Bayou Adventure World Simulation

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SM Theme Parks: Bayou Adventure World

- Four major parks
  - Frog Pond, Skunk Hollow, Gator Island, Raccoon Corner
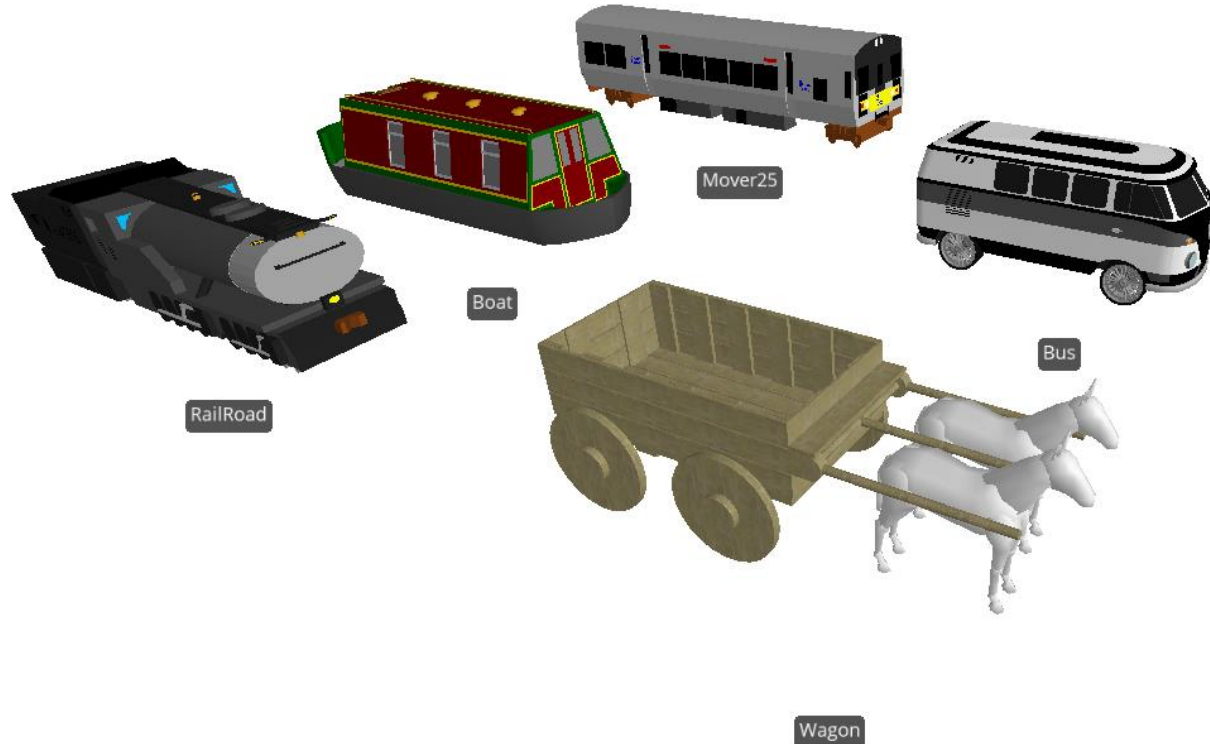- Customers can enter any of the four park entrances

Theme Parks

GatorIsland

SkunkHollow
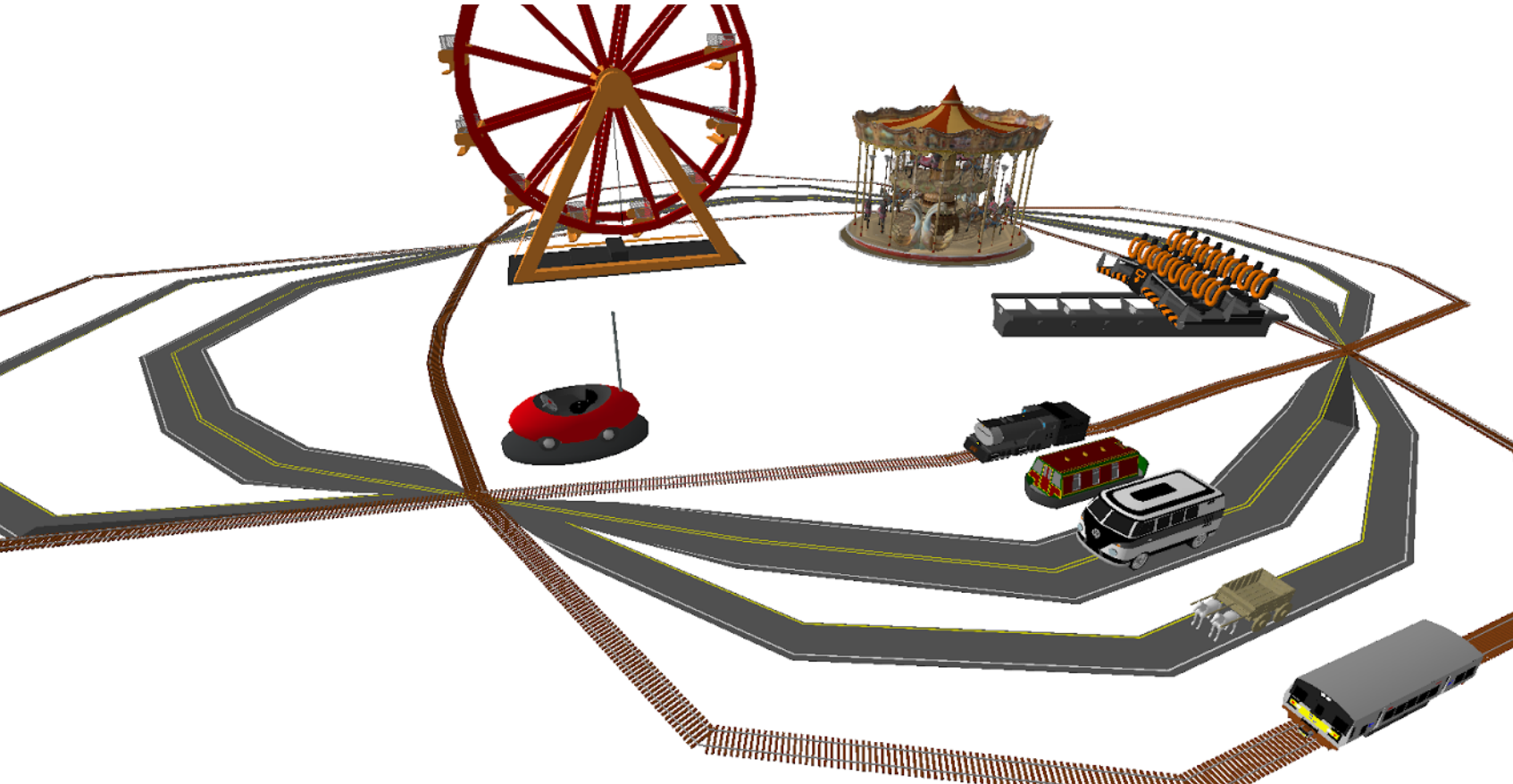
RaccoonCorner

FrogPond

SM Theme Parks: Bayou Adventure World

- 5 forms of transportation
  - Boats, Steam Railroad, Horse & Wagon, People Movers
  - Main form of Transportation: Railroad System & People Movers
- Capacity of 25 people per car

Transportation

Simulation Model Animation

Simulation Objectives

- Minimize Cost
    - Train costs of $800/day + $500/day for each additional car on each train
- Maximize Customer Satisfaction: Types measured by tallied statistics
    - Type 1: Train leaves w/ no people waiting to board
    - Type 2: Train leaves w/ 1-24 people waiting
    - Type 3: Train leaves w/ 25-49 people waiting
    - Type 4: Train leaves w/ 50 or more people waiting

Cost Measurement

- Trains to represent different numbers of cars
  - ex. One 25 capacity train, one 50, one 75,..., 250
    - each had a different cost based on the cost per additional car given
      - ex. 75 capacity train = 1 train + 2 addition cars w/ cost
      - 75 capacity train cost = $800 + 2*($500)
- Limited by Constraint of 8 total trains

Customer Satisfaction Measurement

- Customer satisfaction objective measured by maximizing Type 1 and minimizing Type 4 probabilities

$$Type\ 1\ Probability = \frac{Type\ 1}{Type\ 1 + Type\ 2 + Type\ 3 + Type\ 4}$$

| Responses			
Type1Prob	Type2Prob	Type3Prob	Type4Prob
0.466211	0.0597416	0.0274282	0.446619
0.442427	0.0538928	0.0357627	0.467918
0.466667	0.0588235	0.027451	0.447059
0.521337	0.0485511	0.0274678	0.402644
0.440587	0.0557457	0.0361858	0.467482
0.42419	0.0707008	0.0380227	0.467087

Customer Satisfaction: Alpha

- Alpha response created to weigh both Cost and Customer Satisfaction with a ratio of 1:1
  - $9,000 value found as objective cost (not obtainable)
  - 60% value found as objective Type 1 probability (not obtainable)
- Final Model minimized Alpha

Alpha ▲
0.0713…
0.0832…
0.0911…
0.0926…
0.11304
0.150127

$$Alpha = \frac{\left(\frac{Cost - 9000}{9000}\right) + (0.6 - Type\ 1\ Probability)}{2}$$

Verification & Validation
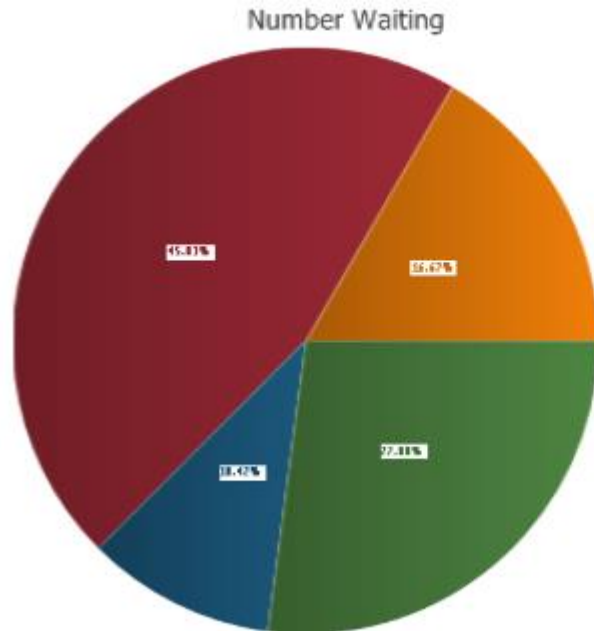
Experiment

- 2 Models
  - Each experiment 100 scenarios
  - Each with 5 replications
- Comparing 2 options for loading & unloading
  - Analyzing scenarios with an Alpha $\leq$ 0.50
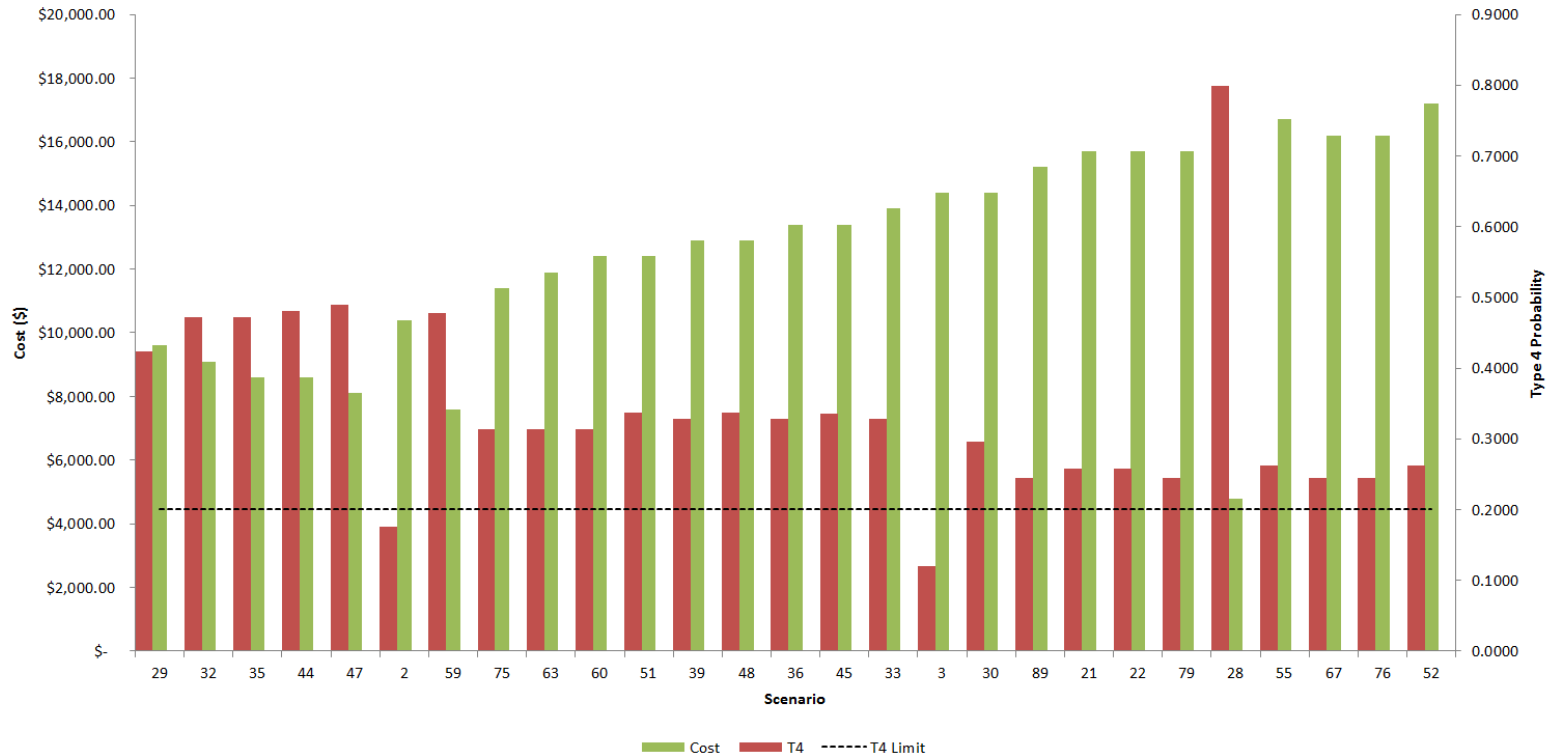
Loading/ Unloading

- Option 1:
  - Load = 45 seconds
  - Unload = 30 seconds
- Option 2:
  - Loading/ Unloading = 130 seconds
- Simulation loads entities until capacity full or until queue is empty

Results: Option 1

Cost vs. Customer Satisfaction for Option 1
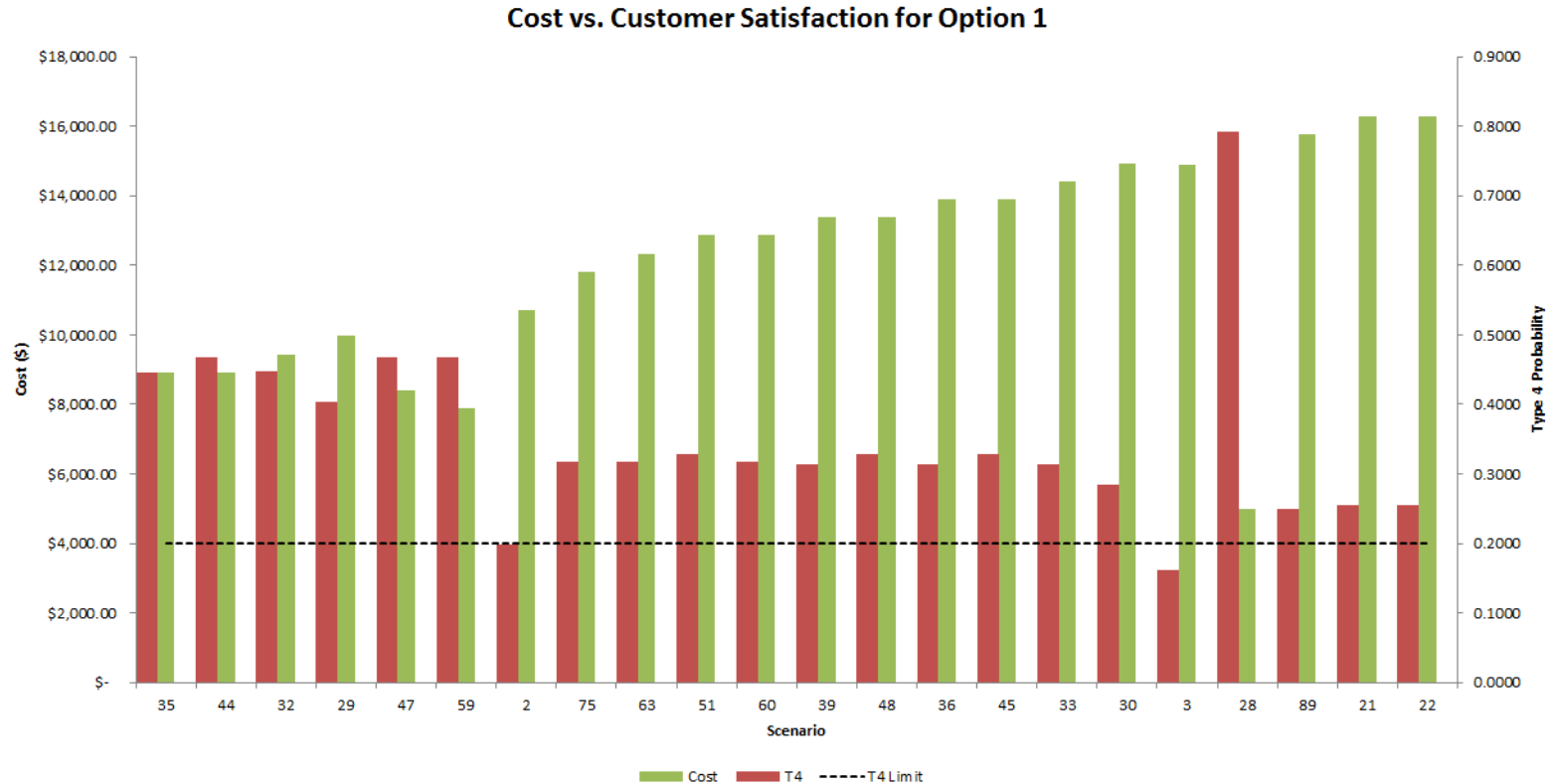
Results: Option 2

Cost vs. Customer Satisfaction for Option 2

Narrowing it down...

Scenario	Dwell Time	NumMover50	T1	T2	T3	T4	Cost	Alpha	Total
2	Option 2	8	0.4138	0.2735	0.1376	0.1751	$10,400.00	0.1709	8
2	Option 1	8	0.4189	0.2473	0.1353	0.1985	$10,720.00	0.1861	8

Final Solution/ Conclusion

Scenario	Dwell Time	NumMover50	T1	T2	T3	T4	Cost	Alpha	Total
2	Option 2	8	0.4138	0.2735	0.1376	0.1751	$10,400.00	0.1709	8

- Final Decision: 8 movers with a capacity of 50 people (two cars per mover)
  - Decreased transportation time, Increased time spent in park (customer satisfaction)
  - Low maintenance cost with small # of cars
  - High reliability with large # of total movers

Questions?