

# Traffic Light Control Device Using Tensor Flow

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**Abstract—** As technology advances, the growth of vehicle manufacturing and production is increasing dramatically. This increases the number of vehicles on the road and also the Vehicle density at traffic lights grows, which is a huge disadvantage for emergency vehicles. Due to this, the waiting time of ambulance at junction increases by resulting in an increased death rate of emergency patients. At the same time, the pedestrians have to wait to cross the signal and due to which the population increases, and the rush leads to accidents by pedestrians. To overcome this, this research work has developed a novel device to reduce the wait time of pedestrians by using a certain average population density at the crossing and almost no waiting time for an ambulance. To implement this Raspberry Pi, a Pi camera and sensors are used along with the Tensor Flow algorithm as its main logic code is available in Python language.

**Keywords—** Raspberry Pi, Pi Camera, Sound Sensor, Tensor Flow, Python.

## I. INTRODUCTION

A traffic light control system is an approach initiated towards solving traffic issues in a defined area. Traffic at every junction is a major conflict faced nowadays. The vehicular traffic consumes a lot of time in everyone's life. In extreme circumstances, a medical help is required and the possibility of an ambulance arriving at the right time becomes a great challenge. It becomes impossible to such an extent that it costs a person's life. IoT has many elucidate and meaning, where IoT can be explained as a hardware controller with real-time sensors that are connected with a medium called internet.

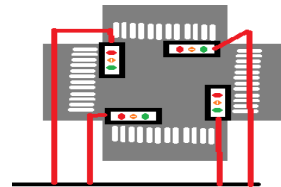
The demand for IoT devices is increasing rapidly and one of the sectors where this IoT is getting increased is in smart cities, which has more scope in upcoming times.

In addition to IoT smart devices, the important thing which improved the smart cities are the use of electrical and communicational technologies and based on these technologies, smart traffic controller is implemented to become more capable for developing real-time monitoring traffic signals for pedestrians, ambulances and data over a wireless network for providing an enhancement in the current traffic controller systems. These are the best technologies in the current market.

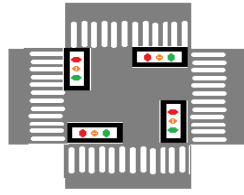
## II. RELATED WORK

Generally, the traffic lights were of two types during implementation. In past, the wires were used in most traffic junctions and were manually controlled by the police to clear the traffic at vehicles at the junction.

Now-a-days the junctions were employed using wireless signal controllers using specific devices to control the flow from a far-away distance. But all those will create some asynchronous way for emergency vehicles to pass through the signal.



A. Wired traffic signal control



B. Wireless based traffic signal

### III. SYSTEM DESCRIPTION

As it's been seen that in the US, the traffic lights were controlled using buttons for vehicles as well as for pedestrians but due to this pandemic there might be a chance of spreading the virus through the touch to overcome this problem. The proposed model has been introduced with a camera that has been used for recognition and it helps to reduce the spread of viruses and also checks the count of pedestrians through which the traffic signal automatically releases the way for pedestrians.

Moreover, in India as aware due to population and development there is a drastic increase of vehicles that indeed causes traffic mostly in urban and metropolitan areas. Due to this, the emergency vehicles like Ambulance can't go through and might end up midway to avoid such a situation we introduced a sound sensor that detects the sound and releases the signals, and continue soon the ambulance get through it.

In this work, the data aggregator is Raspberry Pi, where all the information is collected and it is used as a processor, which performs calculations on the data obtained. The Analog signals were transmitted through IR and Sound sensors and Digital signals in the case of Pedestrians will be captured through the camera module and sent to Raspberry Pi to continue the flow of execution. The Raspberry Pi performs certain operations that need to be done and processes the required criteria that need to be executed.

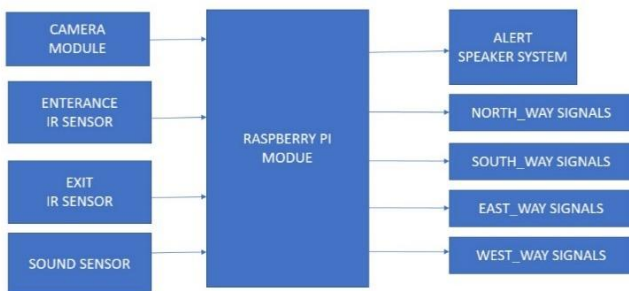


Fig.1 Block Diagram

#### A. Raspberry Pi

The Raspberry Pi operates in the open-source ecosystem: it runs Linux (a variety of distributions), and its main supported operating system, Pi OS, is open source and runs a suite of open-source software. It helps people to enhance their talent by exploring the device from all kind of people to learn about it with programming languages like Python and Scratch. It works on Linux operating system. Raspberry Pi has many features, which are very helpful to build many applications. It is faster than another micro controller because of its high clock speed i.e., 1.4 GHz. It can process high-end programs for applications like Cloud server, gaming, Weather Station console, etc.



Fig.2 Raspberry Pi

#### B. Raspberry Pi Camera

The pi camera is a portable camera device that used to take high-definition videos as well as photographs. It mainly helps beginners to understand and explore all verities of effects that can be created using libraries using it. with the usage of libraries along with python's, it can access MMAL, V4L APIs. It main used in home security applications and wildlife camera traps.



Fig.3 Pi Camera

#### C. Sound Sensor

A sound sensor is defined as a module that detects sound waves through their intensity and converting it to electrical signals. Here the sensor detects an ambulance based on the intensity of its sound frequency and directs the signal to Raspberry Pi for the process of data.



**Fig.4 Sound Sensor**

#### D. IR Sensor

An electronic device that is used in emitting some aspects of the surroundings is known as an infrared sensor. IR sensor is a device used to detect and measure the infrared radiation in its environment. IR is invisible to the naked eye due to its longer wavelength as it resides in the electromagnetic spectrum. It gives off whenever an element heated up above five-degree kelvin.



**Fig.5 IR Sensor**

#### E. Speaker

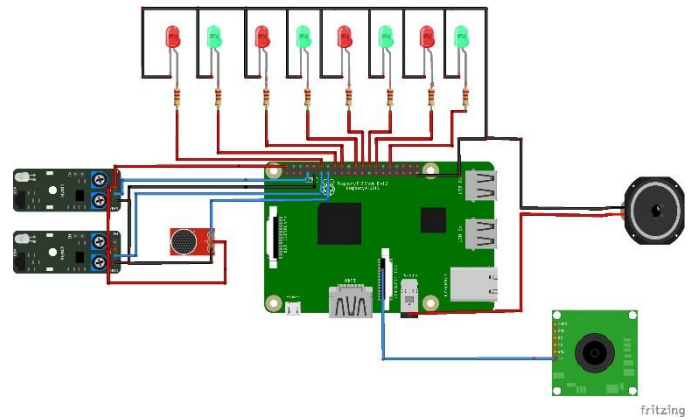
The Speaker allows the analog audio signals to amplify with loudspeaker for indication the sound system for all kind sounds along with its efficiency



**Fig.6 Speaker**

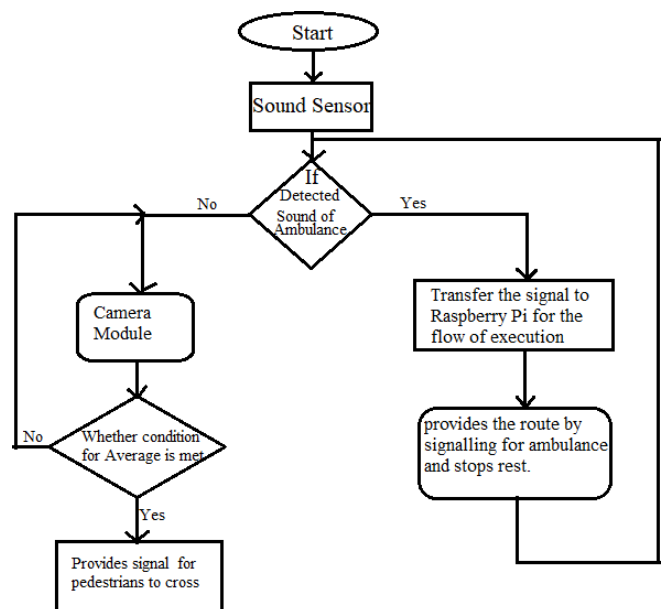
### IV. System Implementation

The schematic diagram of this device is given below.



**Fig.7 Schematic Diagram**

The sensors and camera module connected to the Raspberry Pi and output is expected to be speaker and lights at the signal.



**Fig.8 Flow Chart**

As we see at first the priority will be given to the sound sensor for detecting ambulance sound and then if it detects then it transfer the signal to raspberry pi to change the flow of traffic and stops the remaining path of vehicles.

If it doesn't detect then it will wait for either the ambulance to arrive or in the meantime if the average count of pedestrians meets the condition then stops all the path for vehicles and allows the pedestrians to pass the signal through the crossing and if in meantime by any chance when the ambulance arrives the controller itself automatically stops the current flow and continue to go with the emergency program and late upon completing that task it

gets backs to the original and continues its clockwise provided tasks

IV. SOFTWARE IMPLEMENTATION

Raspberry pi is used as part of the project and the software required for this work is the Tensor flow algorithm that detects pedestrians. The python program is saved in the SD card of Raspberry pi.

The complete setup is done with Hardware, whereas the software implementation is done in the Python IDLE. Python IDLE abbreviated as Integrated Development and Learning Environment is a Development Environment for Python. It executes a single statement like in Python Shell and also can create, modify and execute any scripted program. It also provides us with a text editor that helps with syntactical highlighting, maintain indentation. Debugging can be done step by step using the breakpoint feature. To work on IDLE first it needs to open a Shell. By clicking shell as shown,



Fig.9 Python Shell

Later the code can be written new file and save with python extension (.py)

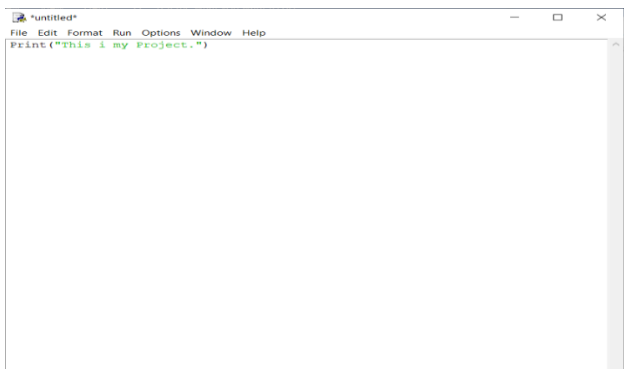


Fig.10 Python File

After Saving using F5 key will help to execute the program

on Shell.

V.RESULTS

The hardware setup is shown in below figure.



The working model of the project detects the object using the sensors like IR and sound. The model works in a way that soon the sound sensor detects the sound of Ambulance/Emergency it transmits the control to Raspberry Pi that executes the signal flow towards the LED that indicates or rather changes the signals and gives the priority to the emergency vehicle to pass through the signal/junction without any delay.

VI. FUTURE SCOPE

As the project determines a present view of traffic affairs but in future, there might be a chance for a situation where it gets stuck with a point of time by continuous development of these devices, we can come up with an individual evolving system sustainably works by itself to avoid the traffic problems by working as an individual by point to point.

VII CONCLUSIONS

This system gives an efficient way to prioritize the emergency vehicles and pedestrians can pass through the crossing with less time required. And the most effective application is that the waiting time for the ambulance is almost Zero as it previously intimated about the emergency at the junction. In the case of pedestrians, there will be an advantage even one of the junctions exceeds its average count and provides the precisely least waiting time

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