Styles of Play in Immersive and Interactive Story: Case Studies from a Gallery Installation of AR Façade

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ABSTRACT
In this paper, we offer an empirical investigation of AR Façade, an Immersive and Interactive Story where players interact with an animated married couple through an augmented reality (AR) interface that allows for unconstrained body movement and speech communication. We conducted a "mixed-method" in-depth analysis of thirty-three players during a gallery installation of the experience and identified five emergent "styles of play". We present qualitative case studies to illustrate the diverse behavior of participants and then we analyze quantitative differences that can lead to improved player modeling. Like prior work on play types in other media environments, our work elucidates the range of behaviors that can emerge in immersive and interactive stories.

Categories and Subject Descriptors
H.5.1 [**Information Interfaces and Presentation**]: Multimedia Information Systems – *Artificial, augmented, and virtual realities.*

General Terms
Design, Experimentation, Human Factors, Theory

Keywords
Play, augmented reality, interactive drama, empirical evaluation, mixed methods, player descriptions, player modeling, real-world gallery deployment, games, immersive entertainment

1. INTRODUCTION
With each new formulation of computational media, researchers have sought to make sense of how participants behave and engage with the media artifacts. Classification labels, such as hardcore gamer versus casual gamer, are initially useful for understanding player habits, but inevitably fall short of fully explaining the dynamic relationship between participants and the medium [1, 2, 6, 7]. However, such distinctions do communicate something useful about the diverse personalities and approaches of the participants. Such analyses can hopefully lead to more diverse content production and can provide opportunities for applying adaptive intelligence techniques to make experiences as engaging as possible. Thus, it is useful to revisit these arguments for each emerging media.

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In this paper, we present a descriptive account of the range of behaviors and interpretations of players in an *immersive and interactive story*, a form of computational media defined by the combination of immersive interfaces, interactivity, and narrative structure. Immersive and interactive stories (IIS) are first-person experiences that embed a user as a character in a story and allow them to enact a role designated to them. The subject of our investigation is the AR Façade experience, a dramatic media experience that combines an immersive augmented reality interface with an underlying narrative structure that responds interactively based on the speech and physical actions of the participant [4]. AR Façade's "story" places the player in a familiar social situation: the player is invited over for drinks by old friends, Grace and Trip, only to find them bickering and trying to get the player to see their side of the argument [10].

We have previously published empirical work on AR Façade, based on a lab study of twelve players, that compared different types of interfaces to the experience, but did not focus on styles of engagement [5]. While we offered a preliminary delineation of three player types (story-player, meta-player, deserter) in support of the interface comparison, our current work provides a more comprehensive analysis. The work in this paper is based on empirical data from a three-month, free-to-the-public installation of AR Façade at a gallery for art and technology. We performed a mixed-method investigation at the gallery, collecting logs and video data and conducting open-ended interviews with thirty-three players (N=33).

Our qualitative analysis leads us to suggest five equally-valid styles of engagement for immersive and interactive stories (*engager, performer, partaker, tinkerer*, and *observer*), as evidenced by their different goals, interpretations, and appropriations of AR Façade. In this paper, we first look at empirical research on player types its influence on player modeling research. Then we illustrate each style of play through five case studies consisting of episode excerpts and images, and quotes from the players. While we accept that the play styles may not adequately represent a player as a whole, we classify players into one of the groups and investigate the in-game quantitative differences. Finally, we discuss the possibility for run-time detection of play style towards more adaptive immersive and interactive story experiences.

2. BACKGROUND
There are two threads of research germane to our work: empirical studies of player behavior (either qualitatively or quantitatively) toward creating *descriptive player models* and *player modeling for games*, which builds on the tradition of computational user modeling in HCI, but leverages the player type research to specialize user models to game situations.

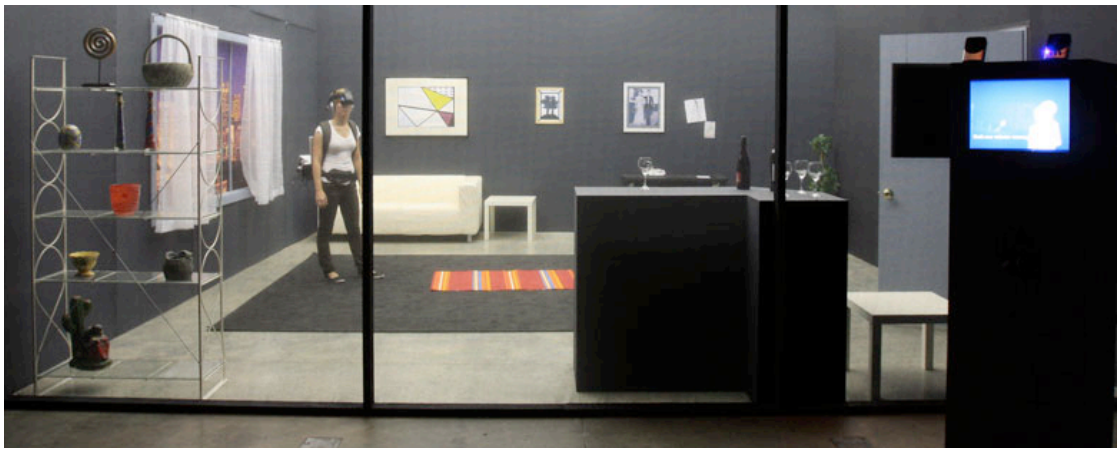

Figure 1. A player experiencing AR Façade at the Beall Center, a free-to-the-public gallery in Irvine, CA.

Descriptive player models: Many researchers investigating games and interactive experiences have communicated that players can have diverse, but equally valid approaches for engagement. In the gaming world a salient distinction is drawn between hardcore and casual gamers, although Juul and others have called for re-examining this narrow differentiation [6]. In Bartle's discussion of multi-user dungeons (MUDs) he identifies four types of players: killers, achievers, socializers, and explorers [1]. Laws performed a very similar analysis of role-playing games (RPGs) differentiating between six types: the power gamer, the butt-kicker, the tactician, the specialist, the method actor, and the storyteller [7]. Bateman and Boon performed a cluster analysis of gamers where they administered surveys, collected Myers-Briggs personality types, and labeled four primary types of gamers: conquerer, manager, wanderer, and participant [2]. Lazzaro also conducted in-depth players studies of contemporary video games, pointing out individual player differences by performing an extensive video analysis and coding emotional facial reactions such as surprise, fear, and fiero (personal triumph) [8].

Descriptive models of players make the most sense within a particular gaming context and have a lot to do with the interaction mechanisms available (e.g. the "killer" archetype may not be possible in a that game doesn't permit killing). We are also cautious about type-casting players into one category or another since people have such dynamic personalities. This paper presents empirical player research and a descriptive model of play styles for an immersive and interactive story. Although our description of play styles is not "operational", it may help designers to explicitly design interactive stories to provide satisfying interactions for the different player types. (Bartle's work is extensively used in this regard by MUD and MMO designers, who work to make sure that MMOs offer game mechanics that satisfy Bartle's different player types). Moreover, our analysis could serve as the basis for creating computational player models for interactive storytelling environments.

Player modeling for games: In other gaming contexts, descriptive models of players have provided a starting point for adaptive storytelling. In Magerko's adaptive drama, *Haunt 2*, he models player behavior on Bartle's player types, and continually updates it based on game actions by the player [9]. Likewise, the *PaSSAGE* system created by Thue et al. attempts to model participant's style of play using Robin Laws' rules as the basis for the model [15]. Their system looks at key plot-points and the path players take through the story to determine weights for each player type. This automatically maintained player model is then used by the system to dynamically select story events. Their preliminary evaluation of the system showed that players felt the adaptive version of the story was more fun and provided more sense of agency than the non-adaptive version.

Other approaches to player modeling and adaptive storytelling have sought to model a player's emotional state without using prescribed "primitive" player types. Sharma et al. created a drama manager with an interferential player model based on four features of player interaction. The primary finding of this investigation was that the average time spent by the player to perform game actions discriminates between gamers and non-gamers [13]. Other approaches include modeling users based on performance theory [12] and using physiological sensor data to modify the behavior of virtual agents [11].

While Façade's story architecture does not create a predictive player model, it does model patterns of player activity (e.g. whether the player systematically sides with one character over another). Existing player models developed for interactive stories and RPGs are not appropriate for Façade where the player makes decisions at multiple levels of abstraction, from detailed social interaction, through various social games (affinity game, therapy game, hot button game), up to major choice points (yes/no questions posed by the characters). Many player models assume a single level of player decision making, and a single progression (rather than the multiple simultaneous progressions active in Façade). In our discussion of future work, we consider how our descriptive account of play styles could add nuance to Façade's story architecture.

3. THE GALLERY SETUP OF *AR FAÇADE*

AR Façade is a first-person immersive augmented reality (AR) experience which simulates a conversation with old friends Trip and Grace, who happen to be in the process of a marriage breakdown (see Figure 1). We employ video-see-through augmented reality and a physical stage modeled after the 3D world of the desktop-based interactive drama, Façade[1]. As we have described in prior work, AR Façade replaces the interface between the AI engine and the player with a modified graphics engine, physical interaction with objects, and speech handling.

[1] http://www.interactivestory.net/

Rather than use speech/gesture recognition technology—which can be problematic with diverse users in non-controlled settings—we tasked twelve "wizards" (undergrads employed at the gallery) with accomplishing this interaction.

To prepare AR Façade for a long-term deployment at the Beall Center for Art and Technology at the University of California Irvine[2], we made a number of improvements over the initial prototype of the experience. We devoted time to constructing a durable head-mounted display (HMD) and creating a transparent physical layout of the space that would be visually appealing and enjoyable to groups as well as individuals. For example, we used black scrim for the long wall of the apartment behind the bar so that audiences could stand outside the wall and easily see the player's activity, while players would not be able to see outside through the wall (especially when viewing through the HMD).

4. METHODOLOGY

Since the study took place at a public gallery during its normal open hours, we did not formally recruit or schedule participants. We did put an announcement on Craigslist.org and hung fliers near the gallery. During slow times we asked patrons at the coffee shop next door if they would like to participate. Nearly all of the thirty-three (N=33) participants entered the gallery with no prior knowledge of the study. Participants were not screened, but we managed to get a range of individuals (16 men and 17 women, an average age of 23.6, and 85% students).

The study lasted around 45 minutes and participants received $5 per half hour. Participants were asked to play AR Façade one time and then take part in an open-ended interview. First, players listened to a gallery docent give a brief explanation of the Façade story and instructions on how to operate the AR interface. Docents would show players a few of the canned gestures (hug, kiss, comfort), but mostly just told them to say and act out whatever they wanted.We collected game logs and recorded each episode from the player HMD perspective as well as from an external camera.

After each participant played AR Façade, we conducted an open-ended interview, starting with a general question like "tell me about that experience" and probing for additional details as the interview progressed. We were not equipped to show players video of their episode to do retrospective interviews—as we have in previous studies—but we did ask players to recall moments that really stuck out for them. After the interview, players filled out a short questionnaire which captured demographics and Likert-scale impressions. Rather than use established questionnaires from the VR community to measure presence [17], we developed a rating system consisting of five Likert-scale questions—content enjoyment, curiosity about outcome, character believability, physical presence, and influence of interaction—each ranging between 1 and 7 and summing to an overall rating between 5 and 35. Triangulating between our rating system, the interviews, and the episode log data, we attempted to capture not only players' sense of physical presence in AR, but also their sense of agency and dramatic involvement.

Our analysis method for play styles evolved through an iterative process and included a "grounded" interpretation of interview data and episode video coding (see Figure 2). First, we transcribed the interviews and followed a grounded theory approach for

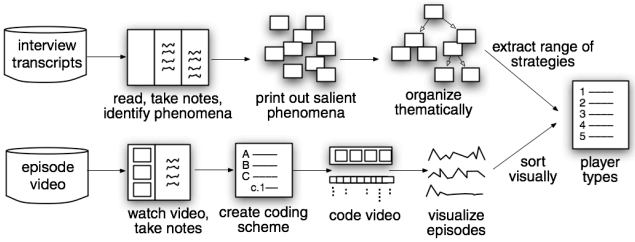

Figure 2. Our mixed-method, qualitative analysis of interview and episode data that led us to define five styles of play

understanding player interpretations, as described by Strauss [15]. We read through the interview transcripts twice, once to take open-ended notes and another to highlight more salient "phenomena" or ideas expressed by players. We then organized the phenomena into a hierarchy of themes using a paper-based affinity diagram method. One branch of the theme hierarchy explored various player strategies and the range of attitudes towards the experience. This process revealed key player statements and led us to conduct a more detailed analysis of the episode video.

The video analysis also happened over several iterations. During the first viewing of the episodes we marked key moments and took notes on recurring player behavior that could be coded. We attempted to draw from prior video coding schemes, but many are too domain-specific, such as Lazzaro's coding of facial expressions [8]. In AR Façade we did not have a clear view of the player's face since players were free to move anywhere and the HMD partially obstructed their face.

We created our own video coding scheme based on knowledge of the observable features in the video collection. In sequential 15-second intervals for each entire episode, we observed occurrences of both player and character speech, gestures, and technical obstructions such as loss of 3D tracking, poor virtual/physical registration issues, or AI logic errors. The 15-second level of granularity was appropriate for Façade's conversational structure—short enough to provide a detailed overview of the episode and long enough to capture approximately one player statement and one character response per interval. Plus, it enabled us to conduct inter-rater reliability tests by comparing the same intervals across two coders (which resulted in acceptable rates of concurrence in the 5% of data coded by both researchers). Finally, the passage of events were visualized for each episode to help us see similarities and differences between players (due to space constraints, we refer readers to the first author's dissertation for more details [3]). We used both the episode visualizations and the theme hierarchy to identify five styles of play.

5. STYLES OF PLAY FOR *AR FAÇADE*

Through our in-depth, mixed-method analysis of thirty-three players at the gallery installation of AR Façade, we have identified the most salient "styles" of play. We define five styles of play (*engager*, *performer*, *tinkerer*, *observer*, and *tinkerer*) and exemplify each through a case study of player actions and their interpretations offered during the interviews. In an attempt to leave gender biases out of the discussion at this point, all five case studies feature players of the same gender.

As we stated earlier, an individual player can exhibit one style at one moment and then switch to another style, so these are not to

[2] http://beallcenter.uci.edu/

be read as player types. In the discussion section, we consider the ramifications of classifying the players into so-called player types and point out some quantifiable differences that should be useful for player modeling in immersive and interactive stories.

5.1 Engager

The first play style that emerges in immersive and interactive stories is where the player fully engages the experience physically, socially, and emotionally. The "engaged" player accepts the illusion of being in a shared environment with fictitious people and is able to influence the course of events through their actions. In our analysis, these players are emotionally involved in the drama, invested in the characters, and curious about the plot. When the players engages, they take on the role that has been scripted for them in the plot without cynicism or mockery. In AR Façade, when the "engager" play style surfaced, players exhibited emotions on their face, as well as through their actions and words. To illustrate this style of play, we present a case study for Player 20 who epitomizes the emotions that can arise in such a dramatic situation. Each case study includes the time in minutes when statements occur with our research notes in parentheses.

Time	Player and character statements (with notes)
5:36	Grace: I'm stifled Trip!.... artistically... (player puts her hand to mouth in disbelief, see figure 3 upper left)
7:14	**P20:** Maybe you should go talk to her... (player points with both hands, figure 3 upper right)
7:23	Trip: Chris, you are saying I am not communicative? (player steps back and bites her lip, figure 3 lower left)
10:15	Grace: Chris, you blame me for this don't you?
10:18	**P20:** Nooo, I don't blame you for this at all!! (jaw drops, reacts emotionally, figure 3, lower right)
15:45	Grace: Chris, I'm sorry. Thank you though. You really helped us...
15:47	Trip: Grace! (player walks quickly after Grace as if she will try to stop her...)
15:50	**P20:** I'm sure that's not all you can say... (towards the back of Grace)

Figure 3. Player 20 exemplifies the engager style of play.

During Player 20's episode she first tries to escape before getting pulled in emotionally. She tries to help the characters throughout, even running after Grace as she leaves. Player 20 paid close attention to the characters and responded as if she was actually stuck in that uncomfortable setting, as she noted:

> *"Especially when Grace said like, 'You've been saying this and that, and is there any meaning behind that?' I don't know, it just kinda put me on the spot, very much so.... I kinda felt caught in the middle between both of them." (P20)*

Even more telling is her tendency to take comments seriously from Trip and Grace. She emotes guilt at times, even apologizing when Grace says she's been pushing her. During the post interview Player 20 said this:

> *"I didn't think they'd actually be like really paying attention to what I said. Like it wasn't just I was saying something and they were reacting to it; it was like they actually sort of had emotional reactions to what I said." (P20)*

Not only did she feel a sense of her own agency, she felt like the characters were emotionally reacting to her. She fully accepted the illusion of an encounter with old friends, although as she expressed later, she did not feel Trip and Grace were necessarily acting appropriately:

> *"I hadn't seen them in a long time, right? Right, so if I hadn't seen them in a long time and all of sudden they're fighting and don't really know what to say." (P20)*

The whole situation caught her off-guard. Her reactions to the fighting seemed authentic; her friend watching from outside even commented that she acted exactly as she would in that situation. She was not trying to be someone else. She was not fixated on the novelty of the medium, but directly interacting with and reacting to the simulated social situation.

5.2 Performer

A second style of play happens when participants play off of the situation represented in the simulation. When the players perform, they "riff" on the characters and come up with actions and dialogue often meant to mock the scenario. Unlike the engager style of play, performers do not take the situation seriously and seek to disrupt and make fun of it through situational humor. When a player performs, they are usually very physical and vocal, but they do not necessarily believe their actions will impact the situation. They want the attention to be on them, not the characters or the plot. The experience is treated like a stage performance.

In AR Façade, the performer style of play is gratified by funny reactions from Trip and Grace, such as when Trip becomes bashful and uppity if the player talks about sex. To illustrate the performer style of play, we present the following case study of Player 4 who epitomizes the crazy, divergent things some players attempted, especially when they could entertain their friends watching from outside.

Time	Player and character statements (with notes)
0:50	Grace: It's been so long since we've seen you.
0:52	**P4:** I knowww! (Player goes in for a big hug)
4:20	**P4:** Can you hurry up and make my drink?
4:22	Trip: I see you are trying to get onto Grace's good side tonight. (Player punches at Trip, figure 4, top half)
5:56	**P4:** I'm on Grace's side (Player does the "finger snap" towards Trip, figure 4, lower left)
6:55	Grace: You keeping trying to tell me you love me Trip, that you're so romantic...

Time	Player and character statements (with notes)
6:57	Trip: Oh God!
6:58	**P4:** You guys sound like my parents! Shut up!! (big laugh from her friends)
8:35	**P4:** Trip I love you! I love you!!! (gets down on one knee with hands out, figure 4, lower right)

Figure 4. Player 4 exemplifies the performer style of play.

Player 4 came right in and gave Grace a big hug and then after a minute or two of playing along to see where it would go, nearly all of her actions were meant to be goofy and absurd. Player 4 used the situation to make jokes for her friends and, as one of her friends explained afterwards, her performance seemed to have the desired effect:

> *"It was cool – like you saw them hugging and they're like hugging air and it's like, yeah. (Laughter) And then like [player's name] was kissing him like crazy. (Laughter) ... like, you are like crazy! Yeah, it was funny." (P4)*

The performer style of play emerged the least often, and usually only when there were people there to watch. The presence of an audience definitely impacted how players acted, but it did not necessarily result in this behavior (for example, the engager P20 had her boyfriend watching). On the other hand, the performer style of play did not happen often if an audience was not present, although as one player pointed out: "some of the things I did simply for my own amusement." (P4)

5.3 Tinkerer

A third style of play occurs when participants spend time figuring out the system limitations, fidgeting with the technology, and doing things that are not necessarily related to the characters or the story. Like the performer, a tinkerer pays less attention to the story, but rather fixates on the medium itself. The tinkerer style of player emerges because a player is curious about what they can do and what they might need to do in order to "win" or master the system. They seem to enjoy the physicality of the experience, but they do not feel their interactions will actually matter. They tend to remain outside of the drama and experiment with the interaction mechanisms, taking nothing for granted.

In AR Façade, the tinkerer treated the interaction less like an actual social situation and more like a game that they should be able to manipulate. The characters seemed like cardboard toys that they can poke and manipulate. They tried to figure out the "keywords" so they can "see what kind of reactions" (P6) they can get. The tinkerer often enjoyed messing with the graphics more than the listening to the fight between Trip and Grace. To illustrate the tinkerer style of play, we present a case study for Player 13:

Time	Player and character statements (with notes)
4:30	(Player laughs when she sees her hand on the screen. Plays with the graphics. See figure 5)
5:30	**P13:** (Plays with graphics again...) This is like a soap opera. (laughs)
5:38	Grace: I don't want to look at you. Dammit Trip! (player laughs)
5:40	**P13:** This is like Grey's Anatomy actually.
8:45	**P13:** Maybe I should just poke you. (pokes at Trip)
8:53	Grace: Trip, You and my parents are always... (player still poking in the air)
8:54	**P13:** Poke, poke... (player laughs)
10:15	Grace: Therapy? You think with need therapy?
10:20	**P13:** Ohh! Yes! Cool, you understood me. Yes....you.. do.. need.. therapy...

Figure 5. Player 13 exemplifies the tinkerer style of play.

Player 13 enjoyed jabbing the characters and spoke to Trip and Grace deliberately and slowly. As she explained afterward, she wanted to reach the winning resolution, so her strategy was to talk to Trip and Grace, not like people, but like some kind of robots.

> *"I did want there to be a resolution. And I was trying to find ways to do that, but I wasn't having much success. I tried to calm down, relax, things like simple words." (P13)*

For Player 13, her sense of agency was only affirmed when the interaction mechanism is very clear, like yes/no questions.

> *"I really hoped that they would ask me more interactive questions, like yes or no .....like a video game... (where) whatever you say will direct the rest of the game." (P13)*

Player 13 did most of her tinkering during the second half; she may have been getting bored, or perhaps she felt deflated from the technical errors and the characters' failure to respond. Also during that period—as the transcript above illustrates—she tended to make a lot of side-comments to herself because she had no faith that her meta-talk would be understood by the characters, as she explains:

> *"I had asked them some pretty simple questions and they couldn't understand me. I knew that something as complicated as this is like 'Days of Our Lives' or this is like 'Gray's Anatomy' – that would go way over their head." (P13)*

The "tinkerer" style of player often arose when players did not get the interaction feedback they expected. Their experimentation not

only fulfilled their curiosity about the novel medium, it served as a process of seeking out more concrete interaction mechanisms.

5.4 Observer

A fourth style of play is evident in what the player does not do, rather than what she does do. The observer style of play emerges when a player stops interacting (or speaks and uses gestures infrequently), but continues to watch the story unfold. When a player observes, they are involved in the story lines and characters, but they do not behave like an active conversational partner. They remove themselves from the social situation and passively absorb the scene, much like a film.

In AR Façade, observers paid close attention to the story and became emotionally invested in the characters, but they did not converse much with the characters. When players observed, they seemed to stand away from the characters and just let the drama unfold. Observers were different from engagers who might choose "listening" as a strategy for interaction. Many of the observers would start out trying to interact, but as they failed to get the responses they expected and as the fighting intensified between Trip and Grace, they would become hesitant and perhaps only respond to yes/no questions, if at all. To illustrate the observer style of play, we present a brief case study for Player 7:

Time	Player and character statements (with notes)
6:10	Grace: Emily, yes or no.
6:13	Grace: Do you think its wrong for one person in a relationship to listen too much to the other?
6:20	Trip: What?
6:21	**P7:** No. (see figure 6)
6:22	Grace: To trust your husband or wife too much to—what?
6:28	Grace: Oh alright. Goddamn it...how can I be happy when you act this way Trip? ...

Figure 6. Player 7 exemplifies the observer style of play.

Player 7 started out talking quite a bit with the characters, but after about four minutes, the more she tried to interact, the more she decided to take a more passive approach:

> *"..there were some points where I thought I was directly impacted by it and I was involved and then other times I felt like I should have wanted to step back and watch... when they were just conversing between themselves—especially on separate sides of the room—I just wanted to watch the conversation." (P7)*

Player 7 may have started out as an engager, but her illusion of agency did not last very long. As Player 7 explains, she was "overseeing" the experience, more like a book or film. She was somehow removed from the conversation, but dramatically involved and curious where it would go.

> *"I knew it was a drama piece and everything... Like I wasn't assuming they were interested in where I fit in the conversation, but I wanted to know where their conversation would lead to... it was almost like a book. Like I was in a situation and I was kind of overseeing, even though I was supposed to be interacting with them." (P7)*

She was aware that she was supposed to be interacting, but did not feel compelled to do so. Her style of play was to observe and listen and absorb the story like a book. In fact, Player 7 paid close attention to the story lines and wanted to know what would happen with Grace:

> *"She wanted to become an artist and how she was forced into advertising by Trip and everything. .. I want to see what, in her view, was important to their relationship..." (P7)*

For players who displayed the "observer" style of play, they became generally interested in the story, but did not actively participate in the player-character role.

5.5 Partaker

The final style of play is a more nuanced version of the engager style. The partaker figures out the interaction mechanisms and follows along with the social situation, but they do not get as dramatically involved as the engager style. They speak and gesture throughout the experience, except they maintain a level of emotional distance from the ensuing drama. Partakers do not necessarily resonate with the content being represented, which is not to say they could not engage in a situation that is more interesting to them. Like all of these styles of play, the partaker style is open to interpretation and players might be interested one moment only to become disinterested the next.

For AR Façade, the difference between engagers and partakers was visible in the player's reactions. If the player was smiling and laughing throughout, even if they were saying all the right things, then they exhibited more of a partaker style of play. If the player appeared to be disturbed and emotionally "in-tune" with the characters, then we identify that as the "engager" style. To illustrate the partaker style of play, we present a case study for Player 31:

Time	Player and character statements (with notes)
1:43	Trip: Julie, remember it was exactly 10 years ago tonight you introduced us? (Player puts hands out, big smile on her face, see figure 7, upper left)
1:48	Trip: Senior year of college....
1:50	**P31:** (Player starts laughing loudly) Ha, ha... Fabulous! Something to celebrate.
1:58	Trip: We really want to thank you for years and years of...
2:02	Grace: Pain...
2:04	Trip: Ah... eh... agony...
2:07	**P31:** Pain can be good (said with a smirk on her face and then she laughs).
2:16	Trip: Yeah... ah love... yeah.
3:25	(Player turns and walks to the door and gives a big timeout signal, still smiling, see figure 7, lower right)

Figure 7. Player 31 exemplifies the partaker style of play.

Player 31 saw the AR Façade experience as something novel and out of the ordinary, so she wanted to give it a try.

> *"I was kinda like this is a cool experience, let's check it out. It was like oh, how does this work. So I was curious..." (P31)*

She was open-minded, and didn't really know what to expect. She played along for a few minutes and then quickly picked up on the tenuous tone of the characters. It was not something she wanted to take part in for very long.

> *"That's a disturbing situation (laughing) to come into, you know... and it's clearly a dysfunctional relationship. I found it hard to relate to." (P31)*

> *"You know you're walking into what is not gonna be a pleasant situation. You wonder should I just turn and maybe like say 'I got lost',.. give 'em a call on the cell phone and say, 'I'm so sorry, I came down with something' (laughing)" (P31)*

As the excerpt above relays, Player 31 said things that you might actually say to old friends in that social situation, but she kept laughing at everything that happened. During the interview she explained her tendency to laugh:

> *"Well, it's – you know what, it's almost that nervous laughter because you're trying to figure out.... you know sometimes couples play off of it and it's more fun." (P31)*

Once Player 31 realized the Trip and Grace were not actually joking around, she left the experience by signaling the timeout (see Figure 7, lower right). Not all of the players who exhibited the "partaker" style would leave quite so early, but many of them did not enjoy the experience because of the story situation, as Player 28 expressed: "It's aggravating listening to people bicker unless you're one of the bickerers... it's like listening to a baby cry. If you're not the mother, you wanna strangle that baby." (P28)

6. QUANTITATIVE SUPPORT

We have offered a qualitative assessment of play styles for immersive and interactive stories grounded in observational evidence from a single media experience, AR Façade. We analyzed only observable, "face value" behaviors of participants without looking at underlying episode statistics, story decisions, or other measurable features (such as physiological measures). The play styles constitute our interpretation of player engagement at the gallery installation of AR Façade.

Table 1. Game statistics when classifying players by play style

	Count of players	Average overall rating (35 max)	Average discourses per minute	Average episode time (min)
Engager	7	26.7	1.6	14.8
Performer	5	27.8	2.1	11.5
Tinkerer	6	21.3	1.7	15.2
Observer	5	24.0	1.1	15.1
Partaker	10	22.3	1.7	11.3
All	33	24.4	1.6	13.6

Towards understanding how different styles of play could be detected in run-time, we have grouped together players according to the style that describes them best. This exercise should be taken with a grain of salt, since many players transitioned their behavior during the course of the episode, for example Player 42 starts out tinkering around with the characters and using meta speech, then he tries to interact normally with the story, and finally during the last five minutes he doesn't interact much at all and seems to simply observe. The video coding also revealed that Player 42 encountered a number of technical disturbances while he was tinkering and then later as he tried to really communicate, Trip and Grace failed to effectively respond to him leading him to merely sit back and watch. Like many of the players, P42 transitions how he behaved during his episode based on the course of events. Nonetheless, classifying players according to play style starts to reveal some quantifiable differences (see Table 1).

Of the thirty-three participants, most players did not strongly exhibit any of the other more distinguishable play styles so they were classified as partakers (10). The others were fairly evenly distributed across the other types. For the overall player rating, highest scores came from engagers and performers, while lower scores came from partakers (as expected based on their lukewarm reception to the content) and tinkerers (perhaps indicating the experience did not do enough to support this play style).

We calculated the average number of discourses triggered by the wizard docents per minute based on the average episode time of that play style. The number of discourses are not a perfect measure of verbosity since they do not account for the variability of the wizards' ability to match player speech, however they give an idea of the amount of talking done by the players. As we expected, the observers were the least conversational, and we were not surprised to learn that the performers were the most verbose. The average episode times for partakers (11.3) and performers (11.5) were both below average, but for different reasons. Partakers were the most likely to quit the experience (comprising 5 of the 9 "player quits" endings), while performers were most likely to be kicked out by Trip and Grace (2 out of 5 "kicked out" endings).

The quantitative game statistics and questionnaire results helped to affirm our qualitative analysis. One demographic, for example, showed the partakers had the highest average age at 25.6 years, while performers were the youngest at 16.0 years old on average. It is not surprising that the youngest players—the performers who were most likely to jump right in and act silly in front of their friends—also gave the experience the highest ratings.

7. DISCUSSION

We conducted this analysis towards understanding player engagement in immersive and interactive stories. Player engagement does not mean one thing. It has different flavors, probably more nuanced than the five we have identified here. All the different styles of play could potentially result in high overall ratings of engagement or enjoyment, for different reasons. Thus an observer's experience can be as valid and satisfying as a performers. Like other prior work on play types, our work attempts to elucidate the range of behaviors that can emerge.

It would be difficult to reconcile our play styles in terms of previous descriptions of player types. Bartle's player types for example do not clearly map onto our play styles (e.g. does an engager equate to a socializer?). Our play styles capture player behavior at face-value and seek to make sense of how players engage the content. Other descriptive player models, like Bartle's exploration of MUDs, operate a different level of abstraction and relate to how players form optimal strategies appropriate for a specific game mechanic. Although AR Façade does have underlying game mechanics, the play styles described in our paper are not confined to a specific interaction or narrative structure.

While measuring a general construct of engagement might be too contingent on a clear definition of one pattern of behavior, it might be possible to detect certain styles of play in immersive and interactive stories. As we showed, low conversational activity is an indication of the observer style of play. Our firsthand knowledge of studying AR Façade suggests other paths towards detecting play styles in run-time. Simple audio level detection could detect the difference between loud performers and soft observers. Similarly, we noticed audible heavy breathing and sighs from players who were emotionally engaged in the drama. Exaggerated gestures were more likely part of the performer experience. The use of frequent repetitive gestures and statements are a potential sign of the tinkerer style of play. Short, one-word statements are more likely from observers and tinkerers. A more complex language analysis could detect whether players stay or diverge from the story context. For example, if players in AR Façade start talking about topics that are not part of the current beat and not within the scripted 'satellite' topics, they are likely to be a performer or tinkerer. Engagers and partakers are more likely to stay within prescribed story lines.

Our observations here are preliminary, but they could lead to more nuanced methods for game evaluation and to stronger player models for adaptive story experiences. The underlying interactive story architecture could also adjust to create a more satisfactory experience by playing off of these play styles. For example, if the system thinks the player is exhibiting a performer style of play, perhaps it could increase the absurdity and try to match the crazy behavior of the player. If the system detects engager play, perhaps it continues to push for the intended emotional responses and to build towards a clear Aristotelean climax. In contrast, if the partaker archetype is identified, it could allow designers to perhaps call more attention to the simulation itself (analogous to Brecht's techniques in theatre).

Immersive and interactive story experiences such as AR Façade are relevant from a behavioral science perspective because they outwardly reveal player personality. Players are not merely acting through an avatar as in most video games, they are physically and verbally enacting a scenario. The medium has potential for learning and training environments, particularly when combined with qualitative research methods that encourage reflection.

8.CONCLUSIONS

In this paper, we summarize some of the findings from a three-month gallery installation of AR Façade, an immersive and interactive story about a marriage gone awry. We present a qualitative analysis of play styles based on interviews and episode data collected from thirty-three participants. We suggest five prevalent styles of play illustrated through case-studies and supported through additional quantitive data. The five play styles operate at a level above specific content related strategies and can potentially provide a framework for evaluating other immersive and interactive stories. Moreover, if the styles of play can be identified through in-game features, they have the potential to contribute to better player models for adaptive interactive narrative. If a system could determine these styles of play as they happen, it opens up possibilities for interactive stories to more actively play off the emotional state of players.

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