TRAFFIC CONGESTION CONTROL AND REROUTING

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ABSTRACT

As the number of vehicles grows rapidly each year, more and more traffic congestion occurs, becoming a big issue for all metropolitan cities. Traffic congestion cause driver frustration and costs billions of dollars annually in lost time and fuel consumption. In this system, we are reducing traffic congestion which unifies the strategies of both dynamic vehicle rerouting and traffic light control. Specifically, calculate a density of vehicle on road using sensor network of proximity sensors to check the density of vehicles of available routes. According to density, set the traffic signals count down dynamically and also route the traffic on available routes. Also send all real-time traffic data on cloud and information are shown on website.

The novel traffic management framework for reducing traffic congestion unifies the strategies of both dynamic vehicle rerouting and traffic light control. One of the main issues for traffic management is congestion. Proper traffic management can prevent congestion or reduce the consequences of congestion by for example rerouting of the other traffic. Congestion occurs when the traffic demand exceeds the road capacity. When congestion will be happened it switched from one route to another if a significant number of drivers use the guidance. This situation could be avoided by new solutions on dynamic user-optimal traffic assignment.

Keywords*: Proactive driver guidance, Traffic load balancing, Vehicular congestion avoidance, Vehicular networks, Distributed traffic rerouting.*

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1. INTRODUCTION

The novel traffic management framework for reducing traffic congestion unifies the strategies of both dynamic vehicle rerouting and traffic light control. One of the main issues for traffic management is congestion. Proper traffic management can prevent congestion or reduce the consequences of congestion by for example rerouting of the other traffic. Congestion occurs when the traffic demand exceeds the road capacity.

When congestion will be happen it switched from one route to another if a significant number of drivers use the guidance. This situation could be avoided by new solutions on dynamic user-optimal traffic assignment. This system periodically computes the assignment of traffic flows to routes that lead to user equilibrium. In this system, vehicles can be viewed as both mobile sensors (i.e., collecting real-time traffic data) and actuators (i.e., changing their path in response to newly received guidance).

The system is cost effective and easily deployable because it does not require roadside infrastructure; it can work using only smartphones carried by drivers. When roadside sensors are available, the system can take advantage of them to supplement the data provided by vehicles to build an accurate representation of the global real-time traffic conditions. When the signs of congestion are observed on certain road segments, it computes proactive individually tailored rerouting guidance, which is pushed to vehicles that would pass through the congested segments. This system introduces a cost-effective and easily deployable vehicular traffic guidance system that reduces the effect of traffic congestion.

1.1 Problem Definition

Calculate a density of vehicle on road using sensor network of proximity Sensors to check the density of vehicles of available routes. According to density, set the traffic signals count down dynamically and also route the traffic on available routes. Also send all real time traffic data on cloud and information are shown on website.

1.2 Objectives

1. The real time of traffic where flow of data and road travel time can be determining on the basis of data reporting by roadside sensors.

2. This system purpose two strategies which compute a single alternative new path for each rerouted vehicle.

3. Future congestion occurs if many drivers take the same road segment within the same time, as assuming that drivers share their route information with the service.

4. It is possible to estimate the future footprint of each driver in the road network.

1.3 Scope

In case of road network, navigation systems can try to bypass the critical zone. Furthermore, any traffic control systems can inform the drivers about the traffic jam risk in order to guide them around the critical zone. To reduce the number of drivers who do not benefit from rerouting and to limit the increase in their travel time. In order to detect the traffic different sensors are being used and different techniques are used to determine the traffic and thus solve the problem related to traffic.

2. LITERATURE SURVEY

[1] Authors Xiaomei Zhao, Chunhua Wan, Huijun Sun, Dongfan Xie, and Ziyou Gao has proposed in "Dynamic Rerouting Behavior and Its Impact on Dynamic Traffic Patterns" this paper.

In this paper, we have proposed a day-to-day traffic assignment model that con-siders the effects of differences between the estimated travel cost and the expected cost. The stability of the equilibrium of this model and its dynamic evolution were analysed. Compared to the case with static rerouting behaviour, the most important improvement is the dynamic change in rerouting weight. The properties of the rerouting weight are derived from survey data.

[2] Authors Juan Pan, Iulian Sandu Popa, Karine Zeitouni, and Cristian Borcea has proposed in "Proactive Vehicular Traffic Rerouting for Lower Travel Time" this paper.

In this paper, the approach is based on a traffic guidance system that monitors traffic and proactively pushes individually tailored rerouting guidance to vehicles when there are signs of congestion. We proposed effective rerouting strategies to compute alternative routes for vehicles. Then, we conducted an extensive set of simulation based experiments to validate our approach.

[3] Authors B. S. Kerner has proposed in "Optimum principle for a vehicular traffic network: Minimum probability of congestion" this paper.

The network breakdown minimization (BM) principle states that the network optimum is reached, when link flow rates are assigned in the network in such a way that the probability for spontaneous occurrence of traffic breakdown at one of the network bottlenecks during a given observation time reaches the minimum possible value; this is equivalent to the maximization of the probability that traffic breakdown occurs at none of the network bottlenecks. The BM principle is conceptionally different in comparison with known traffic optimization approaches at a single bottleneck.

[4] Authors N. Malviya, S. Madden, and A. Bhattacharya has proposed in "A continuous query system for dynamic route planning" this paper.

In this paper, we described scalable techniques for continuous route planning queries on a road network. We explored two classes of algorithms: proximity-based algorithm and K- candidate-paths algorithm. A proximity based algorithm that recomputed the optimal route when more than some fraction of road delays change within a bounding ellipse, and several K- candidate-paths algorithms that compute a set of K possible routes and periodically revaluates the best route as road delays change.

Table 1: Literature Survey

Sr. No	Year	Author Name	Research Paper Name
1	March 2017	Xiaomei Zhao, Chunhua Wan, Huijun Sun, Dongfan Xie, and Ziyou Gao	Dynamic Rerouting Behaviour and Its Impact on Dynamic Traffic patterns
2	October 2013	Juan Pan, Iulian Sandu Popa, Karine Zeitouni, and Cristian Borcea	Proactive Vehicular Traffic Rerouting for Lower Travel Time
3	May 2012	Mahmood Rahmani and Haris N. Koutsopoulos	Path Inference of Low-Frequency GPS Probes for Urban Networks
4	May 2011	N. Malviya, S. Madden, and A. Bhattacharya	A continuous query system for dynamic route planning

2.1 Existing System

With the help of Intelligent Transportation System (ITS), current information of traffic can be used by control room to improve the traffic efficiency. We propose a new context aware approach to find the current status and density of traffic and dynamic management of traffic signals along with the environment conditions.

2.2 Proposed System

In case of road network, navigation systems can try to bypass the critical zone. Furthermore, any traffic control systems can inform the drivers about the traffic jam risk in order to guide them around the critical zone. To reduce the number of drivers who do not benefit from rerouting and to limit the increase in their travel time.

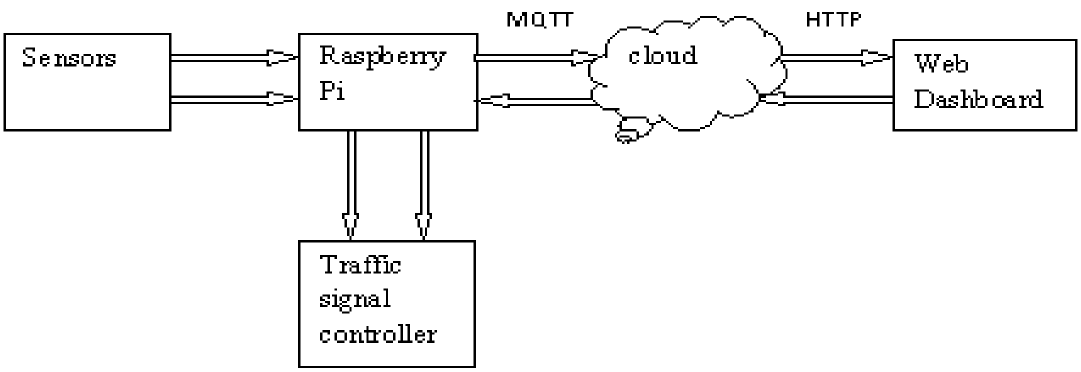
In this system, we calculate a density of vehicle on road using sensor network of proximity Sensors to check the density of vehicles of available routes. According to density, set the traffic signals count down dynamically and also route the traffic on available routes. Also send all real time traffic data on cloud and information are shown on website.

Fig. 1: Web Dashboard

Fig. 2: Optional route

5. SYSTEM ARCHITECTURE

In this system, traffic density sense by the sensor and digital data produced by the sensor data then perform the analysis on data using Raspberry-Pi and compare the traffic density. Data or decision data produced after analysis and new value for signal's countdown. Then all real time traffic data which is send and stored on cloud. Data is stored on cloud and display the real time traffic data on webpage.



The entire system can be dividing into the following major modules:

1. Get sensor data for calculating traffic density.
2. Perform analysis on data and compare traffic density.
3. Controller signal and rerouting based on traffic.
4. Send traffic data on cloud.
5. Display real time traffic data on web portal.

1. Get sensor data for calculating traffic density.

In this module, input is traffic density sense by the sensor and the output is digital data produced by the sensor data. This is to be send to the next module for further operations.

2. Perform analysis on data and compare traffic density.

The input for this module is digital data sensed by sensor and output is decision taken based on sensor data.

3. Controller signal and rerouting based on traffic.

The input for this module data or decision data produced after analysis and output of this module is new value for signal's countdown

4. Send traffic data on cloud.

In this module input is data which will be send on cloud and output is data stored on cloud.

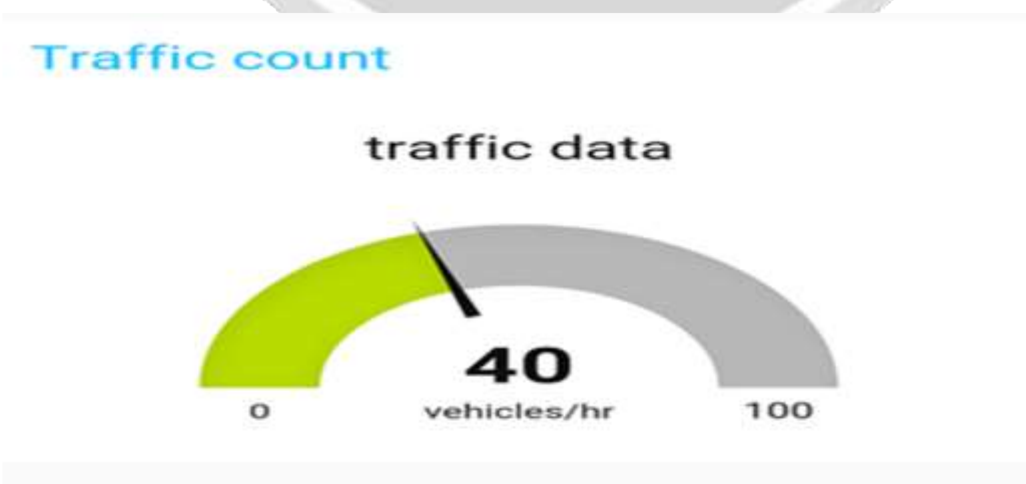
5. Display real time traffic data on web portal.

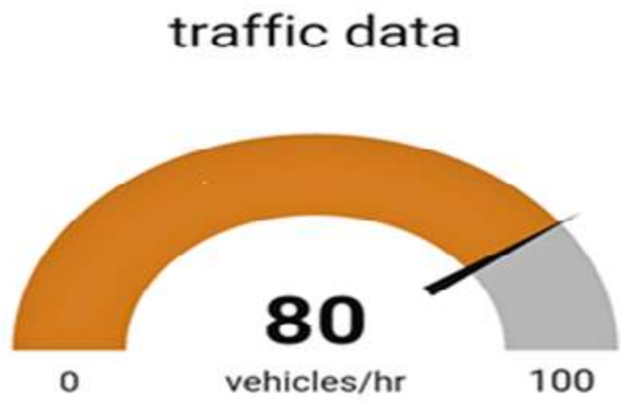
In this module input is data stored on cloud and the output is charts, graph displayed on webpage.

6. TESTING

ID	Test Case Description	Expected Result	Actual Result	Test Status
TC01	Send data using MQTT or the internet	The data should be send to internet/ browser using MQTT protocol	System Working Properly	Pass
TC02	Display Data on Web	Data should be Display on Web	Data is Displaying correctly on Website	Pass
TC03	It detects the change from its nearby objects	It should detects The changes from nearby Vehicles	Detects nearby vehicles correctly	Pass
TC04	It having three lights (Red, Green, Yellow)	Lights should turn on in a sequence	Lights turn on correct time	Pass

7. RESULT





7. CONCLUSION

Thus, we studied and completed the literature survey of our project, Traffic Congestion Control and Rerouting. In this system, Interface sensors with Raspberry Pi, Communication using MQTT, Display data on webpage. We have studied different types of Sensors, Raspberry Pi Board, Traffic light controllers etc. We completed the requirement analysis by studying requirements for our project. In the design phase, we designed the working of project and draw the different UML diagrams. As future work, we plan to explore three directions. First, we will design an adaptive approach to vehicle selection that considers additional parameters, such as road segment length, measured compliance rate, and estimated penetration rate.

6. REFERENCES

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[3]. Mahmood Rahmani and Haris N. Koutsopoulos," Path Inference of Low-Frequency GPS Probes for Urban Networks", May 2012

[4]. N. Malviya, S. Madden, and A. Bhattacharya, "A continuous query system for dynamic route planning," in *Proc. IEEE 27th ICDE*, 2011, pp. 792–803.