DYNAMIC TRAFFIC MANAGEMENT SYSTEM USING INFRARED (IR) AND INTERNET OF THINGS (IoT)

Paul Jasmine Rani. L[1*], Khoushik Kumar. M[2], Naresh. K. S[3], Vignesh. S[4]
[1] Asst .Prof, Department of Computer Science, Rajalakshmi Institute of Technology, India;pauljasminrani.l@ritchennai.edu.in
[2]UG,Department of Computer Science, Rajalakshmi Institute of Technology, India;dravykhoushik@gmail.com
[3] UG, Department of Computer Science, Rajalakshmi Institute of Technology, India; nareshfuleco@gmail.com
[4]UG, Department of Computer Science, Rajalakshmi Institute of Technology, India; agaramvignesh@gmail.com

Abstract The major goal of the project is to make traffic management system work dynamically using Internet of Things, Infrared sensor and Image Processing in order to make traffic system work efficiently. Traffic management automation systems in the market aims to computerized the traffic lights, operates on a periodic schedule to control the light (red/yellow/green) uses various technologies like GSM, NFC focuses on the basic operation of an electrical switch. Our project plan to provide a automated IR-sense based solution that makes traffic signals to shift the lights (red/yellow/green) dynamically. We plan on implementing the project for one junction "Proof-of-Concept" for this paper, which includes traffic lights, IR-sensors, Wi-Fi transmitter and Raspberry Pi microcontroller. The sensed data gathered from IR sensor is transmitted by the Wi-Fi transmitter which is received by the raspberry-pi controller. Based on this compilation it dynamically shifts time of the red signal and the user gets an intimation of status of the signal on his way. The Raspberry Pi controller works as a central console, it determines which sideways of the road signal is to get open or close. The central console gathers all the data from sensors and stores it in the cloud which intimates traffic status to a mobile device.

Key Words: Infrared sensors, Dynamic traffic, raspberry pi

1.INTRODUCTION

The objective of our project is to construct an automate¬d traffic management system, capable of distributing time on receiving signal from the Infra¬red sensors. Traffic management automation systems in the market aims to computerized the traffic lights, operates on a periodic schedule to shift the light (red/yellow/green) uses various technologies like GSM(Global system for Mobile Communication), NFC(Near Field Communication)etc., focuses on the basic operation of an electrical switch. By using this sort of system, there is a major demerit of waiting for long time in the signal. The side with less count of vehicles or no-vehicles is split the same time as the other sides with more crowded vehicles, hence pav¬ing way for long congestion near the signal area. On the other side, by using the method of dynamic traffic there is huge chance of getting this congestion to an end or making it simpler for the road users. Our pro¬ject targets at providing a totally automated IR-sense based solution that makes traffic signals to shift the lights (red/yellow/green) dynamically. The IR-sen¬sors senses the obstruction in its way once a vehicle passes by. Once there is a long obstruction, the IR-sensor receives this signal as there is vehicle crowd on the road. The road side with more traffic enjoys more time, while the side with less traffic experiences less time. The user get warns about the whereabouts of the traffic on there mobile device. The user moni¬tors the traffic-density and nearer traffic signal's sta¬tus using his mobile device.

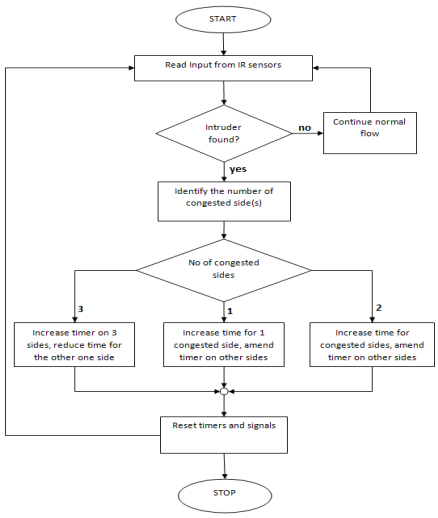

fig.1

We plan on implementing the project for one junction "Proof-of-Concept" for this project, which includes traffic lights, IR-sensors, Wi-Fi transmitter and Raspberry Pi microcontroller. The sensed data gathered from IR sensor is transmitted by the Wi-Fi transmitter which is received by raspberry-pi controller. Based on the data it dynamically shifts the waiting-time of the signal and the user gets an intimation of status of the signal on his way. The raspberry-pi controller works as a central console, it determines which sideways of the road signal is to get open or close. The opening and closing of the traffic signals are done in clock-wise manner so as to moderate the complexity. The central console gathers all the data from sensors and stores it in the cloud which intimates traffic status to a mobile device. Raspberry pi Board are interfaced with the sensors and programmed in a way that they give data to traffic lights and also notifies the mobile devices.

2. Related Works

The management systems which involve in maintaining the traffic are all static in nature. Either getting inputs for the system or changing of traffic lights accordingly take more time than the time required for the traffic to clear. Few algorithms which involve faster clearance involve the algorithm which enhances accidents.

3. EXISTING SYSTEM

The existing technologies, mostly uses Vehicular Ad hoc Network(VANET) which is prone to flooding in the route discovery phase, wasting bandwidth, delayed signals and increasing network congestions.
There are numerous models which involves managing the traffic which uses Arduino boards. These boards have lesser capability of handling external physical objects. Some existing models require the geographical-nature of the area and road conditions where they're being employed, making the model more expensive and non-usable. The algorithm which relies on speed of the vehicle makes the drivers to urge, ending up in accidents and increased discomfort. Dynamic algorithms are not employed in the systems where all of the above mentioned disadvantages are ruled out, making the model slower and non-compatible to use in real-time.

4. PROPOSED SYSTEM

Our project targets to provide the management of traffic lights in an efficient and cost effective manner which involves the inclusion of Raspberry-Pi and IR sensors. The major threats to the existing models like poor algorithm, usage of arduino boards, VANET based networks and GSM networks are compromised by new model using efficient algorithms, usage of Raspberry-Pi and elimination of GSM networks. An Infrared sensors are employed at either sideways of the road, makes note of incoming vehicles towards the signal. These signals which have the 'congestion' mark will indicate the Raspberry-Pi processor, which was installed inside the signal. The Raspberry-Pi in-

structs the traffic controller to show the appropriate signals based on the denseness of the traffic. The data signal given to the traffic light will be as: * The congested side will be given more 'green light' (i.e., the **timer** in the congested side is given more seconds than the other)to the side and vice versa.

* In case of equal congestion, time distribution of 'green signal' is also equal.

* The time split is fully relied on the input data from the IR sensors (Congested side enjoys more time)

The flow diagram of this algorithm is discussed in fig.1. The major disadvantage this algorithm will suffer will be the waiting-time of vehicles which are on less congestion side. This disadvantage is overcame by **splitting the time**, **not giving entire time** to the side with higher dense. Other factors which can distract the IR sensors are overcome by using an Image processing mechanism with the help of a Web-Cam employed at the signal.

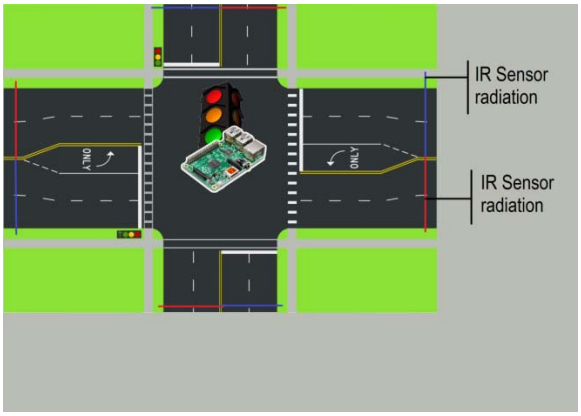

Fig.2

Fig.2 shows the installation of IR sensors in the road. The algorithm known as **background subtraction algorithm** is used in the Image Processing to plot out the blockage in the IR-sensors and the blockages are reported to the processing unit. The **timer is reset** once the blockage is removed and the normal flow of the system is revived to the initial configuration.

This can be illustrated as architecture as in fig3:

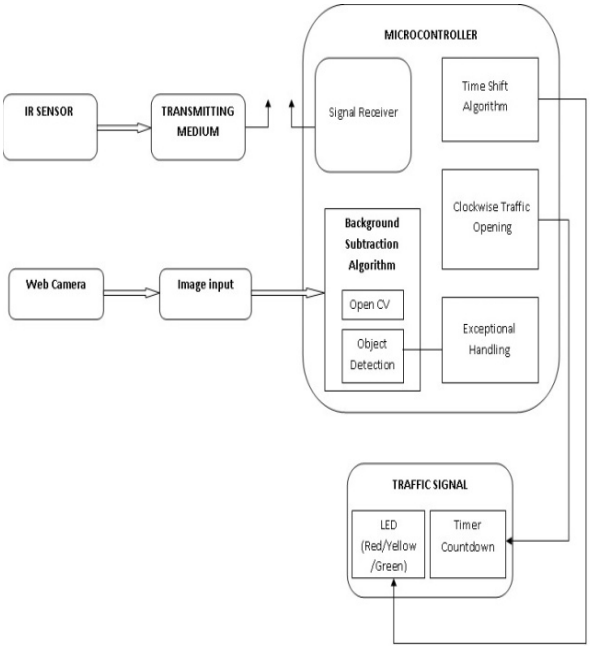

fig.3

5. Experimental Analysis

A matching analysis is done between the existing traffic management system and our proposed system. Consider the time given for the non-crowded side and making use of that time for to the crowded side. A vast increase in time for the crowded side is assured, and in that time more vehicles can pass through the traffic junction, thus reducing the traffic congestion dynamically.

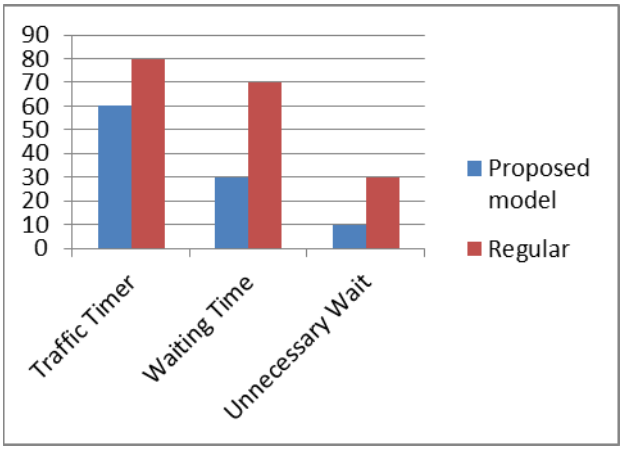

fig.4

6. Conclusion

The existing scheme faces a major demerits of changing the traffic controller in a clock-wise manner, it doesn't make note of the traffic denseness. The denseness of the traffic is calculated and the timer display is shift dynamically. This major advantage rules out the happening of 'unwanted wait' for the vehicles in the more crowded region

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