CSCI 350 Project Proposal
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Artificial Intelligence
Spring 2020

MTA Trip Planner (Enhanced)

I. Project Description

For our final AI project, we will build an enhanced version of the MTA trip planner that uses artificial intelligence concepts to find the best route between two locations in New York City. Using data from the MTA's developer website, we will create a weighted graph with all of the stops, using travel time between stations (in minutes) as the weights. This problem already comes with some constraints, as the MTA schedule changes frequently depending on days of the week, times of day, and unexpected delays. We also plan to tackle fare constraints. For example, low-income commuters may be limited by their budget to fewer daily rides and transfers than necessary to meet their travel obligations. Our AI will find the best route given a fare constraint by allowing users to enter their schedule and producing the list of transit options with the lowest fare. Overall, we have chosen an application project that focuses on informed search and constraint satisfaction in order to optimize a system millions of people use[d] every day.

Further potential constraints will be determined as the project is planned out. Examples will include monetary and time constraints, varying comfort desires (such as minimizing transfers or ridership numbers to avoid crowds), etc. All additions/modifications will be logged.

MTA Trip Planner	Our AI Trip Planner MVP
Fastest Route between Multiple Points	Fastest Route between Multiple Points
Accounts for Real-Time Delays & Changes	Does Not Account for Real-Time Delays & Changes
Routes According to Train Schedule	Routes According to Train Schedule
Includes Subway, Bus, & Walking	Incl. Subway Only (w/ walking transfers)
Does Not Account for Fare Constraints	Accounts for Fare Constraints
Includes All of NYC	Includes All of NYC

II. Team Members & Task Designation

Identify the project members, roles and each member's contribution should be clearly specified for teams.

The members of this team are as above: **Anton Goretsky**, **Samantha Ngo**, **Daniel Rozenzaft.**

We have not yet determined a breakdown per team member, as we are still in the design and planning phase of the project. We plan on still working in concert until that plan is finalized and we can split the roles. A log will be kept of what we have done, on a text file in our main github repository. However, we can note that Daniel will focus more on any mathematical theory that may come up.

III. Focus Topics

Enumerate the CSCI 350/761 related topics (questions and solution approaches) each individual will contribute to the project.

Informed Search: Our train routing system will use a heuristic that is based on the travel time between each station. We will be using A* search to find optimal routes between train stations. We will have a data set that lists out unique station identifiers, station names, and servicing train lines for every station across all five boroughs, which our search algorithm will use to trace train routes and recognize transfer options.

Constraint Satisfaction Problems: We plan to use a backtracking search algorithm in order to eliminate routes that would exceed fare constraints.

As we flesh out the structure of our trip planner, we may change the search by experimenting with different algorithms and heuristics or adding new constraints. We may choose to implement various search methods and then determine via our evaluation criteria which would suit our purposes better. We can also explore further additions to the trip planner that might involve other focus topics. Any new ideas and experimentation as such will be included in the project and logged.

IV. Minimum Viable Product for Final Presentation

Describe what you plan to demo on the final exam date and other deliverables.

For our final presentation, we plan to display an MTA Trip Planner application that finds the best subway route between two points in Manhattan at a certain time given fare and time constraints. The app will include (at the very least) all of the subway lines in New York City and adhere to their regular weekly schedule. Our app will

implement an A*-based search algorithm in order to accomplish this. If time allows, we will work to integrate some bus lines as well.

Note: We will initially implement this using a standard paper immutable timetable. If we have the time to figure out the MTA's API, we will use real time information, but that is not as important as creating the main functionality of the trip planner—creating optimal subway routes.

V. Evaluation Criteria

6. Describe your plan to evaluate the project.

We plan to evaluate our project with various sets of trip inputs, from the simple, one-line routes to complex trips with multiple transfers or monetary and time constraints. We will build a test set that will evaluate all of these cases. As mentioned in Section IV, we may experiment with alternative search algorithms and heuristics in order to find out which performs better for different problem variations. The test cases will be evaluated based on hypothetical trips and best routes as suggested by Google Maps, Apple Maps, and/or the official MTA Trip Planner.