

1.258J/11.541J/ESD.226J
Public Transportation Service and Operations Planning
Spring 2010
Assignment 2

Due: March 18, 2010

Notes: You should work in pairs on this assignment.
The data sets you will need are available on the course website.

Then there are three files covering MBTA Bus Route 101:

Rt101_TBT_WD_Fall05.xls (for analysis)
Rt101_TS_WD&SA_Fall05.xls (for information)
Rt101_LP_WD&SA_Fall05.xls (for information)

As an operations planner at the MBTA, you have primary responsibility for the design of data collection and analysis programs. In the past, data collection has been based on rules of thumb, and has not been heavily influenced by statistical issues. However, periodic major data collection efforts are conducted which provide a comprehensive picture of performance at the individual route level. The task at hand is to design a monitoring program that fully utilizes the MBTA's new automated data sources (AVL, APC, and AFC). This must provide adequate data for ongoing decision-making, and identify any major changes which might have occurred since the last round of data collection.

The new AVL system provides virtually complete data on trip running times and on-time performance, and the new AFC system will provide passenger boardings per vehicle trip for all trips in which passengers interact with the farebox. In addition, some MBTA buses (about 20%) are equipped with APC systems that record on/off counts at each stop using infrared beam technology, and you can assume that these buses are now randomly assigned to every route. Given this, your goal is to determine which data sources should be analyzed to establish basic metrics for decision-making at the MBTA.

Your task here is to design a data collection and analysis program to monitor service on Route 101. You have data covering weekday operations from approximately 5 AM to midnight from 2005 provided in the Excel files listed above. The public timetable and route description are available at <http://www.mbta.com/>. In addition, a current AVL file (Performance_101.xls) and APC file for the route are also posted on Stellar. For this exercise, no actual AFC data is available, but you may assume that every fare transaction (time-stamped) by fare category would be available to you in the future.

Attached are the following:

1. A printout of the file format for Rt101_TBT_WD_Fall05.xls, and the one-page Rt101_LP_WD&SA_Fall05.xls, which includes stop numbers and locations as well as daily ridership summaries.
2. The timetable for Route 101, showing the departure times of each trip (by direction) from the MBTA website.

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Three data items are of interest in the monitoring program: passenger boardings per key trip segments, maximum passenger load per trip, and vehicle running times by period of the day.

Making use of the available data, the lecture material and the readings, as well as your own judgment as appropriate:

- 1) Select and justify accuracy levels for the maximum load per trip for each time period and boardings by key route segments. As part of this process you will need to define key route segments, and decide whether the existing time periods are appropriate.
- 2) Determine which system's data, when properly analyzed, can satisfy your requirements.
- 3) Perform a sample analysis for the three data items requested, to the extent possible with the data provided (include techniques, sources of data, and quantity). Indicate if and how you would use the AFC transaction data, if it were available.
- 4) For the vehicle running times, calculate the difference between the 85th percentile (given by the current MBTA analysis program) and the 95th percentile (which you should calculate) and discuss the implication of using both as the scheduled half-cycle time.
- 5) Discuss other issues which might affect your data collection and analysis program.
- 6) If you want to make a one-time estimate of the percentage of elderly riders on the route to an absolute tolerance of $\pm 5\%$, and assuming a response rate of 25%, on how many trips would you need to distribute questionnaires? How would you structure the sampling plan; when would you sample, and for how long? Please justify your response.

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