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# Multiplayer Body Gesture Interface Design for Interactive Video Gaming

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## **Abstract**

After many studies to develop best practices for a multiplayer interactive video projected onto the floor, we began the design of a wall system. The initial design was based on our studies of the floor. We proceeded to studies in our interaction lab to get the prototype and the basic layout and design. Then we were ready for more fidelity, an environment more like our final target environment. We simulated a mall experience in a “chocolate gallery” where we alpha tested the wall system. Finally we began beta testing with a series of high fidelity studies in a mall. We continued with the chocolate mall environment for questions where we wanted to ask questions from users, and used the mall for pure observation studies. We noticed the importance of a progression in fidelity of our research environments for understanding our users.

## **Author Keywords**

User testing, playtesting, games, multiplayer, game design, user experience design, entertainment

## **ACM Classification Keywords**

Human factors, experimentation, games

## **General Terms**

Design, Experimentation, Human Factors:

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The box on the ceiling contains the video projector, IR LED lighting, the camera, and a wireless network client.



Adults and kids playing on StepScape

### Introduction

I have been designing and playtesting games for many years, including a number of titles selling over a million units. In 2006, I began designing the body gesture interface for advertising-supported gaming on a new interactive wall display for malls and other public venues. I had previously user tested an interactive floor video gaming platform, called StepScape, for the same environment to develop best design practices for both engagement and recall. That system had been deployed in 185 malls nationwide, connected and populated by a nationwide media network with automated feedback from a million play sessions every weekend. The interactive wall display was intended to extend the existing floor display with a more adult audience and more compelling interactions.

The wall display, called WaveScape, differed from prior systems like the Sony Eyetoy because it was multiplayer and had two 3D cameras that provided depth perception. I did well over 100 studies but I needed to evolve new study techniques and environments to figure out how to create a fun user experience for adults shopping in a mall. I started with lab studies but they proved inadequate, yet placing prototype units into a mall was impractical until late stage beta testing.

### Starting Place

When I was testing StepScape, I uncovered a lot of basic design principles that would likely carry over to WaveScape:

#### *Recall and Gaming*

Our most fun games were the least effective in conveying an advertising message. When intently focused on a compelling game, the player does not absorb any information other than what is needed to play the game. My studies revealed the following principles for recall in gaming:

- put the message where the user is looking,
- display the message when the user has time to notice the message
- motivate the user to care about the message

After applying these principles, the company hired Arbitron to do a nationwide study of StepScape advertising. The results were better than any other medium that they had tested (print, TV, radio, gaming, etc) with 2x better brand recall and 20x better message recall at 72 hours. Visibility was 5x any other medium; it impacted everyone who walked near enough to see it.

#### *The Three Laws of Reactors:*

1. If a reactor is idle, it tends to remain idle  
*People assume its not worthwhile and walk by.*
2. If a reactor is occupied, it tends to remain occupied  
*People stop, watch, and join.*

3. Observers greatly outnumber players

*Players are “street performers” who grab the attention of 3-5x as many observers.*

#### *Reactor Usage*

Based on the 3 laws, we noticed that there are three important characteristics of spots:

1. Good attractors bring people to the reactor
2. Good engagement spots encourage people to play on the reactor
3. Good sustainers keep people on the reactor

More studies showed that the best attractors are 2-6x more likely to attract than the worst, the best sustainers hold people 3x longer than the worst sustainers.

#### *Extroversion and Age*

I studied engagement with reactors in movie lobbies and in malls just outside movie theaters. When movies that attracted a particular demographic were over, the reactor was exposed to a homogenous audience. While all ages and both genders would fill the reactor when they were homogeneous, when the audience was heterogeneous, the more extroverted took over (kids > teens > adults). The youngest kids (most extroverted) were always accompanied by adults (most coveted by our advertisers).

As we began designing WaveScape, these principles from StepScape were our starting point.

#### **Initial In-House Testing**

##### *Initial Design Decisions*

Based on what we had learned from StepScape, we knew we wanted observers. We did a few studies of touchscreen interactions but quickly concluded that we wanted interaction at a distance. Ideally, subjects would stand between 3 and 12 feet away from the plasma TV so that there would be plenty of room around them for observers.

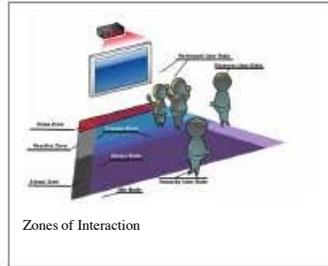
##### *Attraction Studies*

We began our design studies by looking at how WaveScape would attract users. This problem was harder because video on the wall with advertising is nearly invisible (an assumption we proved later in malls).

Our test subjects were asked to fill out a form and then walk across the room to turn them in and pick up some snacks. As they walked back and forth, they crossed the visual field of the first prototype WaveScape. We tried audio callouts (too creepy), we tried showing interesting videos (invisible), and finally we tried many different ways of “mirroring”. Sony researchers had reported that people liked looking at themselves and that is what we found as well. A flaming image of the person proved to be the most powerful attractor.



WaveScape: interactive video on the wall

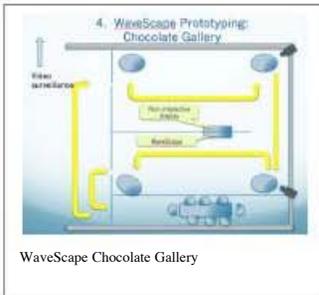


Zones of Interaction

In these studies, we discovered that the natural interaction distance was about 4-7' from the screen (with a 50" screen, we suspect it depends on screen-size but this was never tested). However, we discovered that our interactive attract display would work from about 15'. From this, we developed the idea of 4 states linked to 4 zones: in the idle state, the reactor doesn't see anyone so it just plays an engaging idle animation. In the attract state, the reactor is not in use but it sees someone up to 12 feet away and attracts them by displaying them on the screen in flames. In the reactive state, users are 3-8' from the screen and interacting with the video display. In the "too close" state, a user has gotten closer than 3' from the screen.

**Alpha Testing**

In our alpha tests, we wanted to find out about user experience in the mall. However, WaveScape was still in stealth mode so we couldn't test in public. So, we created a chocolate gallery on the SF Pier behind the Tcho Chocolate factory. We invited people to come user test our chocolate gallery and taste test our chocolates. The chocolate gallery was a space that was 40' wide, divided into a U-shaped space of two 20' galleries connected at the far end. As users walked through the gallery, they went from station to station that described the steps in making chocolate, from bean to bar. Several types of chocolate were sitting in labeled piles for tasting at the end. In the first half of the gallery, they walked by a WaveScape reactor in non-interactive mode, just playing through the interactions as a video. In the second half, they walked past an interactive WaveScape reactor.



WaveScape Chocolate Gallery

At the start of each study session, users were invited into a small conference room. They filled out an initial questionnaire. Then I asked them to walk through the gallery on their own and escorted them to the entrance. I then went to a hidden video-observation station where I watched them in the gallery. The subjects were alone in the gallery, with a mission similar to the mission of people in shopping malls.

We watched how they were attracted and engaged by the interactive WaveScape system as they walked through the gallery.

After they were finished with the gallery, they were invited back to the conference room where they filled out a questionnaire about their experience of the gallery and the results of the chocolate tasting. In the analysis, comments about their experience of WaveScape were studied carefully and correlated with what we saw on the videos. Eventually, I included recall testing for brands and brand message from the WaveScape games they had played or observed.



WaveScape Chocolate Gallery Games

I did many dozens of studies to improve upon the power of our attract mode, to make game play more engaging, to finalize the size and shape and height of the interaction zones, and to solve many other problems of system and game design in the process of developing the hardware prototype and the best game design practices for this technology.

**Beta Testing**

Once we began to have some confidence in our prototype hardware and our design practices, we were ready for high fidelity testing. We put a WaveScape system in a mall. It was across from a Starbucks where I could sit for hours observing and making observations on my computer. It was also in an area with a surrounding mezzanine so I could stand above and watch users as well. I used techniques for tabulating usage that I had developed for StepScape to

record interactions for later analysis. Standard techniques (like “pinch” for resize) that work well on computers and touch screens were less effective with a shopping bag in one hand or a kid in tow. This high fidelity environment introduced problems like users reaching in from the side in a two player contest game that had not been seen in the lab or simulated mall environment where people were more polite. Also, the role of children in the mall interactions were not seen in the lab or simulated mall studies. We also saw many social groupings, gaggles of teens, pairs of moms with babies in strollers, etc that we had not studied in the simulated mall.

While beta testing in the mall, we uncovered many questions that we wanted to discuss with users. That was not practical in the mall so we continued using the chocolate gallery for those kinds of studies. The combination proved quite powerful for investigating many questions.

### **Results**

Reactrix had a profitable media network for StepScape, a new WaveScape product destined for the same media network with advertising-supported games that had been proven to attract, engage, and sustain in the mall environment. The business plan called for an acquisition by a major media company and a half dozen suitors were in a heated bidding war to buy the company. It was September of 2008. The stock market crashed. The economy was in shambles. Retail had cratered, and recovery was uncertain. The suitors fled. The company was given 96 hours to consummate sale to the last remaining suitor, in Switzerland. Negotiations continued, night-and-day, but were not concluded in time. The company folded. However, the research on both StepScape and WaveScape were well documented and are being used to this day by companies like Helios Interactive that rose from the ashes.

### **Conclusions**

This research uncovered many of the design best practices for floor and wall displays, and even more importantly, broadly applicable lessons about the process for understanding the user experience and developing best design practices:

- Effective advertising in intensely engaging games is difficult to achieve and requires careful application of psychological principles of attention and recall
- Prior studies of similar systems provide useful foundations and goals
- Many people have talked about the progression of the fidelity of the prototypes, but to understand the user experience, a progression in the fidelity of the user environment is essential
- In public multiplayer gaming, many different types of social groupings including various mixes of genders and ages have a major impact on usage which are difficult to duplicate in a simulated environment
- Different research environments have different strengths. The lab supports think-aloud protocol. The chocolate gallery supported post-interview discovery about what happened. The mall provided unexpected usage.