Optimizing Seating Strategy on Tower of Terror

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Introduction

Tower of Terror is an elevator styled accelerated drop tower in Disney World's Hollywood Studios. The ride tells the story of a fictional elevator accident in Hollywood Tower Hotel. It then has riders experience an accelerated drop several times before inviting them into the twilight zone. Guests ride in elevator carts, each with 21 seats. This ride is one of the most popular in Hollywood Studios and it often has one of the longest wait times in the park. We wanted to know if they were fully loading every 21-person cart and if the carts could be loaded in a more efficient way. Our goal was to find a way to increase throughput of the ride to decrease Tower of Terror's wait times.

Collecting Data

First, we gathered 315 party size distributions from the Tower of Terror queue and counted the number of empty seats on 130 carts from pictures at the end of the ride. Then, we ran this data into Bouzarth.com, to simulate the Tower of Terror queue. Our class played this seating game, using no strategy and our proposed strategy. We played the game using the first party and first three parties to seat the elevators.

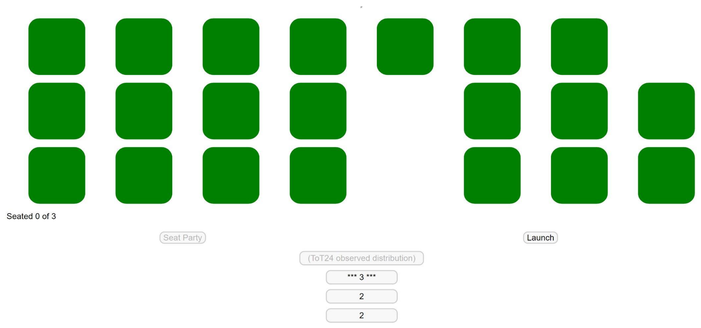

Figure 1. shows the Tower of Terror seating configuration from Bouzarth.com and party sizes.

Our Strategy

We created a strategy that was used for some trials of loading Tower of Terror seats to see if we could be more efficient. Our rules included:

1. Prioritize exact matches eg. parties of 3 are seated in the row of 3
2. Split parties of 5 into sub-parties of 3 and 2
3. Split parties of 6+ into sub-parties of 2s, 3s, and 4s

We played the Bouzarth.com game using this strategy while looking at the next party, and looking at the next three parties.

Results

From the 130 cart pictures, Disney averaged 1.09 empty seats per cart. After playing the seating game, when we had no strategy and only used the first party, we averaged 1.94 empty seats per cart, but when used the first three parties, we averaged 1.06 empty seats per cart. However, when we implemented our proposed strategy, we averaged 1.52 empty seats per cart when we used the first party, and 0.39 empty seats when we used the first three parties.

Statistical Analysis

We used a t-test to confirm that using our strategy and the first three parties resulted in a significantly more efficient seating outcome than Disney had. We compared two population proportions p_1 and p_2.

p_1 : the proportion of empty seats per cart by Disney

p_2 : the proportion of empty seats per cart using our strategy

$$H_0: p_1 = p_2$$
$$H_a: p_1 > p_2$$

We found the *z*-score to be 1.932, giving a *p*-value of 0.027 (<0.05). Thus, we reject the null hypothesis in favor of the alternative hypothesis and conclude that we performed significantly better than Disney at loading Tower of Terror seats.

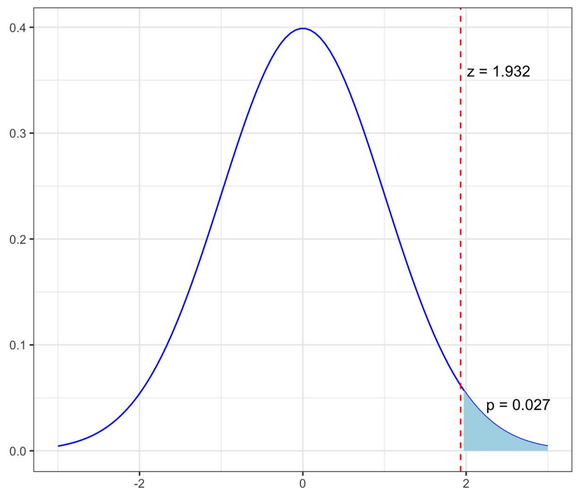

Figure 2. shows the area to the right of $z = 1.932$, resulting in $p = 0.027$ on a normal distribution curve N(0,1).

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Further Considerations

To increase ride throughput and reduce wait times on the Tower of Terror, future work should focus on minimizing human error, collecting more data, and improving visibility further down the line. Considering different loading strategies and queue layouts, such as adding a single-rider line or loading both carts simultaneously rather than one after the other, could also be valuable.

Additionally, strategies to track and predict party sizes in the queue should be explored. For example, tracking and seating processes could be automated by an app developed for Disney's cast members. Such an app would allow cast members to input the current filled seats on the cart and the size of the next party in line, and then the app would indicate the probabilistically best location for that party. These steps could significantly improve seat fill percentages and overall guest satisfaction.

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