Identification Analysis And Calibration Of Various Traffic Factors

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INTRODUCTION

The aim of this research is to identify analyze and calibrate the various factors associated with traffic. These factors are collected based on many independent parameters to describe traffic and factors such as vehicle density, area, time or accidents, which need to be calibrated in order to better match field data. Clustering algorithm named K-Means was used to generate three clusters. A probability factor was introduced to measure the delay occurring .The findings showed that we can group factors associated to traffic into three cluster based on delay its caused and distance between the source and destination.

With the advancements in computational technology over the last few decades, traffic analysis and simulation has become popular among researchers for the evaluation of different alternative design and management strategies for a road network before adopting full-scale real-life implementations. Field implementations generally have legal and financial constraints associated to them while traffic analysis and simulation is a cost-effective and flexible approach to analyze and evaluate transportation systems. The analysis helps to understand how a road should be designed in order to reduce traffic. In this research we identified and calibrate various factors that actually cause traffic. We find the probability of each factor and how much delay they cause.

Already existing systems like google map does not give accurate result google map works on no of android devices present in specific route and how fast they are moving. Predicted value then updated after some time.

MOTIVATION

As quantity of vehicles are increasing in our country but we don't have corresponding infrastructure to support it.So in order to reach destination on time we need to have accurate traffic analysis.

OBJECTIVES

1. To identify various factors that affects road traffic.
2. To collect traffic data from google map.
3. To calibrate or measure strength of various traffic affecting factors.
4. To find the probability of each factor and their delay.
5. Categorized factors according to its severity and frequency.

LITERATURE SURVEY

1.Investigating and calibrating the dynamics of vehicles in traffic micro-simulations models:

- AIMSUN software allows to model transportation network small and large from a single intersection to an entire region.
- This research paper investigated two main approaches in studying how car dynamics are represented in AIMSUN traffic micro-simulation model.
- First is to analyse traffic using AIMSUN and second is using Instrument vehicle(vi).

2.Investigating the Transferability of Calibrated Microsimulation Parameters for Operational Performance Analysis in Roundabouts:

- Microscopic simulation models are based on modelling of vehicle kinematics and interactions.
- Movements are governed by gap acceptance, car following, lane changing, and other models and are typically calculated for each vehicle at every specified time-step.
- Proposed two analytical models (aaSIDRA and RODEL) •
- Proposed Three microsimulation tools (PARAMICS, Sim-Traffic, and VISSIM) •
- Analysis done at Marconi Roundabout Cosenza, South Italy.

3.Modelling, Simulation Methods for Intelligent Transportation Systems:

- Presents an overview of traffic flow modelling at the microscopic and macroscopic levels • Review of current traffic simulation software, as well as several methods for managing and controlling the various transportation systems.
- Examines the field of traffic flow theory and the concept of macroscopic vs. microscopic ways of modelling transportation systems

4.Short-term traffic forecasting: Where we are and where we're going:

- Literature review of the last decade(2001 to 2012)
- Findings support research interest towards:
    - Responsive forecasting(capture situation as accurate as possible) schemes for non-recurrent conditions (unlikely to happen again).
    - Developing prediction systems with increased algorithmic complexity ◦ attempting to understand data coming from novel technologies and fuse multi-source traffic data to improve predictions.
    - The applicability of AI methodologies to the short-term traffic prediction problem.

5.Speed and acceleration distributions at a traffic signal analyzed from microscopic real and simulated data:

- Modeling realistic driving behavior, determining the traffic signal performance, assessing the effect of different control strategies, estimating traffic emissions.
- This paper presents a method to collect real vehicle trajectories near traffic signals dataset using image processing techniques.
- Measure individual vehicles speeds and accelerations at a microscopic level
- Phases:
    - Data requirements and choice of the study area : Rotterdam, the Netherlands
    - Data conversion process : To detect automatically vehicles as moving objects image processing technique implemented in matlab is used.
    - Data cleaning : cleaning the errors when detecting moving vehicle.
    - Simulation : using AIMSUN and VISSIM

6.Traffic Simulation:Case for guidelines:

- Examine how existing guidelines are known and how much they are used in traffic simulation.
- The availability of guidelines was found to vary strongly from country to country.Eight countries have some guidance.(UK , US, Australia, Germany, Canada, New Zealand, Netherland, Japan).
- Discuss various issues to simulate traffic and some of them are as follows:
    - How to structure and manage a simulation project.
    - How to handle model ‘warm up’/run duration/’cooling off’ period:
        - Warmup - time taken by initial empty network to fill with vehicles.
        - Run duration - time taken for actual simulation
        - Cooling off - time taken by network filled with vehicle to empty
    - Number of runs to perform: Since traffic is stochastic and random so multiple runs of the simulation program are needed to obtain reliable results, problem is to find how much runs needed to complete the simulation
    - Calibration methodologies ◦ Model specific issues
    - What to do in the absence of appropriate data
    - What data to use for validation

7.Use of Mobile Data for Weather - Responsive Traffic Management Models:

- Proposed weather responsive traffic management (WRTM) model.

- Effect of weather on traffic has a direct impact on safety ,about 28% of all highway crashes, 19% of all fatalities and 25% of delays involve weather related conditions as a factor.
- Study predict effect of weather and traffic congestion before it occurs.
- Real-time simulation of a traffic network can predict future conditions and thus help design and implement more effective traffic operations including various types of control measures.
- Live demo of project : https://mdotjboss.state.mi.us/MiDrive/map
- Youtube Vedio link :https://www.youtube.com/watch?v=pmmOCbn64p0

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GAP IDENTIFIED

Already present traffic prediction systems like google map have following GAPs :

1. Does not give accurate result google map works on no. of android devices present in specific route and how fast they are moving.
2. Google map does not show what are the reason or factor of traffic.

METHODOLOGY

Data Collection: This was the most difficult step because there were no previously dataset available.In order to get the data, I perform an experiment.I manually insert the source and destination in google map and note the traffic delay and distance between them.I also note the date and time and then I repeat the same source and destination at some other time and record the data.

Data Pre Preprocessing: In order to perform clustering, We don't need source and destination from dataset so remove it and check for any missing values.GroupBy all the records according factors.

Clustering: Perform k-mean clustering according to distance and delay and clusters all the factors into 3 categories.

Calculating Probability:Find the probability for each factor.

RESULTS

```
(base) PS D:\saeem> python .\kmean.py
Factors                    Category    Probability
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Road Closed                       1       0.136364
Road Size                         0       0.0151515
Time                              2       0.0151515
Construction                      0       0.0151515
Accident                          1       0.121212
Line Indiscipline                 0       0.0151515
Social Event                      2       0.030303
Area                              1       0.030303
Toll                              2       0.0151515
Population Density                1       0.0151515
vehicle density                   0       0.0151515
Closed Road                       2       0.106061
Restricted Access road            1       0.0151515
Patholes                          0       0.030303
road construction                 2       0.0454545
Road Side parking                 2       0.0757576
Traffic Signals                   1       0.106061
Bridge Closure                    0       0.030303
Construction                      1       0.0151515
Road Block                        1       0.0151515
population density                1       0.136364
(base) PS D:\saeem>
```

Fig: Factors their category and probability

CONCLUSION

I have identified factors that can cause traffic and find its probability. I categorized these factors into 3 categories based on average delay it caused. Each category or cluster denoted factors that have similar severeness.

FUTURE WORK

- To collect real time traffic data we can create a scrapper.
- To handle and analyse large data, hadoop flume or kafka can be used

- Instead of Kmean CURE clustering can also be used.
- Try to work on a larger dataset.

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