



Apr.26 2016

GreenLine Simulation

Mingzhe Huang, ID: 4944090 Yiding Weng, ID 4464621

A discrete event simulation project was made to help schedule and improve metro service.

Abstract

This program was written to simulate the Greenline transportation system and give the feedback to the Client. The result and recommendation is shown in below chapters.

According to our simulation result, the average waiting time for each passenger is decreased when the number of trains is increases. However, increase the number of cars for each train could minimize the average waiting time in some situation.

A schedule table with 22 to 24 trains in total (westbound and eastbound) is recommended; the number of each train could be 2 or 3. This schedule minimizes the average waiting time for each passenger and avoid wasting resources—put more trains into the service could not deliver the passenger faster. There will not be any passenger accumulation in each station under this plan, no matter what the number of cars is.

More specific information is provided and analyzed in section below.

Background:

The average inter-arrival rate was chosen to be 1 person/30 sec. The program modified the rate by making campus stations and downtown station busier (5 and 10 sec less for each coming passenger). Downtown stations are 5 times likely to be the destination of a passenger than a normal station. That likelihood for campus station is 3.

There passenger flow is varying during the simulation. The possibility is shown below and a function modifies the possibility for each station

10% of the time: 75% above average arrival interval

15% of the time: 50% above average arrival interval

20% of the time: 20% above average arrival interval

10% of the time: right at average arrival interval

20% of the time: 20% below average arrival interval

15% of the time: 50% below average arrival interval

10% of the time: 75% below average arrival interval

A train will take 3 minutes (180 seconds) between each stop and will wait for at least 15 seconds at each stop. The capacity of each car is 50. It takes a passenger 2 seconds to get off and 1 second to get on. When a car is full, the passenger must wait for the next coming train. For each simulation, the trains were arranged evenly to both eastbound and westbound direction. The time lag between trains was set to be same, the minimum time needed to finish the travel divided by the number of train-1 in the railway.