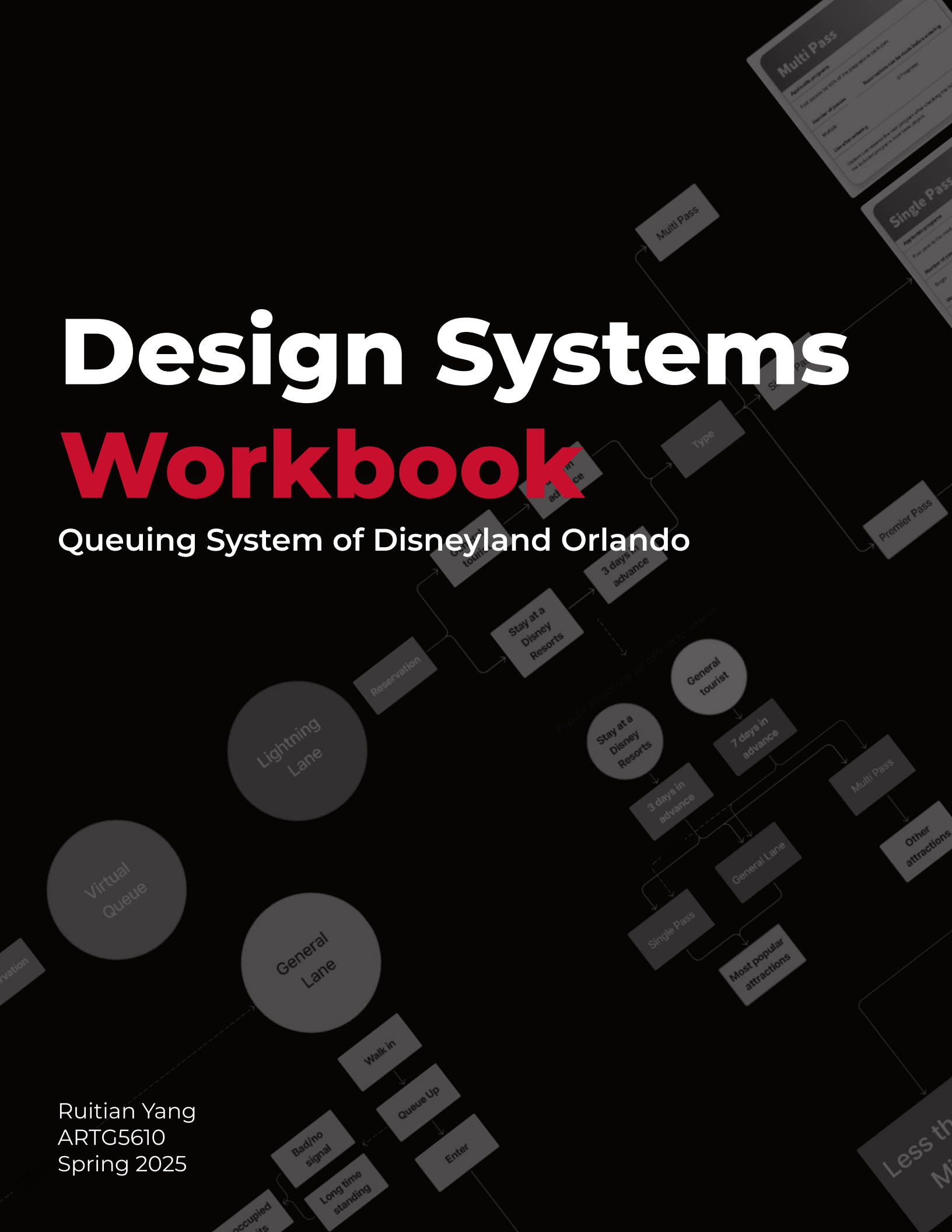
Design Systems Workbook

Queuing System of Disneyland Orlando



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INTRODUCTION

This workbook documents my progressive personal project “Queuing System of Disneyland Orlando”. It explores the composition of the queuing system at Disneyland Orlando, analyzing its existing problems and redesigning it into a gamified interactive experience.

The study began with an investigation of the existing queuing system at Walt Disney World Orlando. I analyzed the structural and behavioral dynamics of traditional queuing systems, lightning lanes, and virtual queuing systems, exploring issues such as unequal access to reservation systems, overcrowding, and long, aimless waits. While guests staying at Disney resorts can book in advance, regular visitors face disadvantages and often

return disappointed. Even with innovations such as virtual queues and “lightning lanes,” most people still have a hard time getting on popular rides.

To better understand this system, I mapped out a diagram of how Disney queues at attractions and analyzed the impact of information flow, emotional rhythms, and spatial design on visitor behavior. I also studied behavioral responses to passive queuing, focusing on emotional fatigue, distraction, and perceived fairness.

These insights led me to design a prototype for an interactive queue-enhancing experience that is built around AR-enabled object collection. The goal was to transform unstructured wait time into a progressive, immersive and rewarding journey that emotionally engages the user while providing moments of surprise and delight. The project is a systemic intervention based on user-centered research and iterative design.

DESIGN AS A SYSTEM

How is design a system and what systems constitute its practice?

01

DESIGN AS A SYSTEM

At Disneyland, queuing is not just a simple waiting process, but a systematic practice of behavioral control and emotion management through design intervention. A queuing system, on the surface, is the organization of passageways and the display of information, but in essence, it organizes the behavioral rhythm, expectations, and resource allocation of visitors. Within the framework of systems thinking, design itself can be understood as a systematic activity that not only organizes elements but also regulates the relationships between them to serve a specific goal.

Donella Meadows pointed out in *Thinking in Systems*:

"A system must consist of three kinds of things: elements, interconnections, and a function or purpose." Applying this theory to the Disney queueing experience, we can see that elements include physical entities such as reservation entrances, channels, app interfaces, service staff, and virtual ticket types; interconnections refer to the flow of information, logical judgments, reservation rules, and user behavior feedback; while the purpose of the entire system is to enhance visitor satisfaction with the experience, regulate on-site congestion, extend visitors' stay duration within the park, and promote consumption—all without increasing resource costs.

Therefore, Disney's queue design is not merely an arrangement of individual interfaces but a multi-layered behavioral system design. It guides visitors' pace and expectations through structured mechanisms while subtly regulating order and experience issues caused by dense crowds. Visitors are not free-acting individuals but behavioral nodes that are guided, categorized, and fed back into the system.

SUBSYSTEMS OF THE QUEUE EXPERIENCE

The “design practice” of Disney's queueing system is actually composed of multiple subsystems that collaborate with each other and are nested in layers. Each subsystem is responsible for specific tasks and works together to complete the entire experience process. From a system architecture perspective, these subsystems are not simply a stack of functions, but a combination of systems with logical flow between them.

VIRTUAL QUEUE SYSTEM

Visitors need to enter the app at fixed times each day (e.g., 7 a.m. and 1 p.m.) to secure virtual spots for popular attractions. While this mechanism reduces physical space occupancy during queuing, it also creates high psychological pressure due to the scarcity of spots and the urgency to secure them. Users must complete the process within a very short timeframe; otherwise, they will lose their queueing eligibility.

Reservation Opens

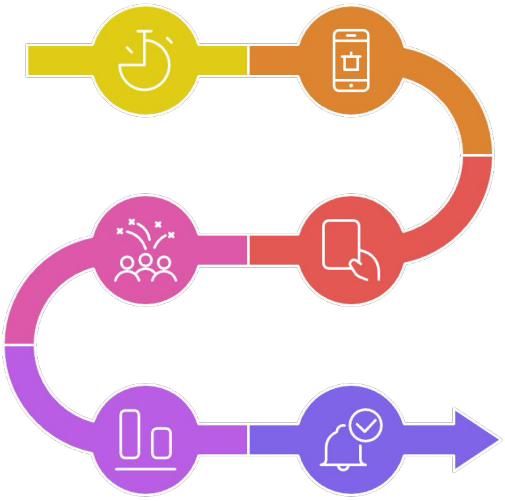
7:00 AM / 1:00PM

Confirm Party

- The app prompts users to confirm their party members
- Once confirmed, users receive a boarding group number.

Queue Status Monitoring

- Users can track their boarding group status in the "My Queues" section of the app.
- The app provides updates like “Now Boarding Groups: 45 to 48” and estimates when the group will be called.



Open the App

- Users must enter the official My Disney Experience app before the release time.
- Once the queue opens, the user navigates to the Virtual Queue section.

Grab a Ticket

- As soon as the clock hits the release time, users must tap quickly to secure a spot.
- The process often completes within seconds due to extremely limited capacity.

Notification and Entry

- When it’s the user’s turn, the app sends a notification (if enabled).
- The user proceeds to the attraction at the specified return time, scans the digital ticket, and enters.

LIGHTNING LANE

The system sets up tiered lanes for visitors with different payment capabilities. By purchasing various levels of “fast tickets,” visitors can skip the regular queueing process. This mechanism was originally intended to optimize the diversion effect for high-demand attractions, but in practice, it has created a systemic class structure: hotel guests vs. non-hotel guests, paying visitors vs. non-paying visitors, with distinct tiers in their experience.

Identify Eligibility and Reservation Time

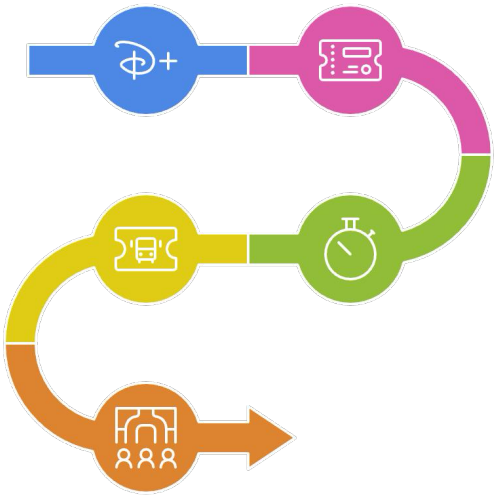
- Stay at Disney Resort: 3 days in advance.
- General tourist: 7 days in advance.

Access via App

- View available times for attractions.
- Select parks and dates.
- Confirm and activate passes.

On time arrival

Visitors queue at Lightning Lane entrance



Select Pass Type

Visitors must select from three Lightning Lane pass types

Specific time slot

Make reservation and choose the time to access

INFORMATION DISPLAY SYSTEM

All feedback (appointment time, queue status, remaining slots) is communicated to visitors through the app. However, due to limited refresh rates and information not always being real-time, the system often experiences information delays during peak periods, causing visitors to rush forward and exacerbating congestion.

PHYSICAL QUEUEING CHANNEL

This includes ground-level guidance lines, shade structures, wheelchair access, and interactive elements, which are the physical spaces where users experience waiting. In design, these spaces not only serve functional purposes such as queuing but also play a role in managing emotions (e.g., hiding actual queue lengths, setting dynamic guides, etc.).

Although these subsystems serve different objectives such as spatial, temporal, and informational guidance, they are interconnected through users' behavioral paths, forming a highly integrated service system.

SYSTEM INTERCONNECTIONS

The various subsystems in the Disney queueing experience appear to be clearly divided and function independently, but they are actually closely connected through visitor behavior paths and system feedback mechanisms, forming a highly coupled, behavior-driven experience ecosystem.

Take Virtual Queue and Lightning Lane as examples. Although they are parallel reservation channels in structure, they are highly dependent on the feedback behavior triggered by user failure or success at a certain node. When visitors fail to secure a spot in the virtual queue at a fixed time (e.g., 7 AM or 1 PM), they often immediately switch to the paid option, Lightning Lane. In other words,

the scarcity of the Virtual Queue creates a demand scenario for Lightning Lane, which is itself a systemically connected mechanism with motivational guidance.

Lightning Lane is further divided into multiple tiers such as Single Pass, Multi Pass, and Premier Pass, each serving different attractions with distinct reservation rules. Whether users can obtain access to the desired attraction after failing to secure a spot in the virtual queue depends on the system's reservation time release rules: whether they are hotel guests, whether they have the correct timing for the operation, etc. These factors form a complex access hierarchy that not only mobilizes time and financial resources but also creates further stratification in behavioral pathways.

Meanwhile, the information display system (app) serves as the central hub for the entire system's interactions. It not only displays real-time waiting times, remaining slots, and reservation statuses but also acts as the critical link between user actions and system responses. Every decision users make relies heavily on the timeliness and accuracy of the information displayed in the app. If the app's information is delayed—for example, if waiting times are not updated or the status of a particular attraction is not refreshed—it can lead to a large number of visitors making the same choice during similar time slots, triggering internal system congestion.

Additionally, the physical queue system (Physical Queue Channels) is not an independent solution but the final, yet most directly impactful component of the entire system in terms of user experience quality. When users cannot make

reservations or pay for access, they are automatically redirected by the system to physical queues. These queuing areas typically bear the brunt of system load and are where visitors most acutely feel the disparity in experience. Long waiting times, lack of transparency regarding progress, and environmental pressure are all results transmitted from upstream system mechanisms. We can say that physical queues collect user behavior feedback that is not prioritized within the system, and this in itself exacerbates experience disparities within the system.

Finally, it is worth noting that these subsystems are not in a stable linear relationship but rather a highly dynamic multiple dependency system. System designers do not directly control visitors' behavioral paths but instead guide visitors to self-regulate between subsystems through the design of different mechanisms, such as information disclosure timelines and reservation rules. Every behavioral transition may trigger changes in system state, and these changes, in turn, influence users' subsequent decisions and path selections.

Therefore, Disney's queueing system is not a simple combination of functional modules, but a dynamic network that continuously adjusts based on visitor behavior. It relies on information flowing between different modules to enable visitors to make choices, and then redistributes resources based on these choices. This system is not fixed, but continuously learns and adjusts based on actual conditions.

SYSTEM ANALYSIS AND INTERVENTION

How systems can be identified, regulated, evaluated, improved, perfected, disabled and disrupted?

02

IDENTIFYING SYSTEM PATTERNS

In analyzing the queuing system at Disney's Orlando parks, we can begin by identifying a variety of typical systemic patterns. The essence of this system is to manage the tension between limited experiential resources (e.g., ride opportunities for popular attractions) and virtually unlimited guest demand. The system is internally composed of multiple subsystems, including traditional physical queues, virtual queuing systems (Virtual Queue), reservation systems (Lightning Lane), and information display platforms (apps that update in real time), which work together to regulate the flow of tourists through the different zones and waiting.

A notable pattern is the positive feedback loop: when

tourists see a popular program with a short wait time through the app, they will quickly rush to that program, resulting in an instant increase in wait time. This cycle of "low wait time induction - tourist explosion - congestion again" creates a nonlinear oscillation.

In addition, there is a delay effect. Tourist behavior is based on the queuing information provided by the system, but due to the delay in data refresh (non-real-time information flow), the queuing situation has already changed when the tourists actually arrive. This decision-making lag is especially obvious during peak periods, and is one of the important factors leading to the sudden filling of local areas.

Through the above analysis, it can be seen that the Disney queuing system is not static, it shows typical dynamic changes, self-regulation and non-linear feedback characteristics.

REGULATING AND EVALUATING

In response to the complex patterns in system operation, Disney has adopted a variety of regulating means to try to maintain the overall order of the system and the quality of visitor experience.

First, the Virtual Queue system is an important regulating tool. By opening reservation slots for limited periods of time, the long queues that would otherwise be visible offline are transferred to the digital space, thus reducing crowd density in the physical environment. This approach reduces the actual pressure on access and entrance areas to a certain extent and improves the perception of congestion.

Secondly, the paid prioritization system (Lightning Lane) introduces a mechanism for visitors to voluntarily purchase fast passes. The system optimizes the overall flow rate by regulating prices and diverting a portion of tourists willing to pay in advance out of the general queuing lanes. This kind of regulation based on market mechanism can theoretically reduce the burden of the free queuing system, but it also inevitably introduces a new social stratification problem.

However, from the perspective of evaluating the system, there are still significant limitations in these regulation strategies. First, there is a lack of information transparency: although tourists can view real-time waiting times via apps, the limited frequency and lag of data updates often exacerbate localized confusion as tourists make decisions based on outdated information. The second is the cumulative effect of negative experiences: for visitors who fail to make reservations for popular programs, repeated unsuccessful attempts and seeing "reservation is full" or "unable to enter the queue" prompts will gradually accumulate negative emotions and reduce overall satisfaction.

Another is structural asymmetry. Because guests staying at Disney-owned hotels can make reservations for popular attractions (e.g., Cosmic Rewind, TRON Lightcycle Run, etc.) earlier in the day, while regular guests can only grab tickets in real time on the same day, the system is designed with a specific prioritization mechanism built into the system early in the process. This setting is gradually reinforced by feedback mechanisms, creating an implicit "privilege loop": early bookers have a

better experience, while late entrants are marginalized, thus exacerbating the stratification of the experience.

In addition, when dealing with abnormal flows during peak periods (e.g., during holidays and major celebrations), existing regulatory mechanisms lack sufficient flexibility and dynamic responsiveness, resulting in the system often being overloaded for short periods of time. As Joël de Rosnay emphasizes in The Macroscope, "the key to managing complex systems lies in regulating flows and delays effectively." and in this regard, Disney's queuing system still has significant room for optimization.

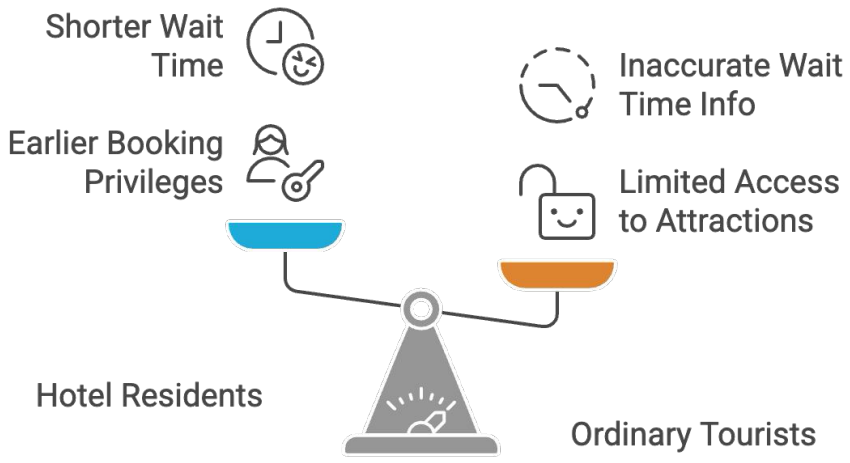


Figure 8. Balancing Tourist Experiences in Theme Parks *Created by Author.*

IMPROVEMENT, DISABLING AND DISRUPTION

Disney's queueing system integrates physical and digital mechanisms to manage and regulate large crowds on multiple dimensions. However, even so, there are still some systemic issues and pressure points. From a systems thinking perspective, we can clearly identify which structures can be improved, which mechanisms should be further optimized, which mechanisms should be weakened or disabled, and whether there is a possibility of disruption.

IMPROVEMENT

Although the Disney app provides real-time queue times and a virtual queue mechanism, there is room for improvement in terms of information transparency and system response speed. The current system is updated infrequently, and the queue information received by visitors does not always match the actual situation on site, especially during peak hours, when this information delay can mislead users into making irrational “swarming decisions.” More frequent data refreshes and more visual congestion trend alerts (such as heat maps and queue length trend curves) can help visitors make decisions. These improvements will not only enhance the user experience, but also make the internal flow of the system smoother and reduce pressure on bottlenecks.

The virtual queue mechanism (Virtual Queue) was originally designed to reduce physical waiting pressure, but it has also raised another issue: the number of slots is extremely limited, and users must “race against the clock” to secure a spot within a fixed timeframe, resulting in low success rates and a strong sense of frustration. Many ordinary visitors, even when strictly adhering to the opening times, often face “full capacity” or “queue failure” outcomes. This mechanism essentially creates a single high-pressure feedback node within the system, concentrating all user expectations at a single entry point, resulting in significant psychological disappointment and uneven resource allocation.

DISABLING

The current virtual queue system replaces traditional physical queuing with “invisible waiting.” While this appears to solve the issue of space occupancy, it also makes the waiting experience abstract and fragmented for visitors. The inability to see progress and the lack of a sense of participation have become new pain points for the system.

The system can be redesigned to reintroduce elements of “visualization of waiting” and “sense of process,” such as dynamic progress bars, visualization of virtual queue paths, and phased feedback during waiting (e.g., indicating the current position in the queue). These feedback mechanisms do not affect the main process but can compensate for the human-centric perception channels obscured by technical logic.

DISRUPTION

The more fundamental issue lies in the core logic of the current queuing system, which is still based on “first come, first served.” At the system design level, this structure inherently amplifies competition and uncertainty, especially for ordinary visitors who are unfamiliar with the system rules, easily leading to a marginalized experience.

To truly disrupt this model, we can envision a completely different resource allocation logic: for example, a trigger mechanism based on dynamic participation behavior,

rather than purely snatching entry slots. Specific approaches include: the system observes visitors' behavior on a given day (such as whether they participate in less popular activities or follow prompts to explore other areas) to dynamically unlock reservation opportunities for popular activities. Alternatively, when a certain crowd density is reached, the system automatically opens a "temporary opportunity window" instead of releasing slots at a fixed time. This mechanism would shift the system from a "race for spots" logic to a positive feedback loop of "contribute participation → generate eligibility."

This change would fundamentally break the unequal distribution of experiences currently embedded in the system, where 'speed determines experience,' and return to a more balanced, dynamic, and participatory system principle. As Donella Meadows said, "Changing the rules of the system has far more leverage than tweaking its parameters." Meadows_Thinking in Sys... True system disruption is not about major visual or technical changes, but about reconstructing the relationship structure between users and the system through changes in distribution logic and feedback rhythms.

In summary, the issue with Disney's queueing system is not whether it is sufficiently intelligent, but whether it is sufficiently balanced. Through localized improvements, appropriate functional reductions, and a systematic reconstruction of the distribution logic, we can drive this large-scale experiential structure toward a more inclusive and resilient direction from a systemic perspective.

INTEGRATION

What is a practical example of the relationship between design process and systems thinking from your work this semester?

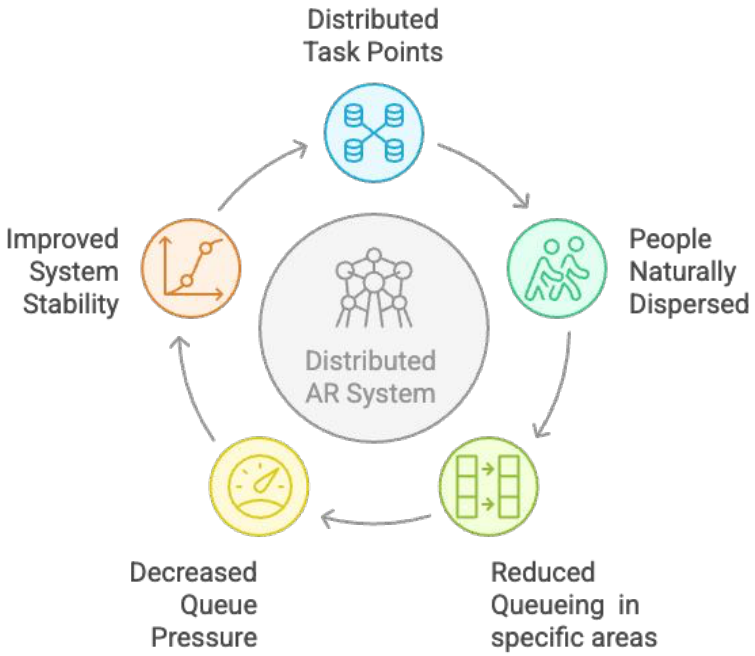
03

INTEGRATION IN PROGRESSIVE PERSONAL PROJECT

In this project, I tried to use a systematic approach to understand and design a very specific experience scenario: Disney's queueing system. This seemingly small problem is actually a very typical complex system—it involves not only spatial arrangement and crowd management, but also visitors' decision-making behavior, information acquisition and response, the distribution logic of technical systems, and the emotional changes that occur during the waiting process. It is not a single problem, but rather a set of mechanisms and how they work, as well as their impact on the user experience. After analyzing the existing queue structure, I did not choose to “redesign” the system, bu
t instead approached it from a very specific angle:

I wanted to change the visitors' perception of queuing without disrupting the existing process. I designed an experience called Queue Quest, which incorporates AR interaction points along the queue route, allowing visitors to collect virtual items via their phones while waiting. Upon completing each collection task, they unlock an illustration. This mechanism breaks down the lengthy, monotonous queueing process into smaller, goal-oriented tasks, making visitors feel like they are "making progress" rather than "wasting time."

This interaction is essentially a small system intervention. I utilized two key mechanisms within the system. The first is negative feedback: because the AR points are scattered throughout the queue, they naturally guide visitors to spread out, thereby alleviating congestion in popular areas.



The second is positive feedback: every time a user completes a collection goal and receives achievement feedback, their motivation to participate is activated. This process itself is like a small loop that continuously drives users to continue participating.

I did not force users to experience the content in a specific order, but allowed them to freely choose their own route. This non-linear participation structure is actually inspired by Capra's idea that “life systems are networked.” Rather than a central control point governing everything, users freely combine multiple nodes to construct their own participation rhythm.

Another aspect of this project that I find particularly noteworthy is that it addresses the systemic inequalities we analyzed earlier. For example, hotel guests can book popular activities in advance, while ordinary tourists find it difficult to secure a spot, turning the queueing experience

difficult to secure a spot, turning the queueing experience itself into a hierarchical structure. I can't change this system, but I hope to use design to alleviate the frustration it causes. Queue Quest offers a parallel yet meaningful participation path. Even if you can't secure a ticket or access the fast lane, you can still gain a sense of control and achievement while waiting in line. As Buchanan noted: “Wicked problems cannot be definitively described, and every solution leads to new problems.” Buchanan_Wicked Problem…——Design may not solve the fundamental problem, but it can redefine the experience within the existing system.

In terms of the design process, I also proceeded step by step in a systematic manner: first analyzing the system structure (information flow, behavior paths, resource entry points), then identifying pressure points and potential gaps for intervention, and finally designing small but continuous behavioral nodes to guide changes in the overall experience rhythm through these small interventions. Ultimately, I realized that design isn't always about creating a “new system.” Sometimes, it's more important to understand the existing system and know where to make a small change to create a different experience.

CONCLUSION

Manifesto – a declaration of my beliefs about design and systems

04

WHAT I BELIEVE

If there is one thing I have learned most important in this project, it is that design is not just about solving a problem, but about engaging in a dialogue with a system.
It is not about pulling users out of chaos, but about finding rhythm within chaos and breathing space within structure.

I no longer view the system as a restrictive framework for design, but as something that can be identified, adjusted, and even played with. The work of design is not to create an idealized new world, but to create different paths of experience within the existing system. Change doesn't have to be big; sometimes all it takes is a new rhythm or a new feedback point to make people feel a little warmth and a sense of control within the system.

I believe that good design does not make people forget the system, but rather helps them find their place within it.

It is not about hiding the wait, but about redefining the meaning of waiting. It is not about making people “wait faster,” but about making them “wait lighter, wait worthier.”

The design I want to create is:

- A design that can be absorbed by the system without being swallowed by it;
- A design that does not force change but can quietly alter the structure of experience;

- Not just smooth-looking, but design that feels right in its behavioral rhythm;
- Not design that makes users feel oppressed, but design that makes them feel like they are part of it.
- Design should be a gentle yet persistent form of system intervention.
- It is not the answer to all problems, but a language that reconnects people with the system.

APPENDIX

05

FIELD STUDY REPORT

Name: Ruitian Yang

Date: February 5, 2025

Form:

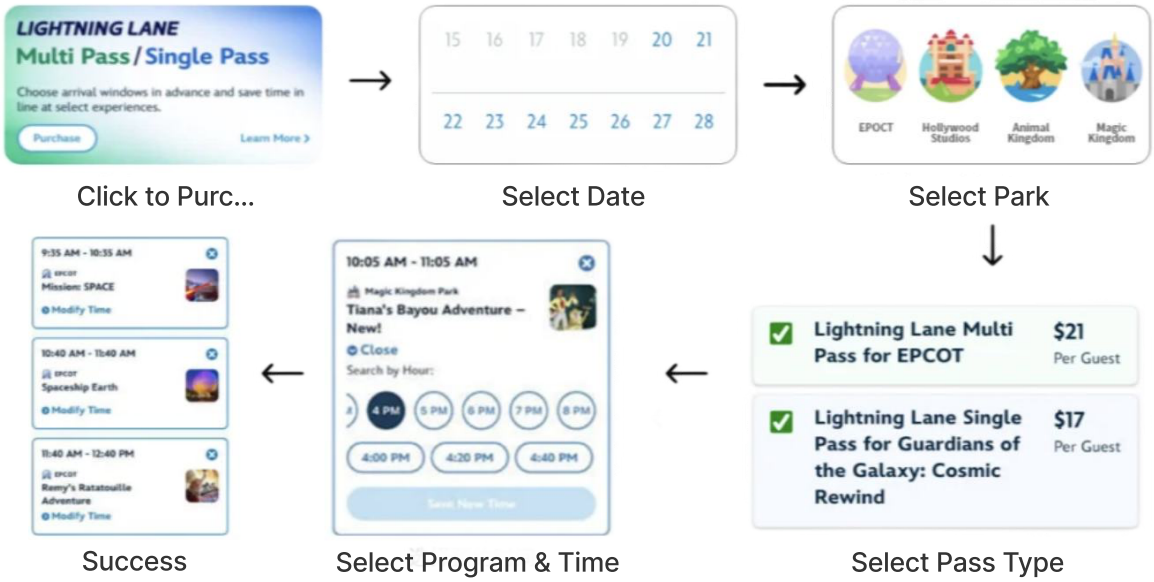
Queuing system for Disneyland (Magic Kingdom)

Single pass:

- Single Use: Each purchase is valid for one specific popular ride only.
- Reservations Required: Guests are required to select an available return time slot in advance and then visit the ride during that time slot.
- Daily Limit: A maximum of two Single Passes may be purchased per day per guest, but cannot be used on the same ride.
- Purchase time: 3 days in advance for regular guests and 7 days in advance for those staying at a Disney Resort.
- Price Range: $20–29

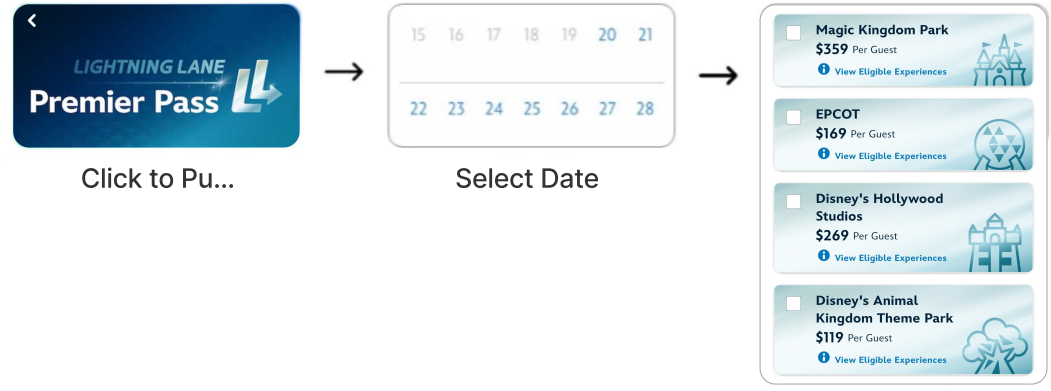
Multi pass:

- Multiple Use: Once purchased, Fast Passes can be booked for multiple designated rides in a single day.
- Reservation Required: Visitors can select up to three ride return times in advance. After using the first reservation, it is possible to continue to book other available rides, depending on the remaining availability for the day.
- Exclusion of specific popular rides: Some of the most popular rides (e.g. TRON Lightcycle Run, Seven Dwarfs Mine Train, etc.) are not included in the Multi Pass and require a separate Single Pass.
- Purchase time: 3 days in advance for regular guests and 7 days in advance for those staying at a Disney Resort.
- Price: $10–21/each



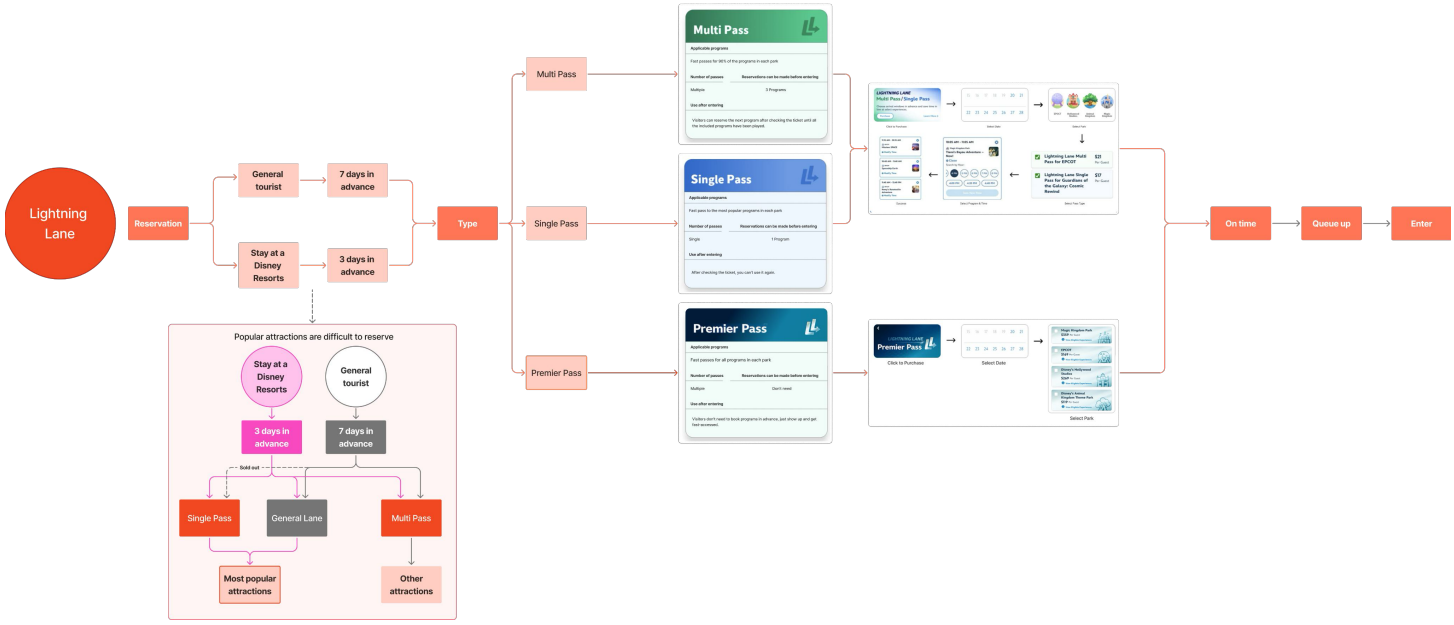
Premier Pass:

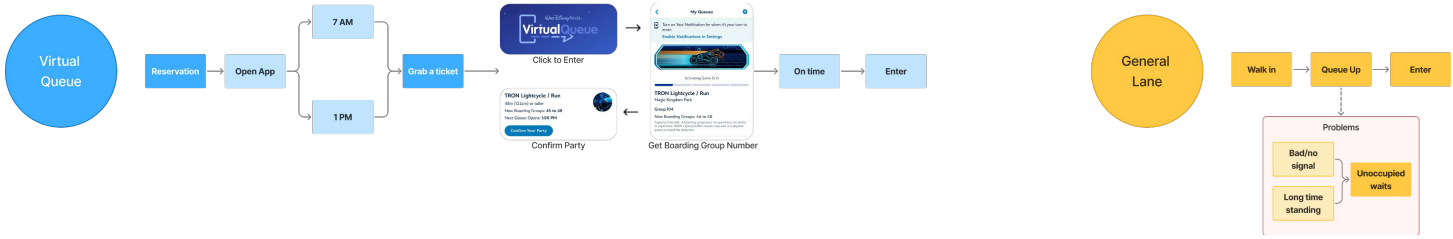
- Full Access: Allows guests to use all Lightning Lane rides in their chosen theme park once each, including all rides covered by Single Pass and Multi Pass.
- No Reservations Required: Unlike other passes, Premier Pass holders do not need to choose a return time in advance and can visit the ride at any time and enter through the Lightning Lane entrance.
- Purchase Restrictions: Quantities are limited and require the purchaser to be staying at a Deluxe Resort.
- Purchase time: 7 days in advance for visitors staying at a Disney Resort.
- Price: $450



Click to Pu... Select Date Select Park

Systems:





Insights:

Insufficient supply of Single Pass

- Guests staying at Disney Resorts have the right to book up to 7 days in advance, while regular guests can only grab them 3 days in advance, resulting in popular programs being gone as soon as they open.
- Disney is intentionally controlling the number of Single Passes to drive up the value of Premier Passes, forcing guests to consider more expensive options.

Multiple Pass excludes the hottest programs

- Disney knows the items that guests want to visit the most (e.g. Seven Dwarfs Mine Train, TRON Lightcycle Run, etc.), so it makes these items only available for purchase

through Single Passes, increasing the extra spending for guests.

- Since these items are not available, people using Multiple Passes are diverted to the less popular items, and the popular items are instead harder to queue for.

The queue time estimation system is biased:

- Some programs do not have phone reception in the waiting area to get an update on wait times.
- Disney's estimated queue times are based on queue data from past periods, the flow of guest cell phone data, and equipment operation.
- However, if there is a sudden surge in attendance, a brief technical failure of a project, and people are stranded in the queue area (e.g., mobility-impaired guests needing special arrangements) it could result in actual queue times far exceeding the app's projections.

Ideas:

Disney's FastPasses (e.g. Genie+ and Lightning Lane) currently suffer from complex purchase processes, opaque rules, and unavailability of popular items, which affects the visitor experience. Optimization directions could include simplifying the purchase process, providing clear rule descriptions, a fairer allocation mechanism, and reducing reliance on mobile apps.

Long queuing time is also a major pain point for visitors, limited by factors such as high visitor volume, single

queuing method, and poor queue management. Improvement directions could include increasing the interactive experience in the queuing area (e.g., mini-games), and dynamically adjusting the ratio of normal queuing and fast pass.

Intervention:

Interactive Storytelling/Gamification

- Introduce Augmented Reality (AR) elements through the Disney app to allow guests to unlock exclusive character interactions, virtual scavenger hunts or storyline expansions related to the attraction.
- Install interactive displays or motion-activated projections that react to guest actions, similar to the queue for Harry Potter and the Forbidden Journey at Universal Studios.
- Develop queue-exclusive mini-games that can be accessed via smartphone, where guests can collaborate or compete in attraction-related themed challenges.
- Experience Enhancement:

Make the wait more engaging so that visitors perceive the queue as part of the entertainment rather than an inconvenience.

- Interactive elements can distract from long waits, thus improving the overall experience.
- Themed interactions enhance the immersion of the program, allowing visitors to begin the experience before boarding the ride.

Setting up additional paid unlocking options

- Each Multiple Pass contains at least one most popular item.
- This famous item can be randomly assigned by the system or selected by availability within a certain time period to avoid everyone grabbing the same one.
- If Disney still wants to maintain the commercial value of the Single Pass, they can offer Multiple Pass users a “Hot Program Supplemental Option” in exchange for Lightning Lane status on a high-demand program.
- Experience Enhancement:
- Increase the value of the Multiple Pass so that visitors actually “cut the line”
- Not make it impossible for the average tourist to grab the popular programs at all

Add time alerts within the queue line

- Adding “Dynamic Wait Time Alert” displays to the queue paths, these screens will show updated estimated wait times in real time, allowing visitors to judge whether to continue in the queue or exit.
- For some longer queuing areas, wait time update notification can be played to reduce visitors' anxiety due to “unknown waiting”.
- Experience Enhancement:
  - Make visitors in the queue more aware of what they're waiting for
  - Make decisions ahead of time rather than passively accepting the agony of extra long times