DinoFun World Investigation

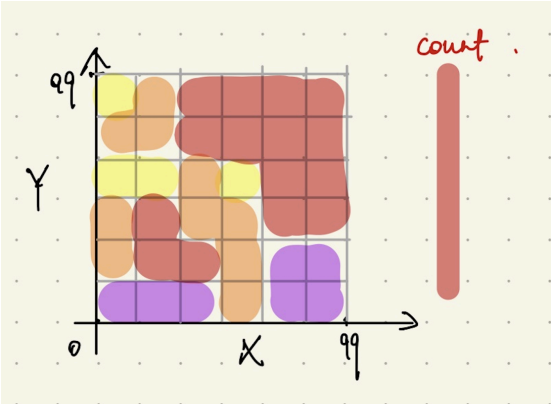
Linh - Robbie - Yijing - Yuzhang

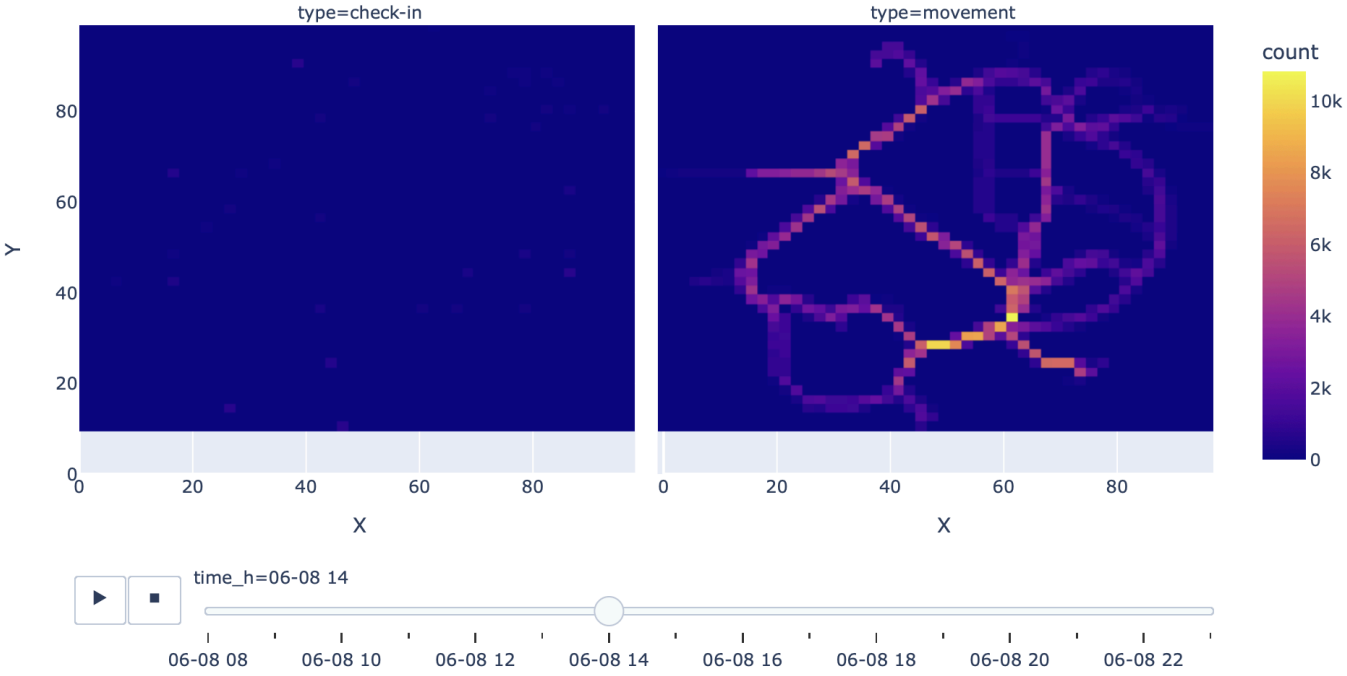
Objectives

The objective of this analysis is to use multiple view visualizations to explore the movement and communication data of park visitors, uncover patterns in the crowd behavior, and identify potential suspects linked to the crime. We aim to offer a comprehensive view of visitor dynamics and key events over the course of the Scott Jones Weekend.

Findings

a. Movement Density over Time





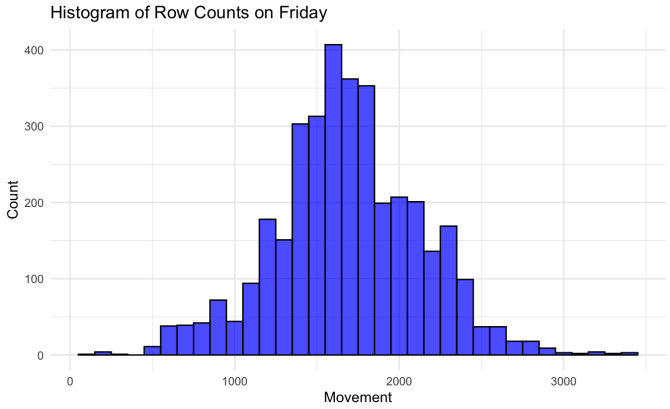
First, we aimed to gain a comprehensive view of the park movement data for the weekend. The heatmap above represents the park's coordinates on a 100 × 100 scale, with facets based on the type of data: check-ins or movement. The grid is color-coded by the frequency of occurrences at each coordinate at a given time—darker shades represent lower counts, while lighter shades indicate higher counts. Additionally, we incorporated a time slider into the plot, where each time point corresponds to an hour.

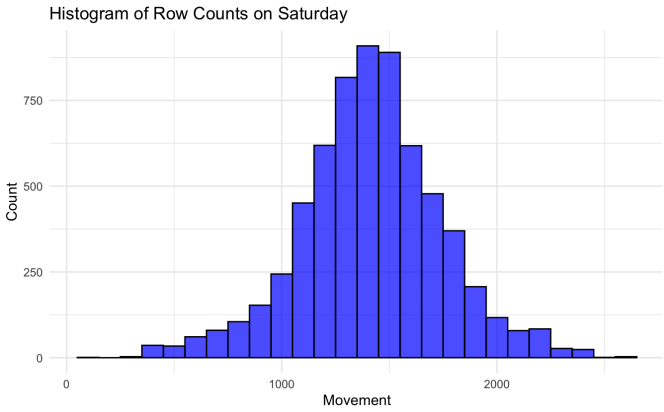
Among the three days, the number of visitors peaked on Sunday, with over 10,000 recorded movements on June 8th at 2pm. Despite this, the daily movement patterns remained relatively consistent. In the mornings, visitors tended to visit Tundra Land and Wet Land, located in the top left corner of the park. By early afternoon, they gathered around the trails in the bottom right, likely heading toward the Grinosaurus Stage. In the evenings, there was a significant increase in movement data at the top of the park, indicating that visitors were leaving the park.

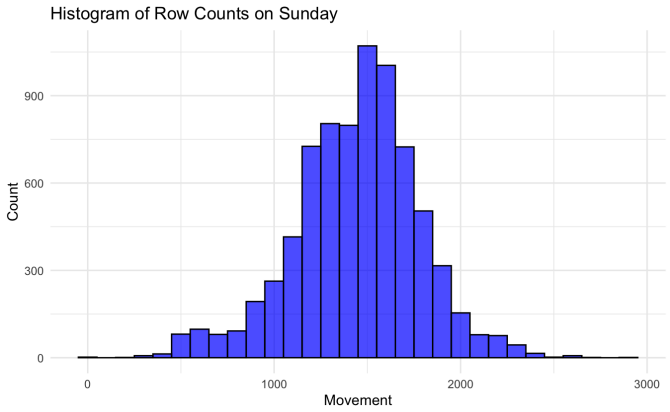
Next, we will take a closer look at the movement data by focusing on a specific day to better study the movement patterns.

b. Movement Frequency

We found that the histogram of movement for all 3 days indicates a normal distribution, with no long tail and few outliers.

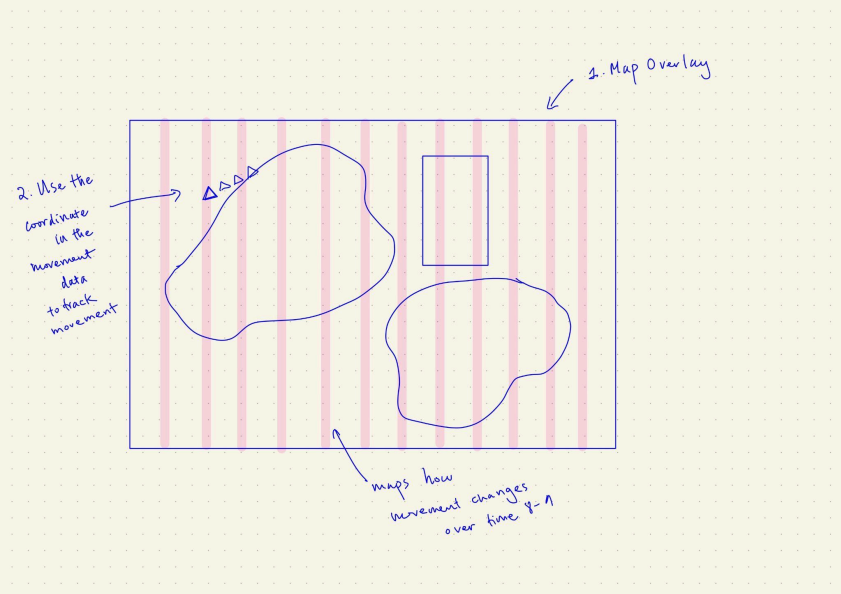






c. Movement Tracking

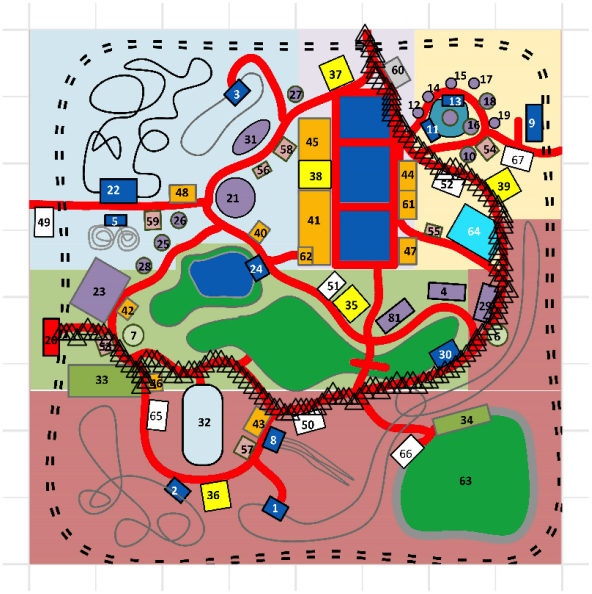
Our group did movement tracking for the whole park on Saturday. The purpose of this was to find the path most people take from the entrance. Tracking movement could help uncover inconsistencies and establish timelines for suspicious activities. For the method, we again overlayed a 100 × 100 grid on top of the original map. Since we have the coordinates data of everyone, we would then map the coordinates onto our grid-map and track people's movements. This is an early sketch of what we planned to do:



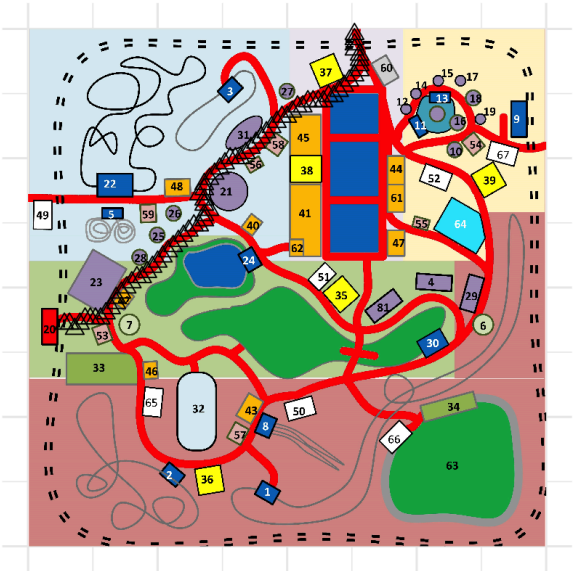
When we applied this approach for the whole park, we could find, more or less, the flow of the movement into the park from a determined time frame. The early results showed the path that people took:

People occupied all paths possible from the park. However, the number of people made the movement hardly readable. We revised this approach by making an animation for the movements in the park on Saturday. Looking at the movement, we did not see any place with abnormally heavy traffic for Saturday, and the flow of people out and into the park seems to be well-managed.

To narrow down our suspects, we pinned down the IDs with least movement on Friday, Sunday, and Saturday and tried to animate the path they took from the entry corridor to when they exit the park. On Friday, the ID with the least movement was 657863. On Saturday, the ID with the least movement was also 657863 - they entered the park at 8 and quickly got out at 8:10. However, on Sunday, the ID with the least movement became NA. We tracked the movement of ID 657863 during the weekend and this is what we found:



On Friday, ID 657863 checked in at 16:11:36 and got out at 21:53:11. They entered through the entry corridor and exited at Scholtz Express in Wet Land.

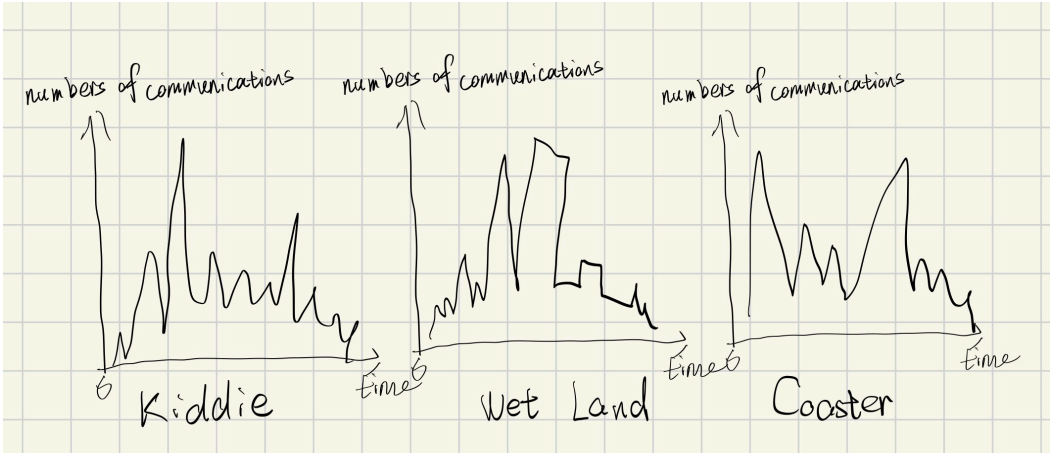


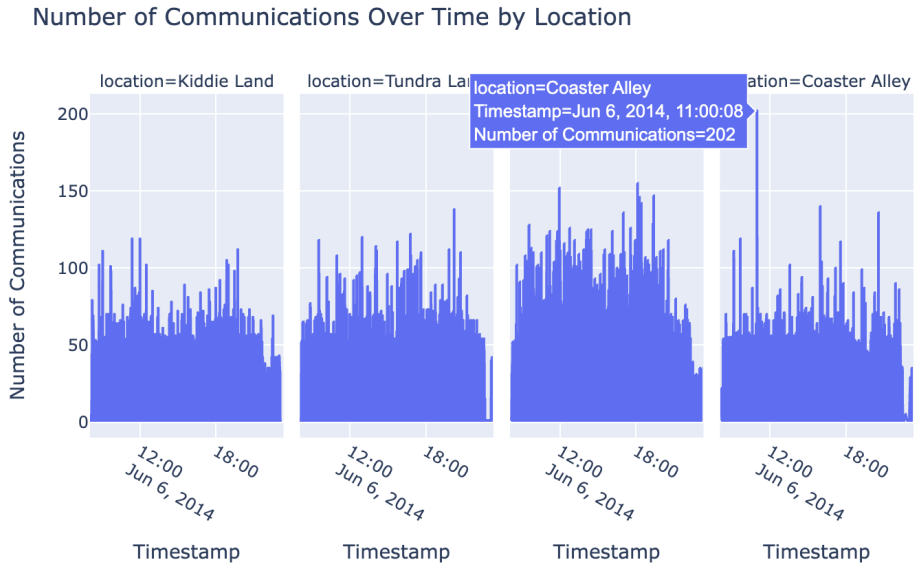
On Friday, ID 657863 entered the park somehow without checking in at 08:00:27 and got out at 08:10:03. They again entered through the entry corridor and exited at Scholtz Express in Wet Land.

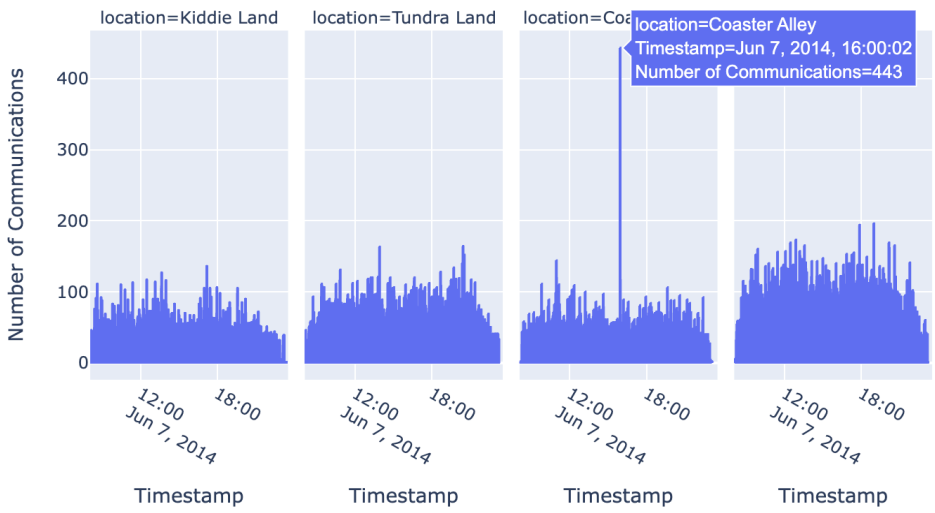
On Sunday, ID 657863 was not seen in the park again.

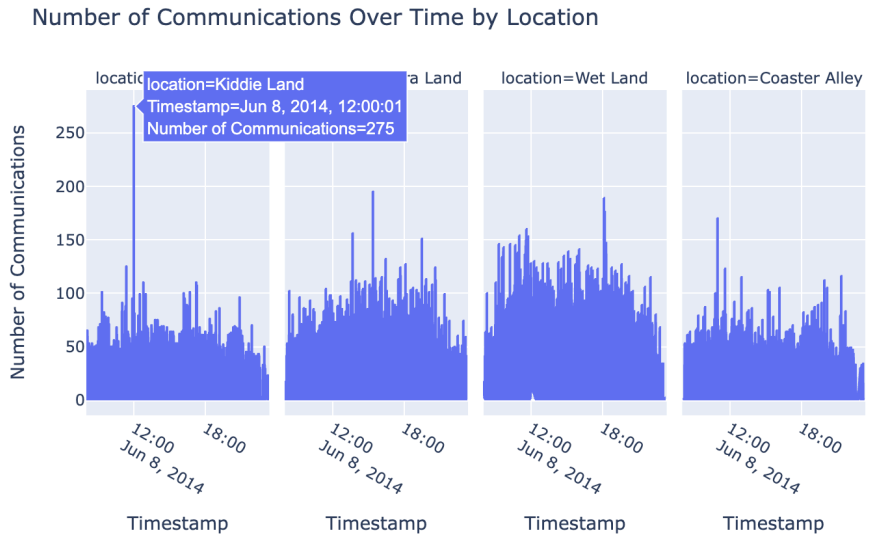
We lost track of this suspect on Sunday, as we found no movement data for them.

d. Communication Frequency









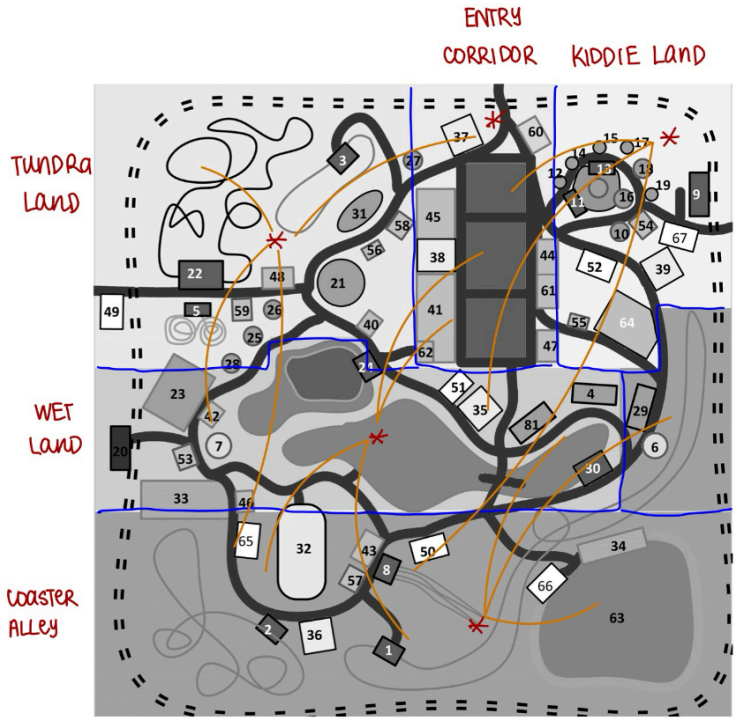
These three graphs show the number of communications by locations on Friday, Saturday and Sunday. We did not include Entry Corridor in our location selection because the communication data from Entry Corridor is too large and there is no huge difference of this location in the three days' data.

We detected three anomalies in the visualizations. Two of them happened in Coaster Alley at 11:00:08 on Friday and at 16:00:02 on Saturday. One of the anomalies happened in Kiddie Land at 12:00:01 on Sunday. The one on Saturday is the most notable one because the communication numbers reached 443 at that time which is the highest among three days.

Based on these observations, we initially hypothesized that these could be the timestamps at which the Scott Jones's shows took place. The sudden rise in communication could be the indicator that park visitors were notifying each other about a show that was about to happen in the park.

However, further investigation revealed a certain park visitor ID that exhibited communications abnormal in frequency on all 3 days of the show: **ID 1278894**. Surprisingly, we were unable to find any movement data corresponding to this person.

e. Communication Tracking



Once we are able to identify the movements of the suspect, this is what we have in mind to visualize their patterns in terms of both communicating and movements. This can reveal the exact actions and locations of the crime suspect over time and whether they work individually or in a team.

Conclusions

- We have so far assumed that the timestamps at which the 3 Scott Jones' shows most likely happened were Friday June 6th at 11:00, Saturday June 7th at 16:00, and Sunday June 8th at 12:00.
- We have also identified several suspicious park visitors who can be prime suspect of the incident: ID 1278894, ID 657863.

Next steps

While we were able to find some anomalies in the communication data, especially the strange communication pattern of ID 1278894, we could not find any movement tracking data that reveals substantial findings on the crime suspect. We request further movement data collection of this certain park visitor to establish a clearer understanding of their motives. We also found suspicious behaviors in the movement data of ID 657863, but could not find any

communication tracking data that reveals substantial findings on the crime suspect. These may be just noise in the data, and we should look into other places to find more clues.