

# Providing Priority for Emergency Vehicles by Traffic Clearance using Image Processing

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**Abstract**— Vehicular travel is increasing in everywhere as more people are travelling across the country, and this increase in the number of vehicle on the road especially during the weekends has led to congestion at road inter sections thereby increasing time wasting of the people at the road, chaos by the pedestrians crossing the junction and most at times leads to accidents. The ambulance path it will be cleared in advance by using high technology and also presently the clearance of the heavy traffic is done using the siren of the ambulance or police cars. This paper presents a microcontroller based traffic light control system that has the ability to control any type of junction based on traffic density and providing priority for the emergency vehicle such as ambulance. It employed camera placed on each traffic signal pole to detect the presence and absence of vehicles and reacts accordingly, the controlling device (R5F100LE Microcontroller) that monitor the output and switches the LEDs (Red, Yellow or Green light) in a particular sequence based on the program loaded into it to control and provides the priority to the emergency vehicle.

**Keywords:** TSN, LEDs, Traffic Clearance using Image Processing, UART

## I. INTRODUCTION

The fast response of the emergency services such as ambulances or fire fighter's cars has become a challenging situation nowadays. Because of many reasons like lack of infrastructure, increasing number of cars or even chaotic driving the time until the ambulance reaches to the patient place is reduced a lot. Sometimes the ambulance gets stuck in traffic and those minutes can cost humans life. The present project is proposing an improvement of emergency services with final effect in saving humans life. The ambulance path it will be cleared in advance by using high technology. Presently the clearance of the heavy traffic is done using the siren of the ambulance or police cars. There is a system called as "Intelligent traffic light controller". Where traffic light intelligently decides based on the total traffic on all adjacent roads.

This system can minimize long waiting time and gives the priority to ambulance, fire brigade, or V.I.P vehicles. The system can be used only in intersections which have installed the traffic lights. In this paper we propose a "traffic controller" that announces the drivers of all vehicles about nearby ambulances and prepares them for sidestep. Our system can work without traffic lights. Basically, the main idea of the project is that the PC control sends an information signal to the driver, after the operator from call centre send a work order using the interface software. The data sent will contain the path, destination and the time to reach the final point. Then, from the PC control, a signal clearance will be send to the electronic boards on the way and traffic light

control. One of the goals is to reset the timer to green signal whenever ambulance has in path which got the traffic load and making the opposite signal board to red signal. All the processes are controlled by the FPGA and software installed on the PC. Real Time Data acquisition from the sensors mounted on the roads will provide information which will help calculation algorithm for choosing the fastest and safest way to destination. This new technology combines the technology of embedded system and Internet of Things which can get the maximum benefits and saves many lives.

Hardware implementation requires microcontroller board, electronic display boards, LED bulbs and software includes Cubesuite+, Ranases flash programmer, for Internet of Things.

## II. LITERATURE SURVEY

Earlier the traffic is controlled manually by police officer. They decide when the vehicle should cross the road and also provide importance to the emergency vehicle. Then in Intelligent Traffic Management System, the traffic is controlled automatically by each lane hundred and twenty seconds of green light is set on. Yellow light flashes for 20 second, before green light, signifying to start your vehicle and be ready to go. This system has some disadvantages that is it does not provide timing based on priority because of that it does not recognize emergency vehicle and give priority for the emergency vehicle. This includes two parts one is wireless sensors network(traffic sensor nodes(TSN) groups) and another is control box. In this they will collect the traffic data with help of sensors and control the traffic. Describes the concept of traffic clearance in which the time delay (10s) between the switching of signals is based on the congestion of vehicle. In our project we use 10s for green light to be left ON.[1]

If the congestion increases and this duration will be extended to 30s. Describes about density based traffic clearance.

We make use of this concept in our project to clear the traffic congestion in ambulance mode. Due to insufficient time we make use of IR sensor instead. We can extend our project by placing camera at junction in four ways by keeping this paper as reference.

Traffic is cleared using green wave system. The green phase of traffic signals will synchronized by green wave. The main disadvantage of this system is that if green wave is disturbed the traffic will collapse. Provides way for ambulance in lane through RFID technology. The system may not work, if the ambulance needs to take another route for some reasons or if the starting point is not known in advance. we make use of two RFID readers which will identify traffic density on two roads. When emergency vehicle is on lane it turns traffic signal to green. The images

sequences from a camera are analysed using various edge detection and object counting methods to obtain the most efficient technique to provide smooth flow for the vehicle.[2]

### III. PROPOSED METHOD

The objective in this paper is to design a system to traffic clearance for emergency vehicle using image processing in python especially by using image processing. This system is first control the normal traffic using sensor based density management. If any emergency situation occur, then the swift movement is important to control the traffic congestion. And we are introducing a special mode called ambulance mode, in which there will be an additional indicator which is in blue. By this the people could know that the ambulance is in its path and try to pave a way for life saver. All these process are combined and makes the life saver to reach the hospital in time.

#### A. System Model:

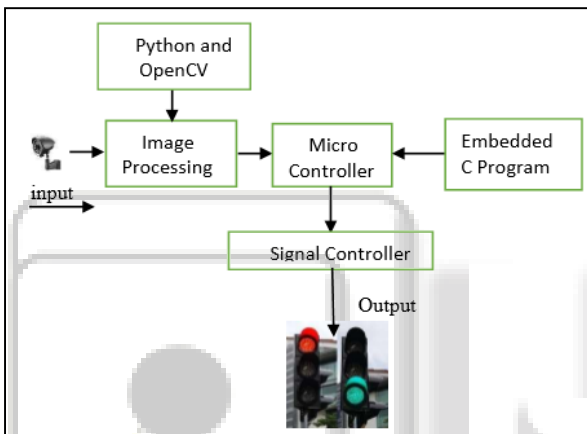


Fig. 1: General Architecture for Hardware and software.

Our project consists of three main modules which coordinates the entire process.

- Ambulance module
- Control module
- Traffic control module.

Above Figure 1 will gives us a detailed description about the model that we are using.

#### B. Ambulance Module:

This unit initiates the entire process of our project. Switching of the controls mainly depend on its arrival. Ambulance unit is designed in a way such that its movements are entirely controlled by Bluetooth. This unit is just made to give an outward appearance of the original ambulance in our demo.

#### C. Control Module:

This unit plays a vital role in recognizing the arrival of ambulance. To progress for the next stage, it sends a signal to the traffic control unit.

A surveillance camera being fitted at the 1km marking will continuously take a snap at an interval of 10 second. The captured image will then be processed by segmentation and fragmentation technique. Segmentation is the most important part in image processing. The main phrase of segmentation is to reduce the information for easy analysis. The overall image is fence off into several parts which is

something more meaningful and easier for further process. These several parts are re-joined will cover the entire image.

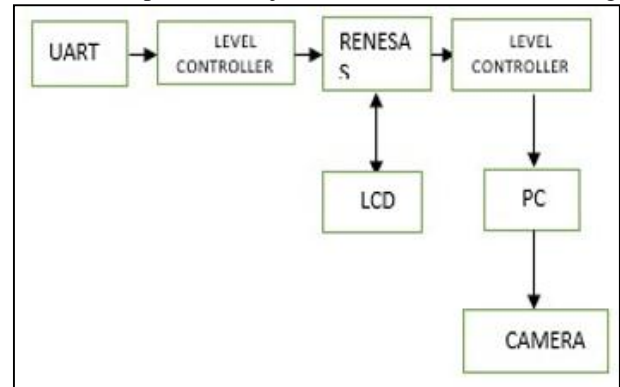


Fig. 2: Work Flow of the System

Figure 2 shows the work flow of the Traffic Management System with Universal Asynchronous Receive Transmit(UART) protocol. Level Controller controls the normal mode in which the time is 10s. Personal Computer manages the image processing phase and informs the level controller to change the mode from normal to ambulance detected mode. The Renesas microcontroller will manage the LCD and the signals.

#### D. Algorithm for Ambulance Detection:

##### 1) PHASE 1:

- 1) Step1: Initially ambulance image is captured with the help of camera.
- 2) Step2: This image compares with the loaded image in the program.
- 3) Step 3: Object detection of this reference image is done with the help object detection technique called Image Processing.

##### 2) PHASE 2:

- 4) Step 4: Real-time image is captured for every one second.
- 5) Step 5: Image detection of these real time images is now done with the help Image Processing.
- 6) Step 6: The signal need to be sent to the Hardware then the Detection of Ambulance phase is completed.

#### E. Algorithm for Traffic Management At Ambulance Detected:

- 1) Step 1: START
- 2) Step 2: Ambulance is on the way to hospital.
- 3) Step 3: On reaching near marking, a camera which is fitted there will take the snap shot of ambulance.
- 4) Step 4: Compares the captured image with the reference ambulance image.
- 5) Step 5: Case 1:
  - 1) If the image matches, a signal will be sent to the traffic light to switch from normal mode to AMBULANCE DETECTED mode in which the signal for that particular path set to green.
  - 2) This mode continues for thirty seconds and goes to step 6.
- Case 2: If the image doesn't match the traffic light continues to be in normal mode.
- 6) Step 6: In normal mode, the signals red, yellow, green will be switched at an interval of 10 seconds.

- 7) Step 7: In AMBULANCE DETECTED mode the Time for the lane or path in which the ambulance is detected, time extends for 20s.
- 8) Step 8: STOP.

#### IV. RESULT

##### A. Initial Time:



Fig. 3: Passing time for Vehicles in normal mode Synchronization of initial time for signal junction when there is no emergency vehicle in any of the roads. This time is constant for every road until any emergency vehicles get detected by the camera.

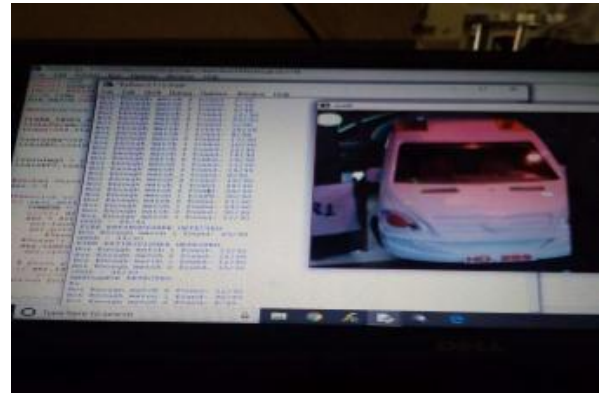
Update Timer: When any of the emergency vehicle detected in any one of the roads in the traffic the image processing will takes place and sends the signals to the microcontroller as road number to increase the time duration of that particular road.



Fig. 4: Update the Time when Emergency Vehicles Detected with Road Number

##### B. Detection of Ambulance:

In software part the representation of the detection of any emergency vehicles are shows as in the figure like AMBULANCE DETECTED or FIRE EXTINGUISHER DETECTED and the road number in which the vehicle is arrived.



#### V. CONCLUSION

The implementation requires hardware and software integration of the different components which basically needs adaptation in order to communicate and send/receive signals. With the help of the algorithms used, the response of the application for our purposes is achieved with high standards. Decision regarding which route to follow belongs exclusively to the system and the human intervention is very low. Real-time data acquisition from traffic offers a better overview of what is happening in the way of emergency vehicles and this helps to avoid accidents or congestion. The technologies of Internet of Things and embedded systems make possible that a complete automation in monitoring system from data detect to data transmission, and to intelligent decision-making.

By this project the problem of traffic to the emergency vehicles can be easily sorted out: the timing of each signal can be automatically adjusted according to the occurrence of emergency vehicle which is real time operation. It will also clear the path for the ambulance, fire brigade in emergency cases. It shows that it can reduce the traffic congestion and avoids the waiting time for emergency vehicles. It is also more consistent in detecting emergency vehicle presence because it uses actual traffic images. It visualizes the fact therefore it functions far better than those systems that consider the detection of the vehicles metal content. Overall, the system is nice however it still desires improvement to realize 100 % accuracy. The technologies of Internet of things and embedded systems make possible that a complete automation in monitoring system from data detect to data transmission, and to intelligent decision-making.

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