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TRAFFIC SIGNAL ACCIDENT DISABLER

Raghavi.S[*1], Vishnu Prasad.G[2], Aishvarya.S.M[3], Akash Ram.C.J[4] & Kalaiselvi.V.K.G[5]

[*1,2,3&5]Information Technology, Sri Sairam Engineering College, Chennai, India

[4]Mechanical Engineering, Valliammai Engineering College, Chennai , India

ABSTRACT

Road accidents are the frequent news that we hear every day. These issues are the most vulnerable thing to human beings. Even though there are many reasons for these road accidents, disobeying the traffic signal is one of the major reason. There can be many control measures taken by government for accidents, still it is increasing day by day. Thus we are going to handle this problem with the help of this TSAD. Here we would discuss about the Arduino Uno, Raspberry Pi and how they implemented in this innovation. Most of these road accidents occur during peak hours. Once if these traffic rules are made automated then we never need to worry about our carelessness, automated in the sense the vehicles are manufactured in such a way that they follow the traffic rules. One of such rules which is automated here is obeying traffic signal that is the vehicle is brought to stationary state once the device detects red signal and released once the signal changes.

Keywords: *- Arduino Uno, Raspberry Pi, Wi-Fi module, Pi camera module, IR sensor, Open CV software.*

I. INTRODUCTION

Highway Traffic Safety Administration, it is found that 5.25 million accidents are taking place every year. The number of accidents which leads to death is approximately 40,000 per year. Traveling is something that we do every day based on our activity. In today's world, without traveling some of our basic activities are impossible. Peak hours are something that we all utilize at the same time for our daily work. This sometimes owing to our carelessness might lead to accidents. These accidents might not only affect the person who is involved but also people around him. Hence it is essential that every person should be careful while driving. To reduce this we have certain constraints to follow while traveling like, speed limit which can also be controlled by speed breaker, helmets, traffic signal etc. But many of us d0o not obey these rules. People might exceed the speed limit, does not care about the traffic signals, and may not wear helmets while driving. All of these happen only because of our Carelessness. Without the help of traffic signals, we cannot travel in easiest way on today's congested roadways. Traffic signals help the one who drives on the road as well as the pedestrians. Just imagine without the traffic signal how it would affect everyone creating traffic jams. There would be nothing to instruct the people when and where to move. Lots of traffic jam may occur which will be a greatest problem for the one who is driving vehicles as well as the pedestrians. People in order to avoid such traffic jams or some other inconvenient situations they disobey the traffic rules rather than following them. Henceforth it leads to accidents. Due to this kind of problems we may not be able to reach our destination at correct time. But we are not in that dangerous situation now as we are having this new innovation which protects us from one such accident that is traffic signal ignorance and so people are interested or not they are pushed into a condition to obey them.

II. LITERATURE SURVEY

Smart traffic control system using ATMEGA328 micro controller and arduino software – B. Naga Jyothi, Vahedha: Every vehicle consists of a Radio Frequency Identification Tag which is highly intact. Once the vehicle (emergency) reaches the traffic junction, RFID reader studies the signal conditions, a green wave is indicated which helps the vehicle pass smoothly without getting congested. As the vehicle crosses the traffic signal the signal automatically changes.

An Automatic Traffic Light Management Using Vehicle Sensor and GSM Model- A.Blessy, C.Lakshmipriya:
Automatic Traffic Light Controller (ATLC) is used which co-ordinates the network of traffic lights of all signal junctions. In this controller, TC-QT50, a vehicle sensor is connected to the Embedded System (ES) which in turn is connected to the server through Global System for Mobile Communication (GSM) which shares the information about the traffic congestion. The server controls the TLC of all the Signal Junction (SJ) and manages the traffic effectively.

Smart Spike System in traffic signal- K.Vishnusaravanabharathi, G.Merlinrose:
It is based on using spikes module, which operates using DC motor. When an ambulance reaches signal the spikes will gets OFF and other signals gets ON with an emergency alert.

Automatic and efficient driving strategies while approaching a traffic light- Martin Treiber, and Arne Kesting:
It is assumed that equipped vehicles obtain information about switching times of relevant traffic lights in advance. This information is used to improve traffic flow by the strategies “early braking”, “anticipative start”, and “flying start”. This can be implemented in driver-information mode or in automatic mode by an Adaptive Cruise Controller (ACC).

Result of literature survey:
We came up with the idea of controlling of traffic signal using sensors and the efficient driving strategies which helps us to improve the concept.

III. KEY COMPONENTS

An accurate solution for this problem can be made by an automated operation rather than a manual work. To avoid such road accidents, many traffic police are posing many rules for all the road way transport drivers, but only few drives according to it where this TSAD makes everyone follow them. To control every person who is in the traffic area, we are going to develop an automatic traffic signal control device.

A. Arduino Uno:
It is open source computer hardware, designed as a single-board microcontroller for building digital devices and the objects that can sense and control the other objects physically. These boards are manufactured as digital and analog input output pins that can be interfaced to other boards or other circuits.

Features of Arduino Uno:
It has an easy USB interface which allows the interface like serial device. The chip plugs onto the USB port and supports as a visual serial port on the computer. It has some other features like timers, external and internal interrupts, PWM pins and multiple sleep nodes. It has 16 MHZ clock which enables communication faster even in larger applications. There are 13 digital pins and 6 analog pins which allows us to connect the hardware to the Arduino Uno externally. For storing the code it has a 32KB of flash memory. At last, it has a button to reset the program on the chip.

B. Raspberry Pi:
It is a small, inexpensive and low cost computer. It has input output connectors and hardware within itself. It was developed for the computer science education and became popular in IOT devices. It has

a. system-on-a-chip(SOC) with 1 GB RAM, connection ports, SD card slot, camera, display interfaces and video/audio jack.

Working of Raspberry Pi:
An SD card has to be inserted onto the board which acts as a hard drive for the Raspberry Pi. Its power connection has to be given through the USB cable and its visual output can be displayed on any output device.

C. OpenCV:
OpenCV was built for providing a common infrastructure for computer vision applications and in the commercial products, it will accelerate the use of machine perception. It is a library of programming functions mainly for computer vision. It use under the open source BSD license. It is written in C++ and has bindings with Python, Java and matlab. It can run on variety of OS platforms such as windows, linux, macOS, freeBSD, NetBSD, OpenBSD for windows and Android, iOS, Maemo, Blackberry for mobile.

How to use OpenCV:
We just want to install the OpenCV library in our computer. We can code into it, it will utilize the all available features present inside the library and displays the required output.

IV. IMPLEMENTATION

For implementing this system, we need two circuits of one with Arduino Uno and the other one with Raspberry Pi and OpenCV application. Initially, Pi camera module is mounted onto the Raspberry Pi board and the circuit is connected to the brake system of the vehicle using digital sensor and push&pull actuator. This circuit will be placed in front of the vehicle as it is able to capture the clear video and the power connection of this circuit will be given through the external power supply or using the car battery. Now, Arduino Uno board is connected with the mobile phone and it is placed inside the vehicle. Its power supply will be given through the mobile using USB cable. A person's mobile needs to run the OpenCV application while driving where we have coding for the further processing. For making a connection between these two circuits, we use WiFi module.
How the brake sensor gets controlled according to the traffic signal?

When a person on his driving, the camera module fixed with the Raspberry Pi will captures the front view of the vehicle and visualizes it in the OpenCV.

Once it capture the RED color of the traffic signal, this will recognized by the OpenCV, now the Arduino board sends the LOW signal(logic 0) to the Raspberry Pi board through the WiFi module as because we were given in the coding inside Arduino. After receiving the LOW signal, this signal is sensed by the digital sensor, push&pull actuator gets activated which intends the vehicle to get stop.

Likewise, if it captures the GREEN color of the traffic signal, Arduino Uno board passes the HIGH signal to the Raspberry Pi board. Now the signal is sensed by the digital sensor and again the push&pull actuator gets activated which releases the brake and allows the vehicle to move. We need not to consider about YELLOW color of the traffic signal. Because, once the vehicle gets brake after recognizing RED color, it will release only after recognizing the GREEN color. So we can make sure that during the time of YELLOW color signal, the vehicle can't be able to move anymore.
We all know that the yellow signal is only for making us to get ready to move. Now this system is fully automated, so no need for instructing us for getting ready to move our vehicle.

What will happen in junction case?
In junction case, a person may wants to go any side of the direction. So he may not to wait for the signal. Hence we have a solution for this that, when he puts indicator then the light sensor observes the light produced by the indicator and it passes as an interrupt to the Raspberry Pi module. Now, this interrupt disables the operation. That is, braking control will not work in this situation. So the person can move to either of the direction as required.

At which distance the sensors sense the traffic signal?
The Sensor senses the traffic light at a distance of about 200 metres from the point of light source to the position of sensor.

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***If the vehicle nearing the signal with very high speed then how it will work*?**
The brake will be applied according to the speed of the vehicle. The speed of the vehicle will be calculated by tachometer, a sensor which is used to sense the speed of the vehicle. Based on the sensed value, the brake will be applied accordingly.

The below chart showing about the distance at which the brake could be applied based on the sensed value to stop the vehicle gradually (avoid skidding).

Fig: 1

[Reference List Citation: (Fig: 1)
https://www.qld.gov.au/transport/safety/road-safety/driving-safely/stopping-distances]

At which frequency the vehicle will apply brake?
The frequency of the brake is applied based on the formula, square of the speed divided by 20.

During night time is the sensor differentiate the surrounding light and traffic signal?
The intensity of red light in traffic signal will differs from the other surrounding lights. Hence, the sensor will sense the red light present in the traffic signal only.

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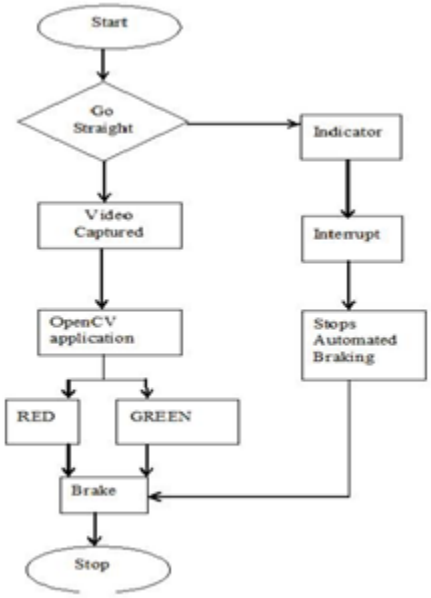
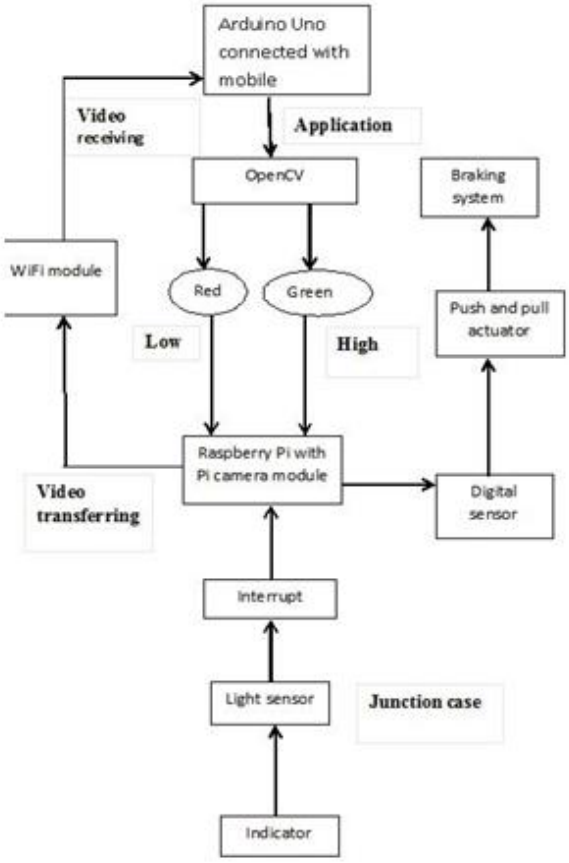
V. FLOWCHART



VI. ARCHITECTURE



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VII. ADVANTAGES

1. No problem of sudden brake as the speed is reduced gradually.
2. As this system is fully automated, there will no problem with our carelessness.
3. We can make sure that this system will reduce the number of road accidents.
4. This can be implemented in any vehicle.

VIII. LIMITATIONS

This system is not adapted for emergency vehicles.

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X. CONCLUSION

This innovation would be made mandatory in every vehicle system. This is manufactured in such a way that it works in any situation and we came through all the situation in above implementation. Private transports are increasing day by day hence there must be control over road accidents. Like wise to avoid accidents many ways are present, our contribution is to avoid the traffic signal accidents. Once after this system is implemented no one can skip the signal even in the absence of police man, no need for CCTV cameras to check everyone are obeying the signal, people need not pay fine as they would never disobey the signal.

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