Damani Brown

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Homework 4 Report

The two changes I decided to explore in my experimental design were the size of the of the merry go round, and the number of game stalls at the fair. The reason I chose to experiment with the number of game stalls was because it was the only attraction whose operating costs could vary depending on the number of customers and booths. In my simulation, I designed the stalls as a class of its own, so to affect the size, I simply had to change the value in the method that determined whether the stalls had reached capacity. The main program took care of the logic which simulated players coming, leaving, and calculating the operating cost, so no changes needed to be made in it. The decision to affect merry-go-round size was to see if we could increase the throughput of the ride, and reduce the size of the queue at the end of the simulation. In the code, the size change required a little bit more tweaking, but it followed a similar process as the game stalls. The merry-go-round was also its own class, so size of the queue could be changed simply by changing the queue size in the constructor, as well as the value in the method which checked to see if the queue had reached max capacity. I didn’t do any experimentation with extra cash/express booths, but intuitively I think having two express booths and 1 cash booth would be best. Given the number of tickets used in my experiment, and the amount that the express booth consistently produced, it seemed that more people were inclined to go to the express lines, and they also have to spend $50 there which would increase the profit.

After running a loop simulating a fair day 50 times, I collected the average results of the number of people who went to the fair, the profits of the express and cash booths, the collected tickets of each attraction, the operating costs of each attraction, and the average size of the queue’s for the merry-go-round and roller coaster at the end of the fair day. The first iteration I ran was with the normal settings for the fair, which helped to standardize my results. On average the fair produced about $12,173.39, had an average of about 213 customers, and a fairly reasonable operating cost of $226 for the 13 workers.

To experiment with the game stalls I ran the iteration with the stalls capacity changed to represent 5 booths / 25 seats, 20 booths / 100 seats, and 30 booths / 150 seats. With just 5 seats there was a minor decrease of 100 tickets used at the game stalls when compared to the default 10 booth one. Interesting the operating cost only went down from $126 to $123. 20 booths produced about the same number of collected tickets, and $3 increase in the operating tickets going from $126 to $129. An interesting thing I noticed in this iteration was that the express booth profit was about $300 lower, and the total ticket count collected by the roller coaster was about 1000 tickets lower. This is interesting because I would expect to see them made at one of the other two attractions, but the merry-go-round and game stalls produced a similar ticket amount as when there were 10 booths. This could possibly be due to an error in the customer logic, but nonetheless I thought it was interesting to point out. Using 30 booths didn’t affect the number of collected tickets much either, as it produced around the same number as the 10 booth iterations. My conclusion with this information leads me to believe that the game stalls don’t need extra seats, as most of the customers were choosing not to go to other attractions.

The merry-go-round experiment produced some interesting results as well, which somewhat helps to explain the data collected from the games & stall experimentation. When downgrading the size of the carousel, there is a 2000 decrease in the number of tickets used at the merry-go-round, but this is obvious since its smaller. What’s interesting in the decrease in the number of tickets used at the Game Stalls, about 1300 less tickets, and the Roller Coaster, about 3000 less tickets. There’s also a decrease in the operating costs of the game stalls by about $30. All of this information leads me to believe that the queue for the merry-go-round is causing a huge issue for the rest of the attractions. When people choose to queue up for it, they spend more time there, mainly because it’s the longest running attraction when the load and unload times are factored in. We even see this is most of the experiments as the queue size for the merry go round at the end of the day is usually around 270 people. When the size of the carousel increased to 30, there was a massive boom in the numbers. The merry-go-round saw in increase of 6000 tickets, the game stalls saw an increase of about 2500 tickets. And the final roller coaster ticket count increased by about 100. The op cost of the game stalls went up drastically to $188 with only 10 booths, and interestingly the average size of the end queue was still 265 people. The average number of fair goers was at its lowest average during this experiment with 203 people.

Seeing the massive ticket usage fluctuation when messing with the merry-go-round leads me to the conclusion that this fairground manager should do a few things. Firstly he should increase the throughput of merry-go-round by adding a second merry-go-round. This would allow the fair to service more people at the fair and decrease the massive queue that it ends with. If it’s a popular attraction, then the cost of the merry-go-round, plus an extra worker would be easily absorbed (assuming the people’s satisfaction is the defining factor in the fair’s daily profits). Another thing they could do is rent a bigger carousel, but decrease the ride time to accommodate for the act that the load and unload times will be longer with 10 extra people. This would also be another solution to decreasing the long queue. The games and stall however, seemed to be rather stable with just 10 booth and 50 seats, so I wouldn’t increase the number of booths. In fact, I ran an extra experiment with 25 less seats, but a 30 person merry-go-round carousel, and the number of tickets used their increased by about 2000. However this did make the operating cost jump up about $60. This would actually be better because some of the stalls were sold, he could make an extra $1000 and pay less employees to manage them. Actually it would be better if he moved those employees to work at the existing merry-go-round, or a second one, it could drastically help with increasing the throughput for the lines, allowing more of the fairgoers to enjoy the rest of the park.