Massachusetts Institute of Technology

1.258J: Public Transportation Systems

Spring 2017

Assignment 3

Data

For this assignment you will use automatically collected vehicle location, fare collection, and passenger counting data from the MBTA bus routes 70 and 70A. The fare collection data has been processed with an algorithm to infer destinations. In addition you are provided with GTFS schedule data.

Teams

You will work in groups of three or four, assigned by the course instructor. A single submission should be made by each team, in PDF format.

Data Analysis and Modeling

1. Running Times
   a. Analyze running times and comment on the results. Prepare running time scatter plots by direction, showing how running times vary by time of day and within time periods. When are running times greater? When are they most variable? Which segments contribute the most to long and variable running times?
   b. How do running times compare with the schedule?
   c. Specify one or more running time models and estimate them using the provided data. Compare and interpret the models and the results. What variables are significant? Do the coefficients have the signs you expected? Do you obtain good fit? In which applications could running time models be useful?
2. Headways
   a. Analyze headways and comment on the results. Prepare a space-time diagram to visualize vehicle movement. Are headways regular? When and where are they and are they not? Is there any indication of effective operations control?
   b. How do headways compare with the schedule?
3. Dwell Times
   a. Analyze dwell times and comment on the results. How variable are dwell times? What do they depend on? Do they vary significantly by time of day?
   b. Specify one or more dwell time models and estimate them using the provided data. Compare and interpret the models and the results. What variables are significant? Do the coefficients have the signs you expected? Do you obtain good fit? In which applications could dwell time models be useful?
4. Ridership

    a. Analyze ridership and comment on the results. Where does the route experience the greatest number of boardings? Where does it experience the greatest number of alightings? How does ridership vary by time of day and within time periods?

    b. Calculate OD matrices by time period. Which OD pairs are strongest? What is the passenger turnover rate?

    c. Specify one or more models of number of boardings at a stop. What variables are significant? Do the coefficients have the signs you expected? Do you obtain good fit? In which applications could these models be useful?

5. Loads

    a. Prepare flow profiles by time period, showing flow in passengers per hour past each stop. When and where does the route experience the greatest loads? How crowded are the vehicles? Is capacity being reached? Do loads vary greatly between successive vehicles? Are high loads mostly due to fluctuating passenger arrival rates or to irregular headways?

    b. Specify one or more load models. What variables are significant? Do the coefficients have the signs you expected? Do you obtain good fit? In which applications could these models be useful?

6. Service Delivery Policy

    a. Is the bus service meeting the MBTA Service Policy in terms of on-time performance and crowding?

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