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A Unified Framework for Vehicle Rerouting And Traffic Light Control to Reduce Traffic Congestion using Load-Cell

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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 civil engineers in almost all metropolitan cities. In this paper, we introduce a Load-cell based traffic management framework for reducing traffic congestion, which unifies the strategies of both dynamic vehicle rerouting and traffic light control. Specifically, each vehicle, represented as an agent, deposits Load-cell in its route, while roadside infrastructure agents collect the Load-cell Information and fuse them to evaluate real-time traffic conditions as well as to predict expected road congestion levels in near future. Once road congestion is predicted, a proactive vehicle rerouting strategy based on global distance and local Load-cell is employed to assign alternative routes to selected vehicles before they enter congested roads. In the meanwhile, traffic light control agents take online strategies to further alleviate traffic congestion levels. We propose and evaluate the traffic congestion problem and traffic light control based on load-cell information. The unified pheromone-based traffic management framework is compared with seven other approaches in simulation environments. Experimental results show that the proposed framework outperforms other approaches in terms of traffic congestion levels and several other transportation metrics, such as air pollution and fuel consumption. Experiments over various compliance and penetration rates show the robustness of the proposed framework.

KEYWORDS— Load cell, proactive vehicle rerouting, online traffic light control.

I. INTRODUCTION

In this paper we Introduce Load cell place on road to recognize the vehicle out on the town. This goes about as a contribution to the STC unit. The STC unit creates a yield signals for Red, Green and Yellow Signal and screen their timings contemplating the quantity of vehicles on every street. A similar data is transmitted to the portable client which will ask for blockage status. On the off chance that vehicle driver at intersection send SMS on GSM cell phone to STC unit, the driver will get message demonstrating blockage status of street. STC framework will likewise give data about backup course of action to the client, if introduce movement is substantial. Notwithstanding above, in the crisis mode, for a vehicle like emergency vehicle, fire warrior or squad car, the signs are modified for the quick and simple development of these vehicle. On the off chance that a crisis vehicle is going by the course, the signs on the streets which are crossing this course will be instantly made red to stop vehicles on these courses. This is a critical element which is extremely helpful if there should arise an occurrence of crisis. In the event that the area of the client is closer then the framework naturally initiates the Bluetooth so as to exchange the data. In the event that the client is tad a long

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way from the above then it enacts RF-tx and RF-rx for sending of data. In the event that he is too long then at last it initiates the Wi-Fi to exchange the data. On account of this we are going to decreasing the utilization of energy. At last we will gather the power utilization data and updates in exceed expectations sheet keeping in mind the end goal to demonstrate the charts.

II. RELATED WORK

Findler and Stapp, "A distributed approach to optimized control of street traffic signals" [4]: The paper describes our long-term activity aimed at the control of traffic signals by a network of distributed processors situated at street intersections. Every processor runs an identical expert system and communicates directly with the four adjacent processors. (However, each expert system may need a somewhat different knowledge base to correspond to the geometry and the average traffic pattern of the associated intersection.) Messages can reach also indefinitely distant processors, modulated by the needs of intervening ones. The information transmitted can be raw data, processed information or expert advice. The rule-base of the expert systems has a natural segmentation, corresponding to different prevailing traffic patterns and the respective control strategies. Multidimensional learning programs optimize both the hierarchy of the rules and the parameters embedded in individual rules. Different measures of effectiveness can be selected as the criterion for optimization traffic. A Distributed Approach to Optimized Control of Street Traffic Signals.

Nayak, R. R., Sahana, S. K., Bagalkot, A. S., Soumya, M., Roopa, J., Govinda, R. M., & Ramavenkateswaran, N. (2013), " Smart traffic congestion control using wireless Communication"[1]: with globalization and the need for mobility fueling traffic growth all over the world , the problem of congestion on highways and in cities is becoming more and more acute. Intelligent traffic management system are helping people reach their destinations quickly and safely while at the same keeping traffic's environmental impacts in check. The goal of Intelligent traffic management system is to achieve improvements in mobility, safety and productivity of the transport system through integrated application of advanced monitoring, communication, display and control process technologies both in the vehicle and on the road. The paper presents the method to ,solve the problem of invisibility of the traffic signal due to huge vehicles blocking the view, prevent congestion caused at tollgates, give collision warning to the vehicles.

III. PROPOSED METHOD

The Load cell set on street to identify the vehicle out and about. This acts as an input to the STC unit. The STC unit generates an output signals for Red, Green and Yellow Signal and monitor their timings taking into consideration the number of vehicles on each road. The same information is transmitted to the mobile user which will request for congestion status. If vehicle driver at junction send SMS on GSM mobile phone to STC unit, the driver will get message indicating congestion status of road. STC system will also give information about alternate route to the user, if present traffic is heavy. In addition to above, in the emergency mode, for a vehicle like ambulance, fire fighter or police car, the signals are altered for the fast and easy movement of these vehicle. If an emergency vehicle is passing by the route, the signals on the roads which are crossing this route will be immediately made red to stop vehicles on these routes. This is a very important feature which is very useful in case of emergency. If the location of the user is very nearer then the system automatically activates the Bluetooth in order to transfer the information. If the user is little bit far from the above then it activates RF-tx & RF-rx for sending of information. If he is too long then finally it activates the Wi-Fi to transfer the information. Because of this we are going to reducing the consumption of power. Finally we will collect the power consumption information and updates in excel sheet in order to show the graphs.

The work in this paper:

- Initially the system will collect the information related to the traffic such as how much of traffic present in the road and is there any emergency vehicle with the help of Load Cell.
- Whenever the user requests for any information related to our system then the user sends the request.
- Whenever the system receives the request it sends the acknowledgment to the user regarding the location.

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The below figure 1 shows the working of the unified frame work for vehicle rerouting and traffic light control to reduce the traffic congestion.

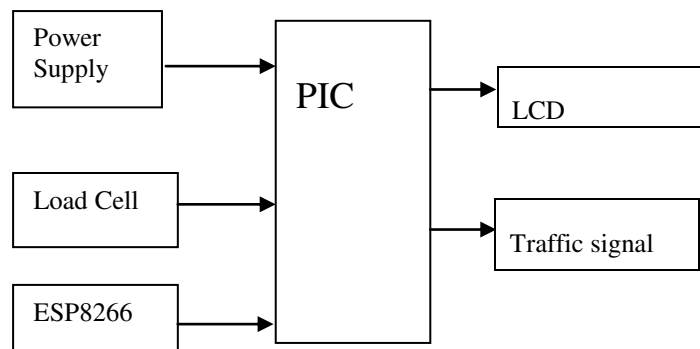


Fig 1: Block diagram of the traffic light control

- If the location of the user is very nearer then the system automatically activates the Bluetooth in order to transfer the information.
- If the user is little bit far from the above then it activates RF-tx & RF-rx for sending of information.
- If user is too long then finally it activates the Wi-Fi to transfer the information.
- Because of this we are going to reducing the consumption of power. Finally we will collect the power consumption information and updates in excel sheet in order to show the graphs.

IV. EXPERIMENTAL RESULTS

A unified framework for vehicle rerouting and traffic light control to reduce traffic congestion using the Load-Cell based on the vehicle weight. When the vehicle crosses the load-cell , vehicle weight andthe number of vehicles will be calculated based on the applied load.



Fig 2 Overview of the traffic congestion controller circuit

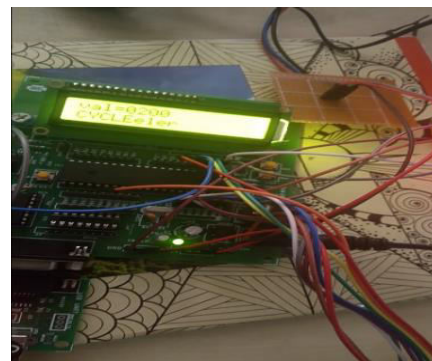


Fig 3 Value of the Cycle

When the vehicle crosses the load-cell, based on the defined weight of the vehicle the system will analyse whether the vehicle is cycle/two wheeler/four wheeler. In fig 3, it displays the cycle weight which crosses the load-cell.

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Fig 4 Value of the Two Wheeler

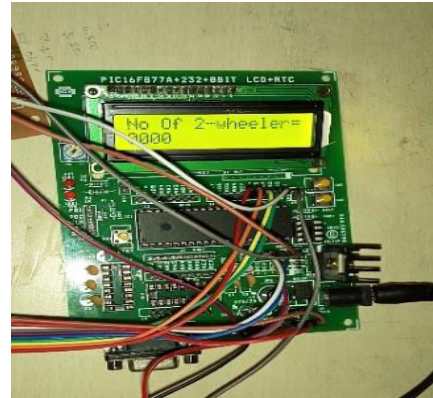


Fig 5 Number of Two Wheelers

The above figure 4 shows the two wheeler vehicle weight and figure 5 displays number of two wheeler vehicles at that moment.

In figure 5, when switch is in off condition vehicle weight will be calculated and when switch is in on condition it displays the number of vehicles which are all waiting to leave that road.

The below figure 6, it displays the total time required for vehicles to pass the road which are all crosses the load-cell. Here the number of vehicles are two, hence it takes only 13 seconds to pass the road.

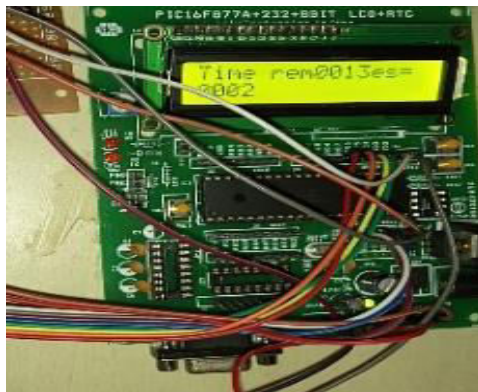


Fig 6 Total Time for Vehicle passing

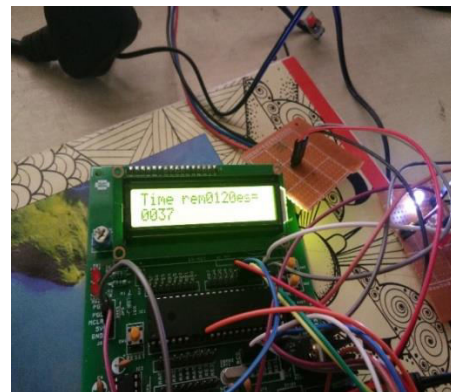


Fig 7 Time Shows the Heavy Traffic

The above figure 7, it displays the total time required for vehicles to pass the road which are all crosses the load-cell. Here the number of vehicles are 37, hence it takes maximum time (120 seconds) to pass the road and it shows high traffic density.

At present, in the traffic signals default signal timing is 60 seconds even there is less traffic it results in wastage of time. Hence by adopting this method, based on the number of vehicles traffic signal timing will be determined. By this way we can avoid the wastage of time.

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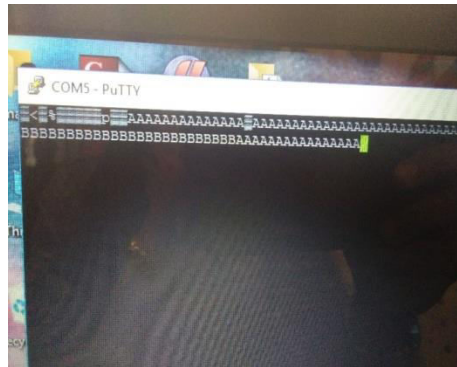


Fig 8 Density of the Traffic

The above figure 8, shows density of the traffic. When it displays 'B', it indicates high density traffic and when it displays 'A', it indicates low density traffic.

The below figure 9, shows the simplest path providing for emergency vehicle.

This figure shows that, initially in the junction of four roads all the three roads have red signal and the first road is green signal, but the emergency vehicle is in the second road so that to provide simplest path for the emergency vehicle green signal jumps to second road from the first road till the vehicle passes that road. After that as usual green and red signal changes to initial condition.

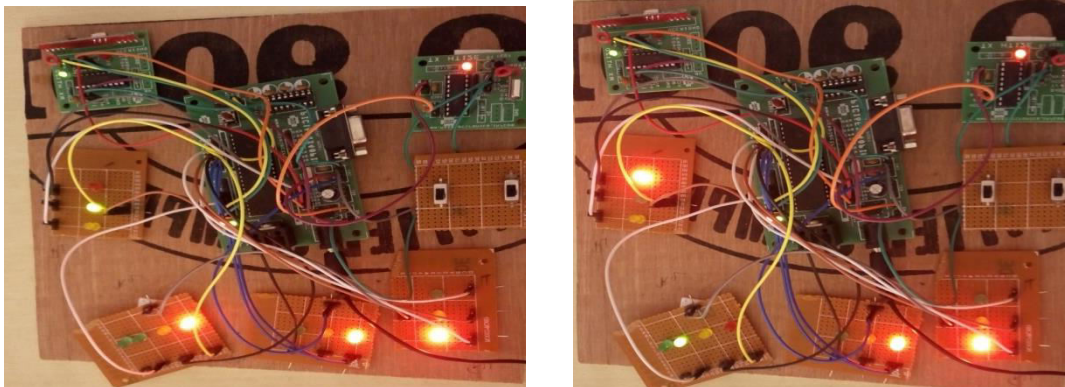


Fig 9 Path for Emergency vehicle.

V. CONCLUSION

The occurrence of traffic congestion at the intersections in cities is one of major problem. The present traffic light controlling system could not sufficient to tackle the traffic congestion due to the lack of efficiency in the designing to prevent this problem we introduce unified framework for vehicle rerouting and traffic light control using load-cell. Vehicle rerouting and traffic light control can individually help to alleviate traffic congestion, and it is desirable to combine them together as a traffic management frame. The framework is derived based on the assumption of equilibrium flows, which is not realistic because traffic is always much more dynamic and complex, address the problem of simultaneous route guidance and traffic signal optimization problem based on a space-phase-time hyper network. In this framework, each vehicle is guided on a path and the traffic signals servicing those vehicles are set to minimize their travel time.

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