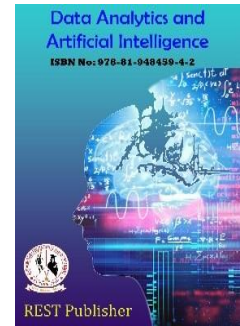




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Smart Control of Traffic Light System for Emergency Vehicle

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Abstract. *The congestion of road traffic becomes a major issue for highly crowded metropolitan cities. Ambulance service is one of the major services which are affected in traffic jams that lead to human death. In order to avoid this traffic has been controlled by giving priority to the ambulance. This paper has come up with the solution of saving people by fast response of traffic signal compared to various schemes based on image processing using MATLAB code. The outcome is the Signal-timing process that reduces the traffic load along the emergency vehicle routes. Although this method highly focuses on emergency vehicles to pass intersection quickly due to critical condition, however the traffic signal will change as soon as the ambulance passes so that the other vehicles will not get delay in the traffic.*

Keywords: *Traffic control; Emergency situation; Emergency vehicle; Image processing; MATLAB*

1. INTRODUCTION

The traffic light control plays a vital role in any intelligent traffic light management system. Vehicular traffic is endlessly increasing everywhere in the world and can cause terrible traffic congestion at intersections. Most of the traffic lights today feature a fixed green light sequence; therefore this sequence is determined without taking the presence of emergency vehicle into an account. Therefore emergency vehicle like ambulance stuck in a traffic jam and delayed in reaching its destination. This can lead to loss of property and valuable lives. More than 20 per cent of patients needing emergency treatment have died on their way to hospital because of delays due to traffic jams. In countries such as India the rate of road expansion is just one-third the vehicular growth rate. Statistics show that the current annual growth of vehicles is around 11% while the annual road extension remains to be only around 4%. The effects of increased traffic congestion are many. Our project focuses on the severe impact caused by traffic congestion of transportation system on ambulance. In places such as India and Thailand where the road width and length prove to be impossible to create a separate lane for emergency vehicles, it is difficult for ambulance to pass through the traffic. There are many ideas that are existed which include controlling a traffic light using timers for each phase or using sensors to detect vehicles. The fuzzy logic system and greedy logic system may help the ambulance to pass the lane fast. Whereas these system however require the presence of traffic policemen during the hours of peak traffic. Also, the above methods may have some delay, waiting time, and also have stop count. In addition to this the basic idea of existing work is to achieve a trade of between the ambulance performance and the impact of the other vehicles, but the performance of ambulance may not be absolutely guaranteed. As the other vehicles direction is very congested, the existing work can delay the time to give a green phase to ambulance direction, which will lower the average speed of the ambulance. The fast past of the ambulance is most important, Even though the other vehicles direction is extremely congested, so as long as the ambulance performance is affected, like being forced to slow down or even stop, we must ensure that the ambulance have to get the green phase in that lane.

2. SOFTWARE USED

MATLAB: MATLAB is a high performance language used for technical computing, it integrates all the necessary computation, visualization and even programming of the system where the solution's to an system is expressed in an familiar mathematical notations. MATLAB is a standard tool used for computational analysis in the cases of inventory and advanced courses of science and engineering which is the best tool for computational by the researches. MATLAB is build up by means of math works intended for fourth generation programming language. A variety of process approved within MATLAB contains control concerning the matrix, purpose as well as plotting of data, execution regarding algorithms, design of user interface, as well as integrating by means of programs formed within other languages like C, C++ and java. Despite mathematical calculation, MATLAB can be meant for embedded methods and by the guide regarding extra package known as Simulink. Specially MATLAB permit intended for matrix estimation as well as thus can be intended for image processing. MATLAB is simple towards gaining knowledge of a variety of device boxes used for it; an illustration is image processing toolbox. <https://www.matsim.org/>

Our contribution: In this work, the video clip from the traffic(ambulance) is been taken. Then converting the video into no of frames then the image processing takes place so that the ambulance is detected. This is done by using MATLAB code. Then sending those information to the traffic signal and the signal is been controlled. After the signal is received the red light is changed to green light in that lane and red light for the other lanes. As soon as the ambulance passed the lane the traffic signal will return to its regular traffic condition.

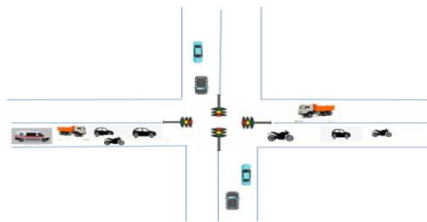


FIGURE1.

3. CONVENTIONAL TRAFFIC CONTROL SYSTEM

The standard methods that are used currently are described below.

3.1Manual Controlling: Manual controlling is said that the man who controls the traffic. The traffic polices are allotted for a required area to control the traffic. They also carry sign board, sign light and also a whistle to control the traffic.

3.2Automatic Controlling: Automatic Priority control of traffic light is controlled by raspberry pi. The lights are getting ON and OFF based on the priority for ambulance.

3.3Drawbacks of the conventional system: The manual controlling system which requires a large amount of man power. As there is difficult to control the traffic by only having man power manually in all area of a city even in towns. So there required a better system to control the traffic. In automatic traffic controlling the traffic light is controlled by giving priority to the ambulance for every phase.

4. METHODOLOGY

4.1Image Acquisition: Initially, we design a road setup with four lanes.The pi camera is attached with raspberry pi.It will monitor the lanes continuously by rotating the camera at 360 degree.

4.2 Image segmentation: Using threshold level, conversion of grayscale into binary image was performed. This process is known as binarization. The process where each pixel in an image has to be converted into one bit and also assigning an value of 0 or 1 depending upon the pixels mean value is known as binarization. If value is greater than the mean value then its termed as 1 else its 0.

4.3 Morphological operation: The morphological operations are used to remove unwanted objects in the image. This is done to eliminate the background portion in the image and to extract only the vehicle objects. This process is also known as ROI extraction.

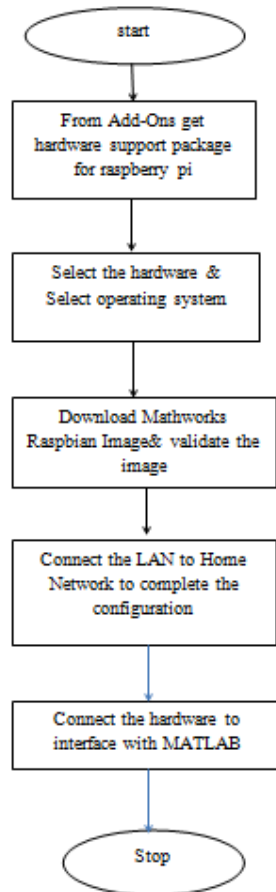
4.4 Ambulance Detection: Each vehicle is considered as one object. After image segmentation and morphological operations, ambulance will be detected and the other objects will be eliminated.

4.5 Block Diagram:



FIGURE1.

5. SOFTWARE IMPLEMENTATION



This is done by using MATLAB code. The MATLAB code and raspberry pi controls the green, red and amber lights. Raspberry pi is interface with the MATLAB for the controlling purpose. The figure shows how to interface the raspberry pi and MATLAB.



FIGURE2. Real traffic Image



FIGURE3. Filtered Image



FIGURE4. Extracted Image

6. CONCLUSION

In our project, we focus on priority control for only ambulance in a traffic signal for reducing the time delay at intersection. Here input is taken from the video through pi camera attached with raspberry pi which rotates continuously and take input of each lane. It converts into gray scale image and by using background image of each lane, an background subtracted image is obtained. The unwanted vehicles are removed and later only the ambulance will be detected. If the ambulance is detected, it send control to raspberry pi to change the signal to green for ambulance coming lane. It guarantees the fast pass of ambulance at the intersection and also minimise the effect of traffic of other vehicles. Our proposed method significantly decreases the waiting time of ambulance compared with available rules.

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