FYP17009

Hong Kong Open Data Visualization

Detailed Project Plan

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Introduction

In 2010, government has launched a Traffic Speed Map application providing traffic information. Through the information, user can know the traffic arrangement, the congestion level and the current situation. Users can access the site and know the traffic information and avoid traffic congestions.

Nevertheless, the poor user interface and of the application results in low popularity compared with other online applications like Google Map. The display size is fixed and the dimension is about 450 x 250. Its size suits for mobile application, but not for web browser. Even worse, users need to use the control panels to adjust the map view instead of some usual gestures to control (Figure 1).
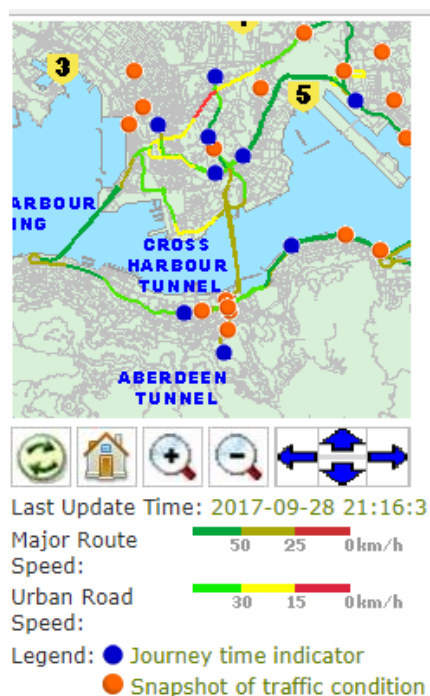

Figure 1 - The traffic speed map available in Transport Department, HKSAR (http://tis.td.gov.hk/rtisPDA/ttis/rtisWebAction.do?setHit=true&locale=en). The width and the height of the panel are fixed. Users can only change the view using the panels. The magnification and moving scale are fixed such that users cannot change the view dynamically.

On the other hand, Google Map has a better interface and provide a variety of functionality. For the traffic speed level, Google Map displays the live traffic of all the roads while the government application only displays the major routes and cross harbor tunnels. Nonetheless, Google Traffic works by analyzing the GPS-determined locations transmitted by mobile phone users, bringing out the privacy concerns.

Objective

In this project, a web application similar to government application will be developed. Users can view the current traffic speed level showed in different colors. In addition, some online map applications may estimate the time of certain route based on the current traffic levels. To certain degree, it is meaningless to use the current data to estimate the time spent on driving in future. Hence, the application will estimate the traffic speed in future for accurate time estimation.

The objective of the project is to develop a web application which:
- in general,
  - Displays the real-time traffic condition of major routes
  - Updates the display for every 5 mins
- for specific roadway,
  - Displays the change of the traffic speed within a time interval
  - Provide information of the specific roadway and its current condition snapshot
  - Analyses the historical data and predicts the speed at certain time.

Scope

It is impossible to complete the whole traffic speed map in Hong Kong because of the time limited and insufficient dataset. Therefore, we will only focus on the data available in government site, which can avoid the privacy issues. Secondly, at most 3 months records will be saved to reduce server workload and improve server efficiency. Lastly, the final product will be a web application but not mobile application because of manpower issue.

Methodology

The construction of the web-application will be carried out into two stages, corresponding to 2 semesters respectively. By the end of the first stage, the traffic speed of all roads should be visualized in a map correctly. For the second stage, the detailed analysis shall be completed. The followings are the procedures for achieving the objects:

Requirement study

Since the final deliverable of the project is similar to the traffic services provided by governments. It is necessary to study the services available in the government as a guideline.

Theoretical and technological study

After the requirement study, we will determine how the dataset should be grouped, followed by designing the layout of the application.

Classification of the data group

Since the traffic speed are various by several factors, some research are required to identify the factors. Also, the handling of extreme data should also be considered in order to minimize the deviation of the dataset. Grouping such as grouping according to day of the weeks should be given out at last.

Data requesting and data processing

For the data request from the government site, we will use HTTP GET to request the data and store the data into the database. Once the request is success, the data will be stored in the database. If the data is not available, we will estimate the value based on the past or leave it empty. The data requested from government are not human readable as only containing the road ID and its coordinates are represented in easting and northing [1]. After conversion, the corresponding

highways can be identified and road information should be stored. In addition, the method of requesting data from government automatically and periodically will be studied.

Construction of deliverable

The second aspect focuses on the technology. Combined with the theoretical model of the traffic speed, a software system will be devised. Then the architecture, server technologies will be decided. The current preference is to apply the multi-tier server-client architecture which consist of a relational database using SQL, application and web server with PHP support (Figure 3)

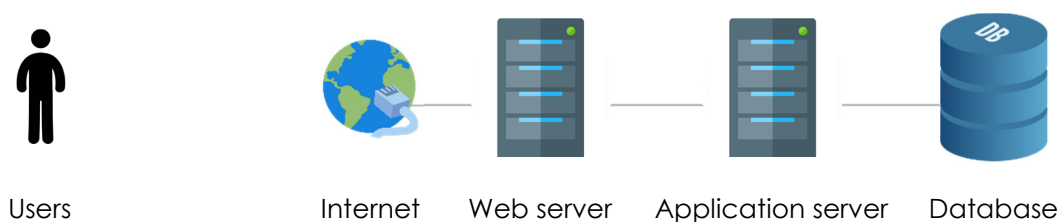| Users | | Internet | Web server | Application server | Database |

Figure 3 - Multi-tier architecture of the web application

To visualize the traffic speed, the best practice is to display it in the map using various color to represent the range of speed. Since it is impracticable to construct the map in this project, online technologies such as Google Map or OpenStreetMap will be applied.

Relational database

The purpose of the database is to store the traffic speed data collected from government. For each record, the road ID, capture date, traffic speed are stored. One additional table containing the road information such as road ID, coordinates, and the name is stored to facilitate the visualization of the speed on the map. To speed up the process, the fields will be made compatible with the data types in map application.

Application server

The server aims for handling the access request to the database and requesting data from the government site, since the server of the government does not allow cross-domain request [2]. This server acts as an intermediary. After requesting data, the server saves the records to database and updates the latest request time to ensure the data are up to date. When receive request from web server, it sends the request to database and retrieve the results, then the server pass back to the web server.

Web server

The web server converted the data received from the application layer into information, which visualizes the data in a meaningful way and compatible with the map application. This part can be accessed via browsers as it is easier to develop the user interface with web technologies and mobile devices can also access the application via browsers.

Hardware & software

The following items used to build up the server are necessary for the project:
·   Database
·   UNIX servers
The above software can be requested from department

Risks and Mitigations

When completing the project, since I do not have sufficient skills related to web programming skills, data analysis skills, the progress may be slow down at the initial stage. Searching and requesting support may hinder the process. However, courses related to web programming and time-series analysis have been taken in semester 1. In worst case, some tasks may be finished at the end of the semester 1.

Schedule

Item	Deadline
Semester 1	
Deliverables of Phrase 1 • Detailed project plan • Project website	1 October 2017
Requirement Study, theoretical and technology study	20 October, 2017
Data request	10 November, 2017
Map implementation	17 November, 2017
Data processing	8 December, 2017
Data visualization - all roads	25 December, 2017
Preliminary testing	31 December, 2017
Deliverables of Phrase 2 • First presentation • Preliminary implementation • Detailed interim report	21 January 2018

Semester 2	
Data visualization - specific roadway • Data analysis	28 February 2018
Improving the interface	15 March 2018
Final review	30 March 2018
Deliverables of Phrase 3 • Finalized tested implementation • Final report • Final presentation • Project presentation	15 April 2018

Conclusion

Despite pf limited data available in government, the ultimate goal of this project is to benefit the users in terms of path selection, planning the urban roadway systems. Also, with more data provided by the government, the traffic condition can be fully visualized and the application able to predict the time spent in travelling with high accuracy.

Reference

[1] Explanatory Notes on Geodetic Datums in Hong Kong – Survey & Mapping Office Lands Department [Internet]. [cited 2017 Sep 26]. Available from: http://www.geodetic.gov.hk/data/pdf/explanatorynotes_c.pdf
[2] Visualization of Road Traffic Condition in Hong Kong – Line Wencong & Xia Fan [Internet]. [cited 2017 Sep 26]. Available from: https://zh.scribd.com/doc/245840020/visualization