Effect of an Interactive Mobile Game on the Movement in a Queue Line at an Amusement Park

Lauren Tocci
Pawling High School Science Research Program

Introduction

Line queues:
- Waiting line of persons or vehicles [4]
- Turn-based system
- Lines=worst annoyance for theme park patrons [1]

Action of waiting in line:
- Exhausting both mentally and physically [3]
- Companies attempting to eliminate feeling waiting in line [2]
  - Interactive Experience
  - Suspended reality
- Parks exploring options to eliminate lines [2]
  - Virtual queues
  - Line reservations
  - Priority Queuing

Queuing Theory and Psychology:
- Queue needs to be a well-organized system and an appealing environment [1]
- Satisfaction= Perception-Expectation [6]
- People need to feel occupied [1]
- People are more willing to wait if the service is valuable [1]
- Future behavior is controlled by memories [10]

Guidelines established by Ledbetter et al. 2013 [3]:
- Queue design needs to foster engagement
- Environment should maintain guests' level of interest in attraction
- Queue environments should support positive affect
- Comfort should not be overlooked
- Fast Pass-Visually separate inequitable wait queues
- Line layout should facilitate interpersonal interaction
- Guests adequately informed about wait duration
- Line design should encourage feeling of consistent progression

Psychology of Waiting in Line:
- Time perception in waiting environments is very different than normal environment [3]
- Unoccupied time feels longer than occupied time [7]
- People want to get started [7]
- Uncertain waits longer than known, finite waits [7]
- Unexplained waits longer than explained waits [7]
- Unfair waits longer than fair waits [7]
- Anxiety makes waits feel longer [7]

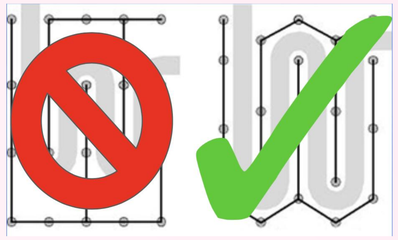
Interactive Queues:
- "Interactive queues" [9]
  - Task to occupy time
  - Involving the actions or input of a user
- "Themed queues" [9]
  - Suspended reality
  - Immersion in environment related to the attraction

Obstacles [2]:
- Expensive
- Increase onerous wait time
- Hard to entertain patrons
- Causes congestion

Role-Playing Game:
- Video game genre
- Player decides action of character [8]
- Characteristics: [8]
  - Developed storytelling
  - Narrative elements
  - Player character development
  - Complexity
  - Immersion

Literature Review

- Interactives on attraction queues trigger positive reactions
  - Heger et al. 2009
- People perceive time faster
  - Activity
  - Feeling of Progress
  - Group Feeling
    - Maister et al. 1988
- Attraction lines guided properly, increases likelihood of orderly patrons
  - James Watson et al. 2012
- Disordered and confusing lines cause frustration and impatience and chaos
  - Pender et al. 2015



http://www.jamesrobertwatson.com/quelines.html

Gap in the Research

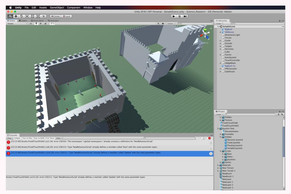
- Queue lines with games still experience congestion
- People expect park experience to grow and develop

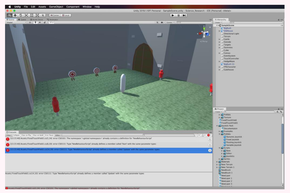
https://www.etc.cmu.edu/projects/play4life/weekly-newsletter-week-5/

Disney Command Center Aims to Keep Lines Moving - The New ...

Goal of the Research

- To provide a solution to the congestion point problem on queue lines with interactive games at a specific location
- To improve the general park experience and immerse the guest into the ride story
- To measure the riders experience and preferences based on the experience





Methodology

Location:
- Legoland New York
- Goshen, NY
- The Dragon
  - Roller Coaster
    - Steel
    - Indoor/Outdoor
    - 48 inch Rider Height Requirement
    - Ride Time: Apx 2 min

Story Line:
- "The red knights have broken into the castle and stolen the good wizard's staff! The King and Queen need you to chase the red wizard & his red dragon out of the castle, and reclaim the staff! For your efforts you shall be named champion of the realm!"

Line Design:
- Line queue game
  - Coded game
  - Progression anticipated
  - People anticipate end of game and start of ride
- QR Code at beginning of line with consent form
- Survey at end of line
  - Interactive and Non-Interactive line queue participants
  - Fast Pass riders included

Methodology

Interactive Game Design:
- Choice of adventure
  - RPG
  - Multiple endings
  - Basic quests
  - Follows story of ride
  - Mobile

COVID-19 Modified Methodology:
- Covid Game:
  - Roblox
  - Linear story
  - No player choice
- Pawling High School Science Research IRB Approved Project 11/2020
- Legoland NY Approved Project ?/2021
- Physical Queue:
  - Line in Park with Social Distancing Markers
    - n=6
  - Participants required to wear facemask
  - Waited in line for themed skating night
- Virtual Queue:
  - Held with an elementary school class
    - n=10
  - Kids waited in groups
  - Participated in virtual roller coaster
- Survey:
  - Survey people on the experience of the queue
  - Questions include:
    - Time perception
    - Demographic
    - Experience
- Data Analysis:
  - Analyze data for common experiences
  - Use data to see if game kept up a good environment while preventing congestion
  - Results of survey dictate the results of the experiment

Results

Both experiments:
- All participants under 18
- 100% of participants enjoyed the mobile game provided
  - Some offered ways to improve

Physical Queue:
- Average predicted wait time: 4.6 minutes
- 60% believed waited a shorter time than estimated
- 40% believed waited time that was estimated

Virtual Queue:
- Average predicted wait time: 14.9 minutes
- 40% believed waited shorter time than estimated
- 60% believed waited longer time than estimated

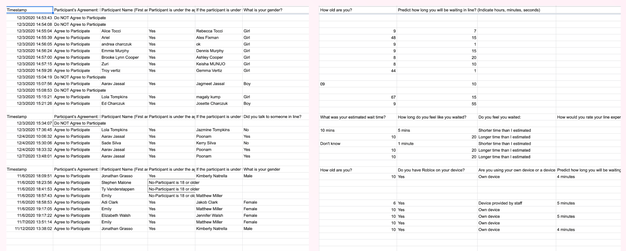
Data Analysis:
- ANOVA test on Jamovi, Perception v Expectation
  - p value of 0.072

ANOVA

ANOVA - How long do you feel like you waited?

	Sum of Squares	df	Mean Square	F	p
What was your estimated wait time?	305	4	76.3	3.01	0.072
Residuals	254	10	25.4		

[3]



Discussion

Guests in participating in physical interactive line queue:
- Had positive experience
- Reported decreased perception of wait time
- Decreased line congestion

Guest factors influence line congestion:
- Pace
- Amount of Guests
- Attention

Guests in participating in virtual interactive line queue:
- Had positive experience
- Reported increased perception of wait time
- Decreased line congestion
- Experiences may have differed due to suspended reality

Significance:
- Research could influence park design and experiences for guests
- Increase the attendance amount and ride participation

Limitations:
- Covid-19
- No control over other negative factors
- Enjoyment is subjective

Conclusion

Goal of the Research:
- Provide improvements to congestion points and time perception guest issues by using an interactive game design

Outcomes:
- Riders who participated in the physical queue perceived time shorter while the virtual perceived time longer while both had a good line experience

Applications:
- Incorporating interactive line queues into a variety of line experiences
  - Amusement park queues
  - TSA
  - Restaurants
  - Retail

Future Research

Expand on Interactive Line Queue:
- Decreasing wait times
- Unique Gaming Experiences
- Technological Exploration of Game Design
- Incorporating interactive line queue designs into variety of line experiences

Acknowledgements

- Gillian Rinaldo
  - Experiment Design and Analysis
- Brynn Gelerman
  - Game Design and Guidance
- Ty Vanderstappen
  - Guidance in amusement industry
- Stephen Malone
  - Game Design and Guidance
- My friends and family
  - Support
- My science research peers

https://www.legoland.com/california/landing-pages/lego-friends/

References

[1] https://disneyworld.disney.go.com/attractions/magic-kingdom/space-mountain/
[2] Heger, Chris, et al. "Waiting as Part of the Fun: Interactive Gaming in Theme Park Queues." Waiting as Part of the Fun: Interactive Gaming in Theme Park Queues, 2009, doi:10.31274/etd-180810-3416.
[3] Ledbetter, J. L., Mohamed-Ameen, A., Oglesby, J. M., & Boyce, M. W. (2013). Your Wait Time From This Point Will Be . . . Ergonomics in Design: The Quarterly of Human Factors Applications, 21(2), 22-28. doi:10.1177/1064804613477100
[4] Queue. (n.d.). Retrieved May 20, 2019, from https://www.merriam-webster.com/dictionary/queue
[5] Maister, D.H. (1988), "The Psychology of Waiting Lines", in Lovelock, C.H. (Eds),Managing Services: Marketing, Operations, and Human Resources, Prentice-Hall, Englewood
[6] Watson, J. R. (n.d.). Better design of Queue Lines. Retrieved May 20, 2019, from http://www.jamesrobertwatson.com/quelines.html
[7] Swift, J. (2018, September 17). Waiting in Line. Retrieved May 20, 2019, from https://research.cornell.edu/news-features/waiting-line
[8]Rollings, A. (2003). Andrew Rollings and Ernest Adams on Game Design - Andrew ... Retrieved May 24, 2020, from https://books.google.com/books/about/Andrew_Rollings_and_Ernest_Adams_on_Game.html?id=Qc19ChiOUI4C
[9]Albert, S. (2019, June 7). The interactive and themed queues of Disney World. Retrieved May 24, 2020, from https://wdwprepschool.com/the-interactive-and-themed-queues-of-disney-world/
[10] Ledbetter, J. (2016). Interactive Amusement Park Queues: Examining the Indirect Effect of Task Work Load on Guests' Perception of Wait Duration Through Task Immersion. Electronic Theses and Dissertations, 2004-2019, 1-151.