Bilkent University

Department of Computer Engineering

Senior Design Project

Greenation

Project Specifications Report

- Arda Göktoğan

- Cemal Gündüz

- Eren Şenoğlu

- Pınar Yücel

Supervisor: Prof. Dr. Uğur Doğrusöz

Jury Members: Asst. Prof. Dr. Shervin Arashloo, Asst. Prof. Dr. Hamdi Dibeklioğlu

Introduction

One of the challenges of the Era is climate change, which causes human kind to come up with solutions which are sustainable and environment friendly for the cities. One of the major causes of CO_2 emission is transportation [1]. In this project, we aim to create a platform that will be beneficial for public transportation optimization in order to limit CO_2 emission.

Description

City transportation planning is an important task for less CO_2 emission. Public transportation routes of the city can be planned in a manner that transportation is less harmless to nature. Our platform will analyze the city's transportation routes and destination demands of people. Then will produce the best routes (in terms of CO_2 emission) for public transportation in a logical way.

The model will be a web-based platform. Users need to sign in to access the projects shared with him/her or to create a new one. The model allows collaborative access and participation to the project. All stakeholders of the transportation field can participate in the project to edit and view. The model will suggest a plan according to the input given by the user. Users will specify or limit different parameters to the model to choose the best action.

Constraints

Implementation

- Google Maps API will be used for visualizing transportation routes.
- Publicly available city transportation data will be used for experiments and building transportation models.
- Github will be used for project development and version control.
- All the bugs and issues will be followed using github issues.
- Github pages will be used for project websites and sharing project reports.

Economic

The transportation vehicle resources of the user including city mayor or any other transportation service provider must be used efficiently.

In order to produce reliable suggestions for transportation routes and schedules, a decent dataset is required to build the model. As a result of being an industrial sector, the datasets

that are publicly shared are dominated by commercial datasets and finding an academic licensed dataset might be troublesome.

Environmental

Transportation vehicles must be chosen suitable to the physical attributes of the location. To exemplify, a steambot shouldn't be chosen to operate in a mountain field or land transportation vehicles shouldn't be suggested to the user for routes that include water.

Social

Optimized transportation plan shouldn't be inefficient for human resources. Passengers shouldn't be experiencing long queues and high waiting times, just to reduce co2 emission. A balance between two sides of the scale should be found.

Ethical

Dataset includes information on citizens' transportation habits and choices. A part or complete of the individual information might be illegal in some countries to process or to collect. Therefore, our platform should not violate any kind of rules such as "General Data Protection Regulation" [2].

Safety

Optimized transportation routes and schedules should not cause an advance in the traffic accidents. Routes should be chosen in a way that it won't pose additional safety concerns for anyone .

Professional and Ethical Issues

The city mayor is required to provide equal rights and opportunities for the citizens. In doing so, every citizen must have the same opportunity for transportation. Independent of location, each passenger should have the equivalent opportunity. In order to exemplify, Çayyolu and Sincan citizens might differ as social groups and locations but in contrast the model might not suggest a plan that makes two counties equal in regards to transportation opportunities.

Requirements

Functional Requirements

Planned projects will be stored online and those who wish to participate in the model can sign up to work on it.

City transportation demand will be the required input from the user. The model will work on it to create and suggest a visualized transportation route and schedule.

Users can manually add or remove stations from the plan. Model will predict the CO2 emission, as a result of the user's changes.

Non-Functional Requirements

User friendly

User interface of the model will provide ease of use to the transportation service provider. The user will be able to fulfill his/her operation with a maximum of 5 clicks.

Scalability

The model should be working reliably on the cities of a big and a small scale.

Security

Transportation data of the individuals and the other private data must be secured against data breaches.

Reliability

Independent from the demands of the user, the model should be suggesting an optimized transportation plan to the user.

References

[1] - "Carbon Pollution from Transportation," *EPA*. [Online]. Available: https://www.epa.gov/transportation-air-pollution-and-climate-change/carbon-pollution-transportation. [Accessed: 11-Oct-2021].

[2] - *General Data Protection Regulation (GDPR)*, 02-Sep-2019. [Online]. Available: https://gdpr-info.eu/. [Accessed: 11-Oct-2021].