Assignment 2

Problem

The MBTA bus lines 70 and 70A run between Waltham and Central Square in Cambridge, as shown in the maps below.
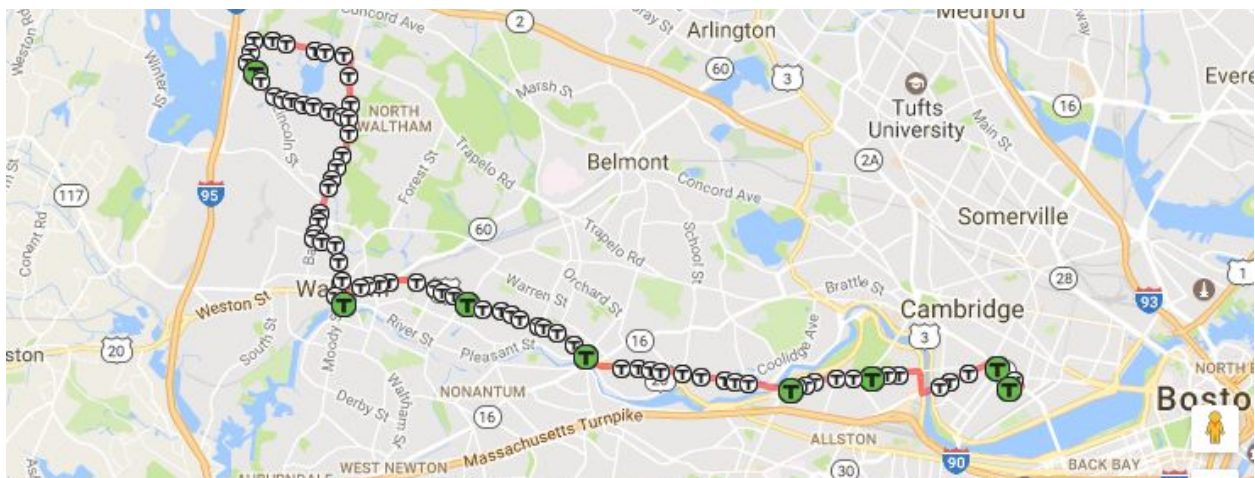

Figure 1: Route 70

Figure 2: Route 70A

There is a proposal to extend service on the Cambridge end to Kendall Square, and it is hypothesized that many of the passengers alighting in Central Square finish their journey to MIT, nearby employment centers, and some parts of Kendall Square on foot. (Those going close to the Kendall Square station presumably transfer to the Red Line at Central Square.) Your objective is to quantify the fraction of inbound morning peak riders who would benefit from the proposed extension. You will accomplish this through manual data collection and analysis of the collected data.

Teams

You will work in teams of 3 or 4 persons. To avoid duplicate collection of data on the same station, each team will claim a stop and date to collect data.

Data Collection

Data should be collected from 7:30 to 9:30 on a non-holiday weekday. The stop of interest is Massachusetts Ave. at Sydney St., only in the inbound direction, shown in the map below with an arrow and circled in green.

Figure 3: Data Collection Site

You will stand near the bus stop and survey passengers who alight 70 or 70A buses. You should wait for them to finish alighting before approaching them, and you should not interfere with the alighting process. When approaching passengers, say the following: "Hi, I'm an MIT student working on a project for a public transportation class, for which we are conducting a voluntary, anonymous, one-yes-or-no question survey. Would you give me a few seconds of your time?" If they accept, continue with "Would you have stayed on your bus if it had continued to MIT and Kendall Square?" as you point to those locations on the map in the last page of this assignment. Record their answer: *yes (Y)*, *no (N)*, *declined to answer (D)*. Remember to thank all passengers that you approach, whether they agree to participate or not.

Each team is responsible for collecting data during one weekday. The following data items should be recorded:
- location, date, and weather conditions

- bus arrival times
- vehicle numbers
- number of alighting passengers
- number of passengers surveyed (including those who decline)
- survey responses

All collected data will be entered into a shared spreadsheet, so that all teams can use pooled data for the analysis portion of this assignment. Data must be submitted by the due date in order to allow all teams enough time to complete the analysis portion of this assignment.

Analysis

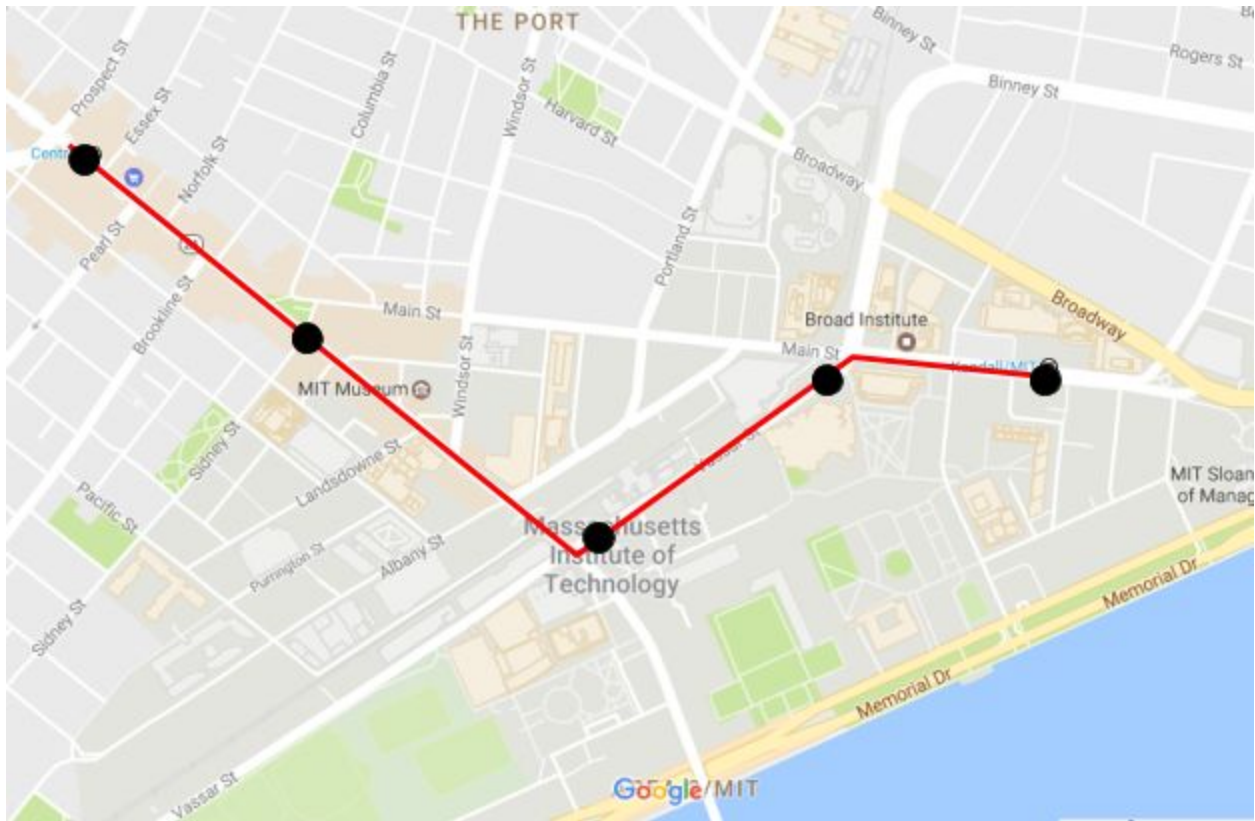The following tasks should be completed using the collected data:

1. Comment on the data collection effort.
2. Estimate the mean number of alighting passengers and calculate a confidence interval around this mean. Plot a histogram of number of alightings over the analysis period. Comment on the results.
3. Make a scatter plot of number of alightings by time of day and comment on the results.
4. Make a scatter plot of number of alightings by headway and comment on the results.
5. Report and comment on the proportion of passengers surveyed and on the proportion of passengers who participated. What factors influenced the participation rate?
6. Estimate the percent of passengers who would have stayed on their bus if it continued to MIT and Kendall Square, and calculate a confidence interval. Comment on the results.
7. Based on the results, should the proposal to extend service to Kendall Square be analyzed further?

In addition to analyzing the manually collected data, you are tasked with designing a data collection program to establish baselines of the proportion of passengers who would benefit from the proposed extension.
1. Select and justify accuracy levels.
2. Determine minimum required sample sizes.
3. Design a data collection program and estimate its cost, assuming surveyors are paid $10 per hour.
4. Comment on whether the survey should be carried out by spot checks or ride checks.

Limit your response to 4,000 words. Submit your response in PDF format. A single submission should be made by each team.

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