

Designing Interactive Theme Park Rides: Lessons From Disney's *Battle for the Buccaneer Gold*

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Interactive theme park rides are an unusual breed of entertainment experience. Half video game, half dark ride, interactive rides have their own unique rules about what makes a good show. Disney's *Pirates of the Caribbean - Battle for the Buccaneer Gold* now at Disney Quest has been called "the best use of VR in an entertainment application - ever". This paper will discuss the tools, techniques, technology, psychology, and serendipity that made *Pirates* a hit. It will also outline general guidelines for creating interactive theme park attractions.

Key Ideas

- Interactive theme park rides are not video games, not rides, but a new medium.
- Intuitive user interfaces are crucial for interactive theme park rides.
- Put more emphasis on the real experiences, and less emphasis on virtual ones.
- People go to theme parks in small groups to have shared experiences together. Interactive theme park rides should be designed around this fact.
- Iterative design is crucial when creating new types of interactive experience.



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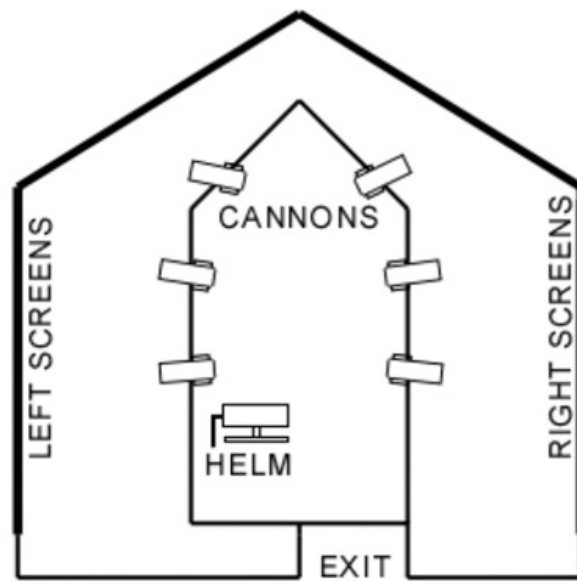
What makes designing interactive theme park rides difficult is that design skills necessary for traditional video games or theme park rides do not always apply in this new medium, and at times can actually work against you. Common video game metaphors such as cut scenes, life meters, restarting levels, and joystick interfaces are not familiar to the average group of Disney theme park goers. The traditional arcade way of learning a game by wasting a few quarters learning the rules and interface and then pumping more quarters in to continue is not feasible with an hour line waiting to play.

Because these rides are interactive, the guest is in control of their own destiny. This means the game needs to reward success and punish failure. Typical theme park attractions do not have this design constraint. On a Disney attraction, even losing must be entertaining.

The fact that *Pirates* is interactive and virtual carries with it an expectation that it will be a video game. Many guests, especially parents, have an anxiety towards video games, believing that only kids will understand or do well at them. *Pirates* overcomes this expectation with a fun, novel interface and game system that does not require any previous gaming knowledge.

Pirates Overview

Pirates is an interactive theme park ride based on the classic *Pirates of the Caribbean* attraction at Disneyland. With themes and inspiration taken from the ride, this virtual interactive experience treats four guests to an overwhelming immersive adventure on the high seas. With one guest steering at a real helm, the other three guests man six real cannons to defeat virtual enemy pirate ships, forts, sea monsters and ghostly skeletons to collect and defend as much gold as possible in the five minute experience. *Pirates* uses wrap-around 3D screens, 3D surround sound, and a motion platform boat to fully engage the guest as a pirate. Currently *Pirates* is open at DisneyQuest, Disney's virtual theme park venue, in Orlando and Chicago.



Layout of ship and screens

Interactive rides: A delicate balance.

At every turn, the design of *Pirates* was driven by the need to balance between letting the guests have control over their adventure, and making sure that each adventure is a great one. Here are the solutions we found to some of the problems created by this balancing act.

Problem: The captain might steer the ship to dull places.

We solved this problem with several techniques:

- **"Architectural Weenies"**

"Weenie" is phrase coined by Walt Disney himself. It refers to the technique used on movie sets of guiding stage dogs by holding up part of a sausage. The classic "weenie" is the castle at Disneyland. It draws the eye, and the eye draws the feet, and people walk to the castle at the center of the park. In the case of *Pirates*, we had three main "weenies", one for each island: a volcano, an enormous fort, and a plume of smoke coming from a burning town. No matter which way the boat is facing, at least one of these "weenies" is in view. Since the coolest action takes place at the islands, we want to guide the captains to go there.

- **Guide Ships**

Since the short-term goal of the game is to fire on other pirate ships, captains strive to get near these ships so that their gunners can get a clear shot. Many of the ships in the *Pirates* world are "on their way" to the islands mentioned above. Many captains, in just trying to stay near these ships find that just as they have destroyed the ship, they have arrived at one of the islands, without even trying to get there.

- **Sneak attacks**

But what if the captain ignores the guide ships? Even if he heads toward one of the "weenies" it might mean as long as a minute during which the gunners have little to shoot at. For this reason, we created special "sneak attack" ships that "magically" appear behind the players ship, and quickly pull up along side, when no other boats are in range.

- **"The Waterspout"**

This was our nickname for our "last ditch" forcefield that surrounds the gameplay area. If a captain tries to sail out of the main gameplay area and out to open sea, they hit the forcefield, and the ship is "magically" pointed back to where the action is. The few guests who see this don't even realize that anything unusual has happened. They are just pleased to have their boat going somewhere cool.

Problem: The pacing of the adventure needs to build to a climax, while still making the guests feel in control of their destiny.

The initial hook of the adventure is in the form of a non-interactive sequence where Jolly Roger the Ghost Pirate explains the roles of the captain and gunners, encourages the players to sink many pirate ships in order to get their gold, and then does a 3D close up gag, followed by a motion base gag. After that, the guests are in complete control, and the pacing of the show is mostly governed by the weenies, the guide ships, and the sneak attacks. These combine to give a nice balance between action, and short periods of calm. Guests fight the guide ships, the sneak attack ships, and the ships in other interesting encounters at the islands. Each island is a scenario, with a little story and a couple secrets:

In the "burning town" island, guests fight other pirate ships while sailing through a narrow canal with buildings and frantic townspeople on either side. At the end of the canal an enemy ship loaded with dynamite blocks the way.

In the "volcano" island, guests fight other pirate ships, but can also get bonus treasure by firing on the "treasure troves" on shore. This scenario has two possible endings. Either the volcano blows up (and blows you back out to sea) or the captain discovers the secret waterfall lagoon, which ends with the ship going over a waterfall, but "magically" falling back to the main gameplay area.



Battle for the Buccaneer Gold at Disney Quest

In the "fort" island, guests are attacked with fireballs by soldiers at the fort. An enormous gold ship (hard to sink, but worth many points) is just setting sail, guarded by navy ships.

There is only time to visit one or two of these islands in the five minute adventure, which lends to replay value.

To make the journey from one island to another more exciting than just a long sequence of sneak attack ships, we introduced a sea serpent, who attacks the ship. We timed his appearance carefully, so that some variety is provided just when it is needed. Most guests mistakenly believe that they "found him", which is great, because it is exactly what we want them to think.

We couldn't figure out how to guarantee the guests would find their way to an exciting climax, so we made the climax come to them. Jolly Roger (the host from the beginning) appears suddenly after four and a half minutes, and it turns out that he only encouraged you to do battle and gather gold so that he could steal it from you. A battle against Jolly Roger's ghost ship and dozens of flying skeletons then ensues as our ship races past jagged rocks. The host turning out to be the villain is a great surprise for the guests, and provides great storytelling economy, as one character wears two important hats. The experience ends one of two ways: either the guests defeat Jolly Roger, and enter a victory lagoon where they can now shoot fireworks from their cannons, or Jolly Roger defeats the guests, and our boat explodes as giant skulls swirl around us, and we sink to the bottom of the ocean where sharks swim over our wreckage.

Both endings are exciting, but the lose ending is really the more exciting one, to help compensate for the fact that the guests just lost the game. This way, even if you lose, you feel pretty good, because the whole thing was just so cool.

Intuitive user interfaces are crucial for interactive theme park rides.

In order to ensure the high throughput that theme parks demand, there must be no time wasted acclimating the guest to the story, interface, or game rules. One thing Pirates makes extensive use of is an incredibly rich back-story that every guest can relate to - that of being a pirate. The attraction title, music, and theming of the queue line immediately gets the guest in the correct mind-set to play. They know what to expect, what is expected of them, and can then focus on the details of the interface and game rules.

The physical interface must be easy to learn and easy to use the first time a guest plays. Pirates uses very simple, obvious interfaces like a steering wheel to steer and actual cannons to point and shoot virtual cannonballs. We decided to make the helm and cannons active while the guests are boarding the ship. This gives them a few seconds to fire off a test shot or try a turn on the wheel to acclimate to the interface before the pressure of the actual game begins. Extensive guest testing of the interface assured us the design would work with real guests.

Aside from physical interface, the communication between the guest and the game elements must be intuitive. We chose to bend reality in places where it would make the game easier to adapt to and play. Some examples include:

- We exaggerated the virtual cannonball color to an unexpected light blue color because it contrasted with most other colors in the game and thus made the cannonballs easier to see. We changed the cannonball physics during the final scene of the game to be attached to the ship because the ship moves, bumps and turns too much to keep track of your cannonball otherwise.
- In the opening scene Jolly Roger delivers an introduction on the left side of the ship. We found many guests looking to the right would not realize he was even onscreen so we slowly darkened the rightmost screens to encourage the guests to look in the direction of Jolly Roger.
- The captain's throttle can move the boat at about 90 miles per hour and turn on a dime because actual boat physics would have resulted in a very slow and boring game.
- Instead of programming what the optimal strategy for an enemy pirate ship to defeat the guest would be, the enemies were developed with rules that would provide a good show. Some examples include:
 - Staying broadside with the guest ship
 - Attacking evenly on both sides of the guest ship
 - Keeping pace with the guest ship
 - Leading guests from the relatively low action open seas into high action scripted scenarios at the islands
 - Sneaking up from offscreen when the guests had nothing to shoot at
 - Staying away from the guest ship while the serpent was onstage

By choosing to be less concerned with reality and more concerned with what was fun, we created an experience that matches guests' expectations of what being a Pirate might feel like. Therefore it is easier to adapt to, quicker to learn, and is a better show.

More emphasis on the real experiences, less emphasis on virtual.

To be successful, the ride must extend beyond what guests can get elsewhere. With the power of graphics supercomputers in video game consoles in the home, these rides simply cannot keep up with the curve to remain fresh from a visual standpoint. To be worth the price of admission, these rides must overwhelm, play to more senses, and provide a real physical experience that cannot be replicated in the living room. In Pirates, the use of a motion base gives guests a unique experience of feeling every cannonball hit, every wave, and the bites of attacking sea monsters. Localized 3D surround sound

and tactile speakers create a wide sound bed of cannonballs whizzing by, crew creaks underfoot. Strobe lights help create the explosion of a direct cannonball hit on the helm. 3D stereo glasses not only put the action in your face, but also make the projector screens disappear, creating a very convincing virtual world.



**Battle for the Buccaneer Gold
at Disney Quest**

Because guests must run from cannon to cannon to best defend their ship they get a physical experience instead of merely sitting passively in front of a monitor. Guests get social interaction from bumping into each other, taking turns on cannons, barking out orders, and negotiating the rocking ship. The feeling of being tired and practically out of breath after five minutes of plundering with your friends or family is a feeling that you got your money's worth.

In the cannon interface we had a problem that guests could fire the cannons too fast, sometimes more than 5 shots per second thus trashing the enemies before the other players could even get a chance. Software timers to keep the number of shots down created frustration because the cannon was not responding to the guest input. Instead we created haptic blocks to keep the number of shots low. By introducing some weight and friction into the firing mechanism (a pull string) it is physically hard to shoot more than once or twice per second. By solving the problem with real physical methods instead of arbitrary virtual software blocks, the game remains fair and playable. For the ambitious player with enough energy to still shoot a ridiculous number of shots per second, each rapid fire shot decreases in power after the first few shots. This keeps the game balanced between the casual players and the hard core shooters.

No one goes to a theme park alone.

In order to create a successful interactive theme park ride, it is essential to understand the mindset of the guests who will be experiencing it. While many people play video games as a way to have a rewarding solo experience free from social pressures, people almost never go to theme parks alone. Instead, they go in small groups, with the intention of enjoying shared experiences together. Many Location Based Entertainment titles suffer from failure to understand this fact. *Pirates* turns out to be a powerful shared experience, and one that many kinds of small groups can enjoy in different ways.

- Boys enjoy it in the obvious way, as an "adventure and battle fantasy" where they can pilot a pirate ship, and man powerful cannons. While they enjoy some communication, they stay very focused on the task of defeating the bad guys as skillfully as possible.
- Girls also enjoy it, but in a different way. The girls tend to help each other more, and talk back and forth between themselves a bit more. They seem to really enjoy the notion of "banding together" to protect themselves against a common enemy.
- Mothers enjoy it in ways that pleasantly surprised us. Generally, mothers at amusement parks are less interested in having a good time themselves, and are more interested in making sure the rest of the family has a good time. Piloting the pirate ship becomes an ideal task for them, because it not only affords them a good view of the rest of the family enjoying the experience, but also allows them to tune the experience (by steering the boat appropriately) to maximize fun for the family.

Two other factors strengthened the social interaction of *Pirates*:

- Shared visual and audio displays. Unlike some VR group experiences where each player has their own monitor and speakers, in *Pirates* all the players can be sure that all the other players are hearing the same things and are looking at things from nearly the same point of view. As a result, players communicate with each other in natural ways (shouting, gesturing, and pointing), that might prove less useful with independent displays.
- Shared input devices (cannons). We designed the game so that the gunners needed to move around the ship to effectively deal with the enemies. The sheer physicality of running around the ship, bumping into other players, and quickly negotiating who uses what gun when, provides a fun and natural social interaction amongst the group.

One potentially "cool" feature was cut early because of the negative effects it was having on social interaction. The original design called for a separate "map" monitor that only the captain could see. The idea was that by looking at the interactive map (which would show the entire area, and track the enemies as they moved) the captain would be able to better know where to next steer the ship, and not have to rely on nearby visual cues. The hope was that the captain would be able to use the map as a "God's eye view", glancing at it occasionally to get a better sense of what was all around him, planning where to go next, and warning the gunners of sudden attacks from behind.

Early prototypes of the interactive map showed that captains didn't use it this way at all. Instead, they either ignored it completely, or (more often) became immersed in it, playing the whole game while staring at the map, and not looking out to sea at all. This created a significant communication

disconnect between the captain and the gunners. Very often a captain "steering by the map" would confuse the gunners by shouting for them to fire on ships that he thought were good targets, but in reality were behind the ship, or out of range. Sessions would begin with a lot of:

"Shoot him!"

"Shoot who?"

"The ship on the right!"

"What ship on the right? There's nothing there!"

and end up with the captain giving up on the map, or (even worse) giving up trying to communicate with the gunners.

Getting rid of the map put the gunners and the captain in the same visual space, allowing them to have useful conversations. And while we were initially concerned that the captain "wouldn't have enough to do" compared to the gunners (which was part of the reason we introduced the map), it quickly became clear that in trying to:

- steer the ship around nearby obstacles
- navigate to distant destinations
- position the ship so that the gunners could get the best shots at enemies
- keep an eye on both sides of the ship to watch out for "surprise attacks"
- alert the gunners about these attacks

the captain had plenty to do, and he seemed to have a lot more fun doing it than when the "captain's map" was there to distract him.

Iterative design is crucial when creating new types of interactive experience.

As with any new medium, paving the frontier is a game of trial and error. To reduce the risk of designing ourselves too far down dead ends during development, we use an iterative design strategy. For Pirates we mocked up the basic show concept - steering a ship and shooting cannons at enemy ships - in less than two months. We were able to do this because we reused existing in-house software tools and hardware systems developed on previous DisneyQuest attractions. It was important to us to mock up the fun first. By using temp sounds and quick artwork prototypes we learned early on what dynamics were important to make the game work. This left almost an entire year to concentrate on perfecting the balance, script, artwork, and audio without worrying too much about the underlying game dynamics.

Throughout the development of the project we used an interpreted scripting environment written in Scheme that allowed us to reprogram the game while the attraction was running live, even while guest testers were in the middle of the game. This allowed for rapid iteration of ship behavior, cannon parameters, difficulty settings, and general development of the game logic.

Guest testing is always an important part of the process when developing interactive entertainment. Guest testing assures that the designer's assumptions are checked, game systems are properly balanced, and unpredicted social behaviors can be understood and used to enhance the game. By testing early and often, unpredicted issues can be dealt with eliminating expensive redesigns.

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