanic. In Star Wars: The Force Unleashed, you can fling an object or a person to the ground, using a hurling motion with the nunchuk part of the Wii controller (typically held in the left hand, see Figure 1.1.a). This motion feels forceful and aggressive, and represents one of the fantasy powers that Jedi Knights have in the Star Wars universe—to use 'the force' to act on the physical world. Using the nunchuk for this mechanic allows the player to focus the Wiimote main controller (held in the other hand at the same time) movements on the operation of his/her light saber, a primary combat weapon in the Star Wars universe. Interestingly, in the films themselves, hurling people to the ground is a mind-powered activity, requiring no physical movement at all. But in the game, using a forceful movement of the nunchuk seems to amplify and make more satisfying the exercise of this particular power.

The goal was to generate a bottom-up set of dimensions and characteristics of the mechanics, that can help us build a foundation for exploring heightening social and emotional

engagement and enjoyment through designing our own mechanics, or combining and extending those we've observed.

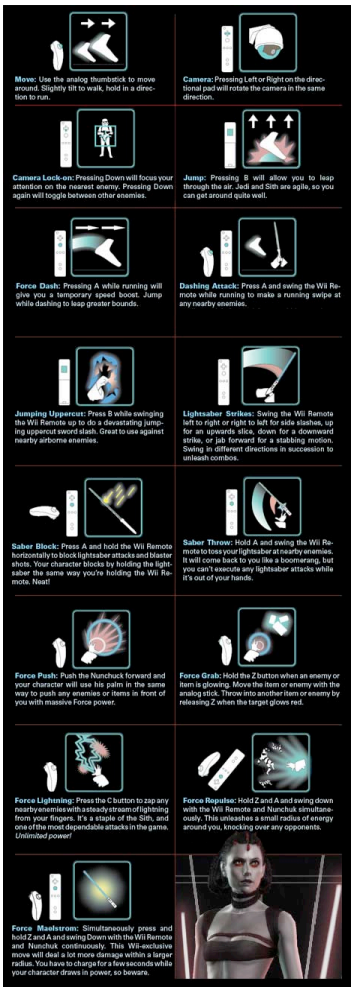

Figure 1.1 The Wii controller (a.) consists of the 'nunchuk' (on the left) and the 'wiimote' (on the right). (b.) GamePro online included this player control taxonomy in an article about Star Wars: The Force Unleashed (see http://www.gamepro.com/article/previews/173628/star-wars-the-force-unleashed-page-3-of-5/).

We also decided, after making our first pass at notations about the individual movement mechanics, that it would be valuable to perform a more systematic analysis of the movement qualities in each mechanic. We knew about previous work in movement analysis to better understand digital interactions, which made use of Laban's Movement Analysis system [10; 14], and we were particularly interested in the three dimensions of Effort, as they seemed to have potential for characterizing a wide range of movement-based mechanics. In the Laban system, a movement can be characterized in its Effort qualities as direct or

indirect, strong or light, and bound or free. We went back and played through the games and made note of where each movement mechanic seemed to fall along these three dimensions.

1.4 Analysis

The goal of this research was to uncover systematic qualities of movement mechanics that may contribute to fun game play, in particular social and emotional engagement during play. What follows are patterns we found, through bottom-up analysis of the observations that we made and collected (via published reviews) about the game mechanics in the games we examined.

1.4.1 Kinesthetic Mimicry

All of the movement mechanics were patterned (to some degree) after real-world physical movements and activities that players already knew how to perform. Here are some examples:

- Holding the Wiimote sideways and pretending to use it as a steering wheel (Wario Ware)
- Pretending to box by punching while holding the Wiimote in the hand (Wii Sports)
- Pulling a block out of a pile by slowly moving the Wiimote backward (Boom Blox)
- Copying dance movements while holding the Wiimote in the hand (Wii Cheer, Boogie Superstar, Wario Ware)

Some movements were more fanciful than others—for example, in Wario Ware Smooth Moves one mini-game required the player to hold the Wiimote in front of her nose as if it were an elephant's trunk, while pretending to be an elephant. In contrast, the movements in Wii Sports and in Boom Blox were based more literally upon existing real-world movements (playing sports, playing a Jenga-like puzzle game).

Some game mechanics mimic real-world activities in which a tool is held in the hand (e.g. bowling, tennis, fighting with a sword/light saber) and some mimic movements that would normally not require an object held in the hand (e.g. dancing, boxing). The form factor of the Wiimote is condusive to imagining some sorts of real-world objects (tennis racket, light saber, long block from Jenga, vacuum cleaner) and not others (e.g. a ball that is to be thrown or rolled, a hula hoop around one's waist). In our play-throughs, the lack of direct physical correspondence did not seem to heavily affect how fun the mechanic was. That is to say, it was still fun to pretend to keep a hula hoop going by holding the Wiimote at one's waist, even though it felt nothing like a real hula hoop.

It makes sense that designers would craft movement mechanics that leverage familiarity with real-world movements, making it easier to quickly train players, and helping them understand the consequences of their actions in the game world. However, we observed a tension between this approach and the typical console-style control structure for games that was in place pre-motion controller, which seemed to have direct effects upon how engaging the experience was.

Console game controllers, which have not changed much since the home consoles of the 1980s (see Figure 1.2), combine a set of buttons and joysticks/d-pads in a single object that is held between both hands during game play. The player can rapidly access all of the buttons on the controller while gripping it. This produces a play stance in which the player is relatively still, eyes focused on the screen, hands together in front of her gripping the controller, fingers rapidly manipulating buttons and joysticks. The player who is accom-

plished can rely on touch and need not look at the controller. Rapidly pressing buttons is not much like performing real-world physical movements, and so game mechanics evolved which transposed physical challenges into button pressing challenges. Perhaps the best example would be fighting games (e.g. Mortal Kombat and Street Fighter), which developed a system of special attacks that could be accessed by memorizing and quickly pressing certain combinations of buttons, requiring a highly precise set of movements that corresponded to tight control of an on-screen avatar's actions. Of course, mastering these movements is hardly like memorizing actual combat sequences for real-world physical combat, and yet, the quick reflexes and mental calm required to execute these movements has some kind of parallel to real-world physical expertise. A player can become very accomplished in console-based combat, and acquiring these skills takes time.

1.4.2 Tensions Between Precision and Loose Movement Style in Design

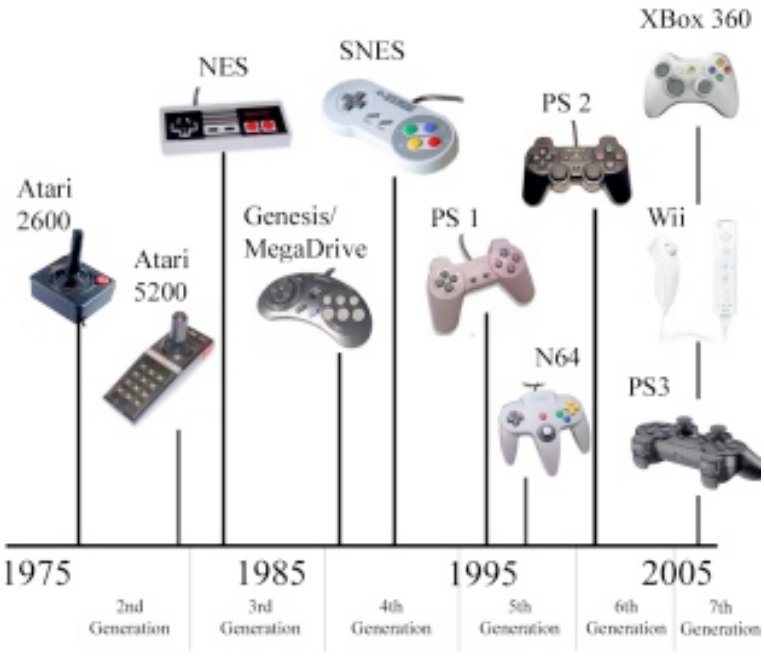

Figure 1.2. Today's game controllers have the same basic structure that emerged around 1995 (image taken from http://blog.echovar.com/?m=201001).

The Wii's controller combines the typical joystick and button structure of a console controller, with a novel form-factor (the two separate elements, nunchuk and Wiimote) that allows the player to execute broad movements and gestures. The games that we played made use of these elements of the controller in different ways, that seemed to have a strong impact on how fun it was to perform a given game mechanic.

The clearest example from our observations is engaging in sword play. Two of the games we played included sword play—Star Wars: The Force Unleashed, and Wario Ware Smooth Moves. In the latter game, sword play was part of a mini-game that simply in-

volved waving the Wiimote around using the 'boxer form' (Wario Ware trains the player in different holds of the Wiimote which it calls 'forms'). In the Star Wars game, using the light saber is a core aspect of game play, and combines waving the Wiimote around like a real sword, with various button presses before and during waving, that affect what sort of strike is made. For example, the player presses A and holds the Wiimote horizontally to block another player's strike with her light saber. This combines a button press requirement and a pure kinesthetic mimicry of an actual block. Holding down A and swinging the Wiimote toward an enemy actually hurls the light saber itself toward the enemy. The light saber boomerangs back after a brief time. The player of course is not really throwing the Wiimote, so this movement is only partially kinesthetically similar to what would occur in real life. Waving the Wiimote around without holding down any buttons executes moves that one would expect, and this feels the closest to full kinesthetic mimicry.

When playing Star Wars: The Force Unleashed, it is easiest to engage in the movements that do not require button presses, and that are most directly related to real-world analogs. (These are the same movements that are enabled in the Wario Ware mini-game). It is far more complex and less immediately engaging to combine button presses with broad movements, and doing so took away from engagement and immersion for us in our play sessions. It is clear from reviews (e.g. http://uk.wii.ign.com/articles/910/910269p1.html) that the designers were constrained by needing to provide button-based game-play mechanics while also trying to exploit the Wii's motion capabilities, and it is also clear that these movements were more accessible and engaging to those already entrained in the button-pressing prior releases of the game (as opposed to our team, which had not played prior versions).

Not all combinations of movement and button presses were of necessity awkward feeling at first. For example, when removing pieces in Boom Blox, the player needed to hold down A and then move her hand slowly backward to pull a block out. This felt kinesthetically similar to grasping a real block, and was quite intuitive.

Some Wii games avoid the conflict between tight, button-based control and broader movement by strictly containing the role of movement in game play. In Mario Galaxy, for example, there was very little use of broad movement. Rather the Wiimote was used in a two-handed fashion, in which the nunchuk's joystick (held in the left hand) maneuvered the game avatar, and the Wiimote (held in the right hand) was mostly used as a way to point at and interfere with enemies. Reviewers enjoyed this novel two-handed mode of gameplay (e.g. http://uk.wii.ign.com/articles/732/732898p1.html), regardless of the lack of broad movement. In some sense, one could say that the designers of this game used movement to make relatively small tweaks to the basic controller paradigm, which managed to add value to game play while preserving its main contours.

In any case, this continuum (from pure broad movement to mostly button and joystick control schemes), and the artful blending of these modes of game play, seems an important design dimension to consider in crafting movement mechanics.

1.4.3 Piecemeal Versus Full Body Motion

Another pattern we observed, was that it was rare to find movement mechanics that resulted in whole-body movement. Of the games we examined, only Wii Sports and Wii Cheer elicited smooth, full body motion from players (see for example this videoclip posted on Youtube: http://www.youtube.com/watch?v=TvHrF0cpx7o&mode=related&search=).

What was far more common, was a semi-active player—games like Boogie Superstar and Star Wars: The Force Unleashed encouraged broad arm movements and a standing play position, but left the player's torso, hips, and legs relatively motionless, with little weight shifting going on. Some games had so little movement that they could be played in the

usual seated gaming position, such as Mario Galaxy and some of the Wario Ware and Super Monkey Ball minigames (e.g. driving, throwing things). Other games required brief bursts of relatively full-body movement (such as the Wario Ware dancing and hula hoop minigames).

We noticed in our play sessions, that the full body movement games seemed to elicit more engagement, and to more quickly result in fun for players and those who observed them. As one of our observers put it, it is more fun to watch someone engage in whole-body movement, and also more fun to perform the whole body movement.

These observations can be grounded in some known phenomena from social science: the physical feedback effect [13] and emotional contagion [4]. Research has demonstrated that if a person moves as if she is happy, she will tend to label herself as more happy afterward—vigorous and joyful full body game mechanics may be making use of this physical feedback effect. Watching others who are feeling a strong emotion causes us to also feel a bit of this strong emotion (emotional contagion—[4]), and since full body movements provide more legible displays of emotion, they may contribute to stronger positive emotions in spectators during play sessions as well. We are currently developing game prototypes that allow us to conduct controlled comparison of game versions, to test out whether these effects hold true, under more rigorous experimental conditions.

1.4.4 Laban Effort Dimensions and Engagement

In our first pass-through of game play, we noticed that some kinesthetic mimicries of activities were a lot more fun than others. Our second play pass-through, in which we noted Effort qualities of the movement mechanics, gave us an intriguing piece of the puzzle as to why this might be. Let us consider the example of dancing. Three of the games required players to engage in dance or dance-like activities: Boogie Superstar, Wii Cheer, and the Wario Ware dancing mini-game. In our playtesting, we enjoyed the Wario Ware and Wii Cheer dance mechanics far more than those in Boogie Superstar. Looking at the Laban Effort qualities, we found that movement mechanics for both Wii Cheer and Wario Ware dancing were free, whereas Boogie Superstar had very bound movement qualities. The movements in Boogie Superstar were typically sustained (performed over and over again in a regular fashion), whereas the movements in the other two dance games were mostly sudden (lots of changes in what was required of the player). All three games had mostly light (versus strong) movements.

In our experience, performing the Boogie Superstar movements (such as swinging both arms in front of the body, back and forth, to a tight rhythmic metronome), felt mechanical and constrained, whereas the dancing in the other two games felt more silly and joyful. We believe the Laban Effort dimensions help illuminate why this was so. Dancing while playing Boogie Superstar does require performance of movements that could be part of real-life dance, but the tight tempo constraints and repetition do not feel like real improvisational, casual dancing, and don't seem to generate the same buoyant state in the player. Thus it may be important for designers who are aiming for kinesthetic realism to have particular *physical and emotional end states* in mind to aim for, which are derived from certain *qualities* of the movements they are trying to imitate with the movement mechanics.

It's also worth noting that both Wii Cheer and the Wario Ware dance mini-game seemed to have looser criteria for recognizing a movement as correct, which allowed people to put more of their own movement 'spin' on performance. That is to say, one could play both Wii Cheer and the Wario Ware dance mini-game with far more improvisation in footwork, hip wiggles, weight shifts, and the like. This may have also contributed to the increased engagement we felt when playing these games.

1.4.5 Social Interaction

Although all of the games we tried out were designed to allow group play, it was far more common for a game to have a turn-taking mechanism that resulted in serial solo play, rather than multi-player simultaneous play. This is not to say that the 'audience' wasn't highly engaged during the other player's turn—far from it. Many of the games were highly performative—watching others play was very interesting and created strong engagement and lots of positive interpersonal dynamics (see [15] for a fascinating study of interpersonal dynamics in group console play).

In terms of multi-player mechanics, most of what we observed was competitive in nature. For example, sports matches against one another (Wii Sports) and parallel dance performances that were scored and compared (Boogie Superstar, Wii Cheer).

One interesting opportunity for cooperative play was the use of both controller pieces in Mario Galaxy. One player could operate the nunchuk, and the other the Wiimote, making for a somewhat easier and very engaging form of cooperative play. We also found that it was great fun to play Wii Cheer in multi-player mode without any real regard for scoring, but instead, as a non-competitive group activity.

Our research team felt, on the whole, that cooperative game mechanics seemed underdeveloped, and we see this as an opportunity area for creating engaging movement mechanics. We are currently developing social game prototypes that explore and extend some of the informal activities we found ourselves engaging in during our play sessions [16].

1.4.6 Movement and Its Relation to Story and Game World

Earlier in this chapter, we presented the example of picking someone up using 'the Force' and hurling them away, in Star Wars: The Force Unleashed. This movement mechanic is executed with a button press and then a quick flick of the nunchuk to fling the person. The ease with which one can accomplish this movement and its powerful effects give the player a visceral vicarious experience of what it might be like to be a Jedi knight who can control people effortlessly. So one can say that the story and game world resonate well with how this mechanic is enacted.

In the games that we examined, we found for the most part only very thin story worlds, with very little opportunity for this kind of projection and exaggeration. Most of the games instead worked with well-known activities (sports, dancing, cheer leading, parlor games like Jenga) and did not really provide the player with a strong avatar or story world to project into.

Perhaps it is simply the case that quick, casual games like these are not well suited to deep story worlds that might require more complex and extended play sessions [7]. However, we suspect there is opportunity in further examination and development of story and character-based movement mechanics that exploit the unique visceral experience of having movement qualities radically different from one's own everyday body. We are working on prototypes in our lab that push further on this aspect of engagement with movement mechanics.

1.5 Conclusions

In our detailed examination of movement mechanics in Wii games from several genres, we have generated some insights into what makes certain movement mechanics more fun than others, and that may lead to better elaborated design guidelines in future, for creating engaging movement mechanics.

We were able to unpack kinesthetic mimicry a bit, delving into what makes some games a more faithfully engaging mimicry of a certain activity than others. We observed that whole-body movement seems to lead more easily to a positive experience for players and spectators, and we observed emergent coop play patterns that we believe can be fruitfully extended and developed.

Our lab group is using this analysis to aid in the evolution of a design pattern language for movement-based game mechanics, and to help us push the envelope with our own movement mechanic prototypes. We imagine that these explorations may also be of value in broader HCI contexts, such as the development of interaction schemes in virtual worlds or with accelerometer-enabled mobile devices.

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