ECE496-Design Project Course:
Project Proposal Draft A

Project Title: Applications for Intelligent Transport - History Timeline Reporting Engine
Project ID: 2016193

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Date: September 21st, 2016

Executive Summary:

Connected Vehicles Smart Transportation (CVST) exists as a system that provides a platform for novel applications and innovations to improve the efficiency and safety of transportation systems. The system, in it's current state, mines and stores a large variety of information related to traffic. However, given the sheer size of the data available, the current platform makes it challenging for users to rapidly draw conclusions from the data. This project's primary objective is to improve the CVST platform so that users can easily find and use the information they require. To achieve this, we will first analyse the data in order to provide a clear visualization of it. To begin, we intent to start with a smaller, simpler subset of the CVST data to provide a functional base before expanding to include the rest of CVST.

Table of Contents:

Project Description:

Technical Design:

Work Plan:

Background and Motivation

Connected Vehicles Smart Transportation (CVST) is a platform that serves as a real-time database system and an open API which is used to develop intelligent applications for transportation. Currently, the system mines and stores a variety of information gathered from its network of sensors. The data is then presented through the CVST portal. However, given the sheer volume of the data available, the current platform makes it very challenging for users to draw conclusions based on the retrieved data, both historical or real-time.

One of the tools that other industries use to tackle problems of similar nature is Business Intelligence (BI). BI is a set of techniques and tools for the transformation of raw data into comprehensible and meaningful information. It serves to provide the user with a configurable set of statistical analysis.

Our project will primarily focus on the implementation of BI technologies to improve the data analysis functionality of the existing CVST system.

Project Goal

Implement a comprehensive history timeline report engine for the large collection of data within the CVST system. The engine will aid users in drawing meaningful conclusions by identifying, performing analytics and analyzing key parameters of historical and real-time datasets.

Project Requirements

Functional Requirements:

> ➢ The system shall accept a variety of input parameters to control the data, the nature of the analysis.
> ➢ The user shall be able to specify the format with which the output of the analysis is presented in.
> ➢ The user should be able to perform analysis and modelling of data with the goal of discovering useful information, helping to reach conclusions.
> ➢ The system should incorporate new data coming in for future use through the use of new APIs.

Constraints:

> ➢ The data analysis presented must be accurate. Any uncertainties, particularly with predictive analysis must be clearly indicated.
> ➢ The system must work with all datasets within the scope of CVST.

Objectives:

> ➢ Analysis of current data must be fast to ensure parallelism with real life events.
> ➢ Enhance user experience by designing data representations with clarity in format and visual appeal, and also form an intuitive GUI design for users with all levels of technology proficiency.

Possible Solutions and Design Alternatives

1) Data Analysis Algorithms - Algorithms selected for our data analysis engine will be based on ability to recognize critical/associated data, time/space complexity, and application versatility. The datasets used in the project will another factor in this consideration. Examples include:
   a) K-means
   b) MapReduce
   c) SVM (Support Vector Machine)

2) Data Visualization Platform - The visualization platform will be chosen based on its level of flexibility, browser compatibility, and ergonomic design considerations such as visual appeal. Examples include, but are not limited to:
   a) D3.js
   b) ChartJS
   c) Pentaho
   d) BIRT

3) Input parameters - The input parameters specified by the user will define the scope of data sets retrieved for analysis. This scope will determine which algorithm will be used for optimal performance. A large enough set of input parameters must be available, otherwise the project would be too limited in terms of practicality and applicability .

Feasibility Assessment

Skills and Resources:

- ➢ Business intelligence applications
- ➢ Knowledge in data mining and database systems
- ➢ Possibly machine learning and artificial intelligence to predict future data trends and perform predictive analysis
- ➢ Open source platform for data visualization, such as Pentaho, D3, BIRT, etc.
- ➢ Web application development

Risk Assessment:

The scope of the CVST system is very large. It contains data from traffic sensors but as well as data from NextBus, Cameras and Drones. Working with those datasets can be difficult and time consuming. To minimize this, our primarily focus will be on the more traditional data, i.e those from traffic sensors, to ensure functionality before moving onto the more complex datasets.

References

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