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REAL TIME SMART TRAFFIC MANAGING AND CONTROL SYSTEM

Sharik Akthar.S, Thowfeeq Ahamed.M.H, Yogesh.S.N, Mr. J. Satheesh Kumar
Department of ECE
Hindusthan College of Engg. & Tech, Coimbatore, India

Abstract— This model is designed to develop a real time traffic managing and control system which will be operating on the basis of vehicle density. The signal changes automatically by detecting the traffic density at each lane of the junction. Existing method of traffic light control system is based on time concept. A particular time will be programmed to each side of the junction which will not vary depending on traffic density. These conventional method of traffic light managing systems will be creating more traffic in major cities across all countries. In this model we will be calculating the number of vehicles in each lane and we will be allotting the green signal or we will be prioritizing the lane which has to be turned green based on the density of the vehicles. Raspberry pi microcontroller is used to control the traffic signal based on the traffic density. Ambulances are facing problems due to traffic signals so this smart traffic management system is also implemented to help in emergency case situation.

Keywords— Ambulance detection, Image processing, OpenCV, Raspberry Pi, RF transmitter and receiver, Stop line detection, Traffic Signals.

I. INTRODUCTION

The current world is facing more problems now a days one of which is traffic congestion even in less populated areas. As we can assume that one of the main reason for the traffic congestion is due to the more and more increase in volume of vehicles. Also the inadequate infrastructure and lack of development are some added disadvantages to the traffic jam. Traffic congestion can be explained as increased vehicular queuing on road networks. These type of traffic congestion will slows the speed of the vehicles, when these vehicles are fully stopped for a some period of time, then that will be generally known as traffic jam. These traffic congestion will create frustration to the drivers. In order to avoid the congestion in the traffic, Traffic Sign Recognition (TSR) are used. If a smart real time traffic control system is controlling the traffic signals then the drivers safety and comfort will be satisfied, for this need and to reduce the burden of the driver we have created this model.

Another problem due to the conventional traffic control system is, if the ambulance or any emergency vehicle is stuck in traffic signal, then the traffic police can give priority to the

ambulance lane rather than giving to any other lane so that the ambulance can pass through the traffic as soon as possible. In some cases the emergency vehicles will be stuck far from the traffic signal and can be unnoticed by the traffic police so the ambulance has to wait for a while in the traffic until the signal is given. This system will be play major role in avoiding this situation.

Due to irresponsibly we can see some traffic violations at the traffic signals, like the case of crossing the stop line during red signal which may also leads to crashes.

II. METHODOLOGY

A. Proposed System

The proposed system is used to automatically control traffic signals without manpower. Control of this system is entirely deployed on Raspberry Pi. This device will do its task all day without any interruption. Vehicle density is noted in each lane of the traffic based on which the Raspberry Pi will be controlling the signal.

B. Block Diagram

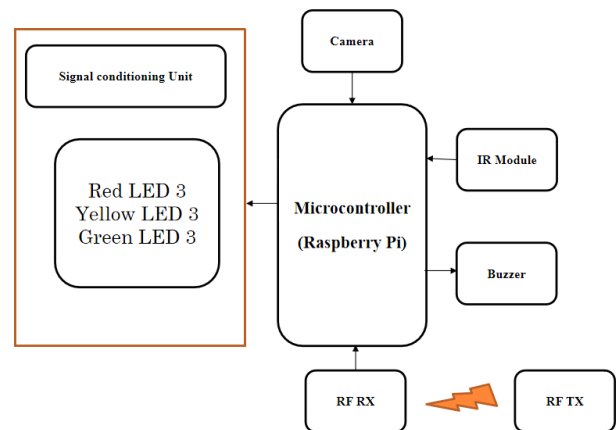


Fig.1 Block Diagram

C. Hardware Configuration

Microcontroller

A microcontroller can also be imagined as a small computer which is used for specific operation in an embedded projects. A microcontroller will be containing one or more

CPUs (processor cores) in it along with memory memory unit and input/output peripherals. It is the entire project's control unit. We have used Raspberry Pi3 microcontroller in this project.

Raspberry Pi3

The Raspberry Pi is the low cost computer with credit card size single board which is mostly used by current generation for study purpose. It is the perfect tool for scientists because it is affordable and difficult to break. It was Developed in UK by Raspberry Pi foundation in 2009. The intention is to promote study of basic computer science in schools. It uses different kind of processor, so Microsoft Windows can't be installed. But several versions of the Linux OS can be installed.

Raspberry Pi can act as CPU, with integrated GPU, RAM, network interface card, USB controller, and GPIO controller for interfacing with electronics. It runs an operating system and application software (written in any language, C, Java, Python, PHP). It is similar to Android smartphones as it uses a ARM architecture (Advanced RISC Machine).



Fig.2 Raspberry Pi3

Buzzer

A buzzer is a electronic device which creates a buzzing or beeping sound. It is mainly used to give alert signal to the user that a certain event has happened such as a timer cycle has completed, someone is at the door, etc.

RF (Transmitter & Receiver)

The RF module, is used to transmit Radio Frequency signals. The frequency range of this RF module will varies between 30 kHz & 300 GHz. Generally RF system uses Amplitude Shift Keying (ASK) where the digital data is represented as variations in the amplitude of carrier wave.

Signals from RF can travel through larger distances whereas IR signals can be transmitted only for short distances so in many cases RF transmission is selected over IR transmission. Also, RF signals can travel even when there is an obstruction between transmitter & receiver, whereas IR transmission operates in line-of-sight mode. This RF module comprises of RF Transmitter and RF Receiver.



Fig.3 RF Transmitter and Receiver

Camera Module

Camera is a device which can record and store image in digital form. Capture an image is usually done by photo sensors, using a charged coupled device. Captured images can be viewed on any platform with third party software like VLC player or any web browser. It is used for the monitoring of real time activities also, like in the case we have used to monitor the vehicle density.



Fig.4 Camera Module

IR Module

An IR module consists of a infrared emitter which is a LED made from gallium arsenide. The IR module or the sensor is mainly used to determine the obstacle in the sensing range of the module. It is a combination of both transmitter and receiver part. Infrared light will be emitted through the transmitter LED. When the transmitted light waves are reflected back, the reflected IR waves will be received by the receiver.



Fig.5 IR Module

When any IR signal is received in the receiver then we can come to know that there is an obstacle in the sensing range of the sensor.

III. WORKING

The conventional traffic light system is based on fixed time concept which works by fixed time of red signal and green signal in a particular lane. Due to this conventional traffic light system traffic congestion is occurring in many major cities across the world. By using density based traffic control system these problems will be reduced. Here the density of each line will be monitored and captured by camera. The captured images are processed by image processing method using python, OpenCV algorithm with the help of Raspberry Pi3. Number of vehicles in each lane is calculated. And the lane with higher density is identified and the signal turns green for that lane.

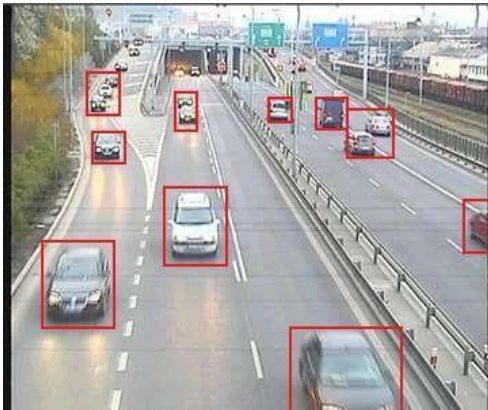


Fig.6 Vehicle detection using OpenCV

Another important problem due to traffic signal is ambulances are facing many problems due to excess traffic and due to waiting in the signal. To overcome this each ambulance will be having a RF transmitter unit with an activator switch. The RF signal will be transmitted from the ambulance once the activator switch is pressed. When the transmitted RF signal is received by the controller, signal in that particular lane will be cleared. In this process no matter how far the ambulance is from the controller, the RF signal will be transmitted for long range and it can have any obstacles in-between.

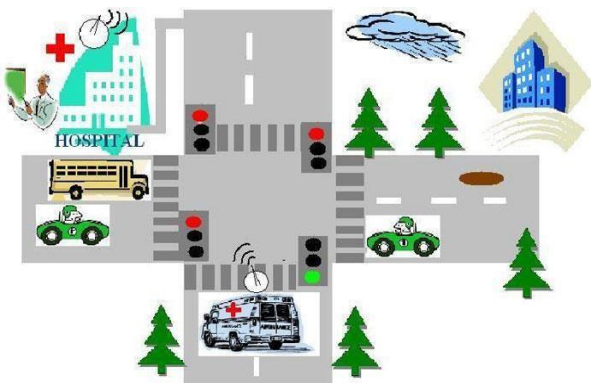


Fig.7 Ambulance detection system

If any vehicle crosses the stop line in the signal while signal is red, then a buzzer will be triggered which will indicate the nearby traffic police. Due to which any accident or collision in the traffic may be avoided.

IV. CONCLUSION AND FUTURE WORK

The developed Real time smart traffic managing control system will be more helpful for traffic department and will be very much useful for vehicle users. When this type of system is implemented, traffic congestion will be reduced and waiting time in the traffic will also be reduced. This system will automatically prioritize the lane which has to turn green based on the vehicle density.

When an emergency vehicle such as ambulance or a fire engine is detected, then the particular lane will automatically turned green which allows the emergency vehicle to pass through.

During red signal if any vehicle crosses the stop line then buzzer will be automatically triggered. No lane will be closed for more than 5 minutes even it has less number of vehicles because at some situation vehicles has to wait for long time in the traffic due to the very less vehicle density at that lane.

Detection of ambulance will be done using image recognition process. And the registration number of the vehicles which does not obey the traffic rules will be noted using image recognition.

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