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PRIORITY BASED REAL TIME SMART TRAFFIC CONTROL

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***Abstract*— The aim of our project is to regulate traffic and to reduce the time on unwanted green signal.**

I. INTRODUCTION

Density and flow are the critical parameters for road traffic analysis. High performance road traffic management and control require real-time estimation of space and density as input for large spatial and temporal coverage of the roadway network. Vehicles crowding may result due to heavy traffic at a junction. To avoid this there are many traffic management techniques available but these old techniques are not perfect by themselves as the real time situations are continuously changing and the system has to modify itself to change in the continuously changing traffic scenarios. Thus we need a system to provide traffic management scheme which is self-changing in nature, so as to be prepared for continuously changing real time traffic scenarios.

The traffic lights that are used in today's traffic management system do not help much in detailing of when deciding when to change the lights for the various road users waiting in different lanes. How long the signal stays green in one lane and red in others is determined by simple preset timing that is calculated when the crossing is designed. Today's methods are robust and work well but the systems are very inefficient because they are unable to handle various situations that arise throughout the day. Unnecessary waiting time in the signal can be avoided by determining in which side the green signal should be on for a long time during the traffic and to achieve this we need to find the density of the traffic present on the roads.

We found that image processing is one of the best methods which we can use for adaptive signal controlling. Image processing provides measurement of pattern i.e. Measures various object in an image and image recognition i.e. Distinguish the objects in an image. Therefore this purpose of image processing can be used to identify the density of traffic present on the roads which gives the information of number of vehicles present in each lane.

In this proposed system, we place a camera such a way that it can capture the entire top view of the road on which we need to control traffic. We are using matlab to identify the number of vehicles present in each in and out lane. Matlab will send specific characters for each in and out lane that depends on the number of vehicles which is fixed by matlab programmer. The specific characters will get send from pc to microcontroller by using usb to ttl in the binary form. Microcontroller will identify which characters is received and according to that it gives priority to that lane in which traffic density will be maximum. We are using 4 traffic signal set to clear the priority. In such a way that traffic priority will get cleared. After all four lanes are cleared according to the priority given to them by microcontroller camera will again get ready to click next image. Each in lane is used to decide the priority and out lane is used to decide the duration. For how much duration led needs to be on that decided by number of vehicles present in out lane. If the ambulance is detected then priority will be given to that lane, irrespective of the traffic density.

METHODOLOGY

- Image Processing Unit.
- USB to TTL.
- Control Unit.
- Traffic Signal Light.

1. Image Processing Unit:

In an image processing unit, camera is dynamically capturing entire top view of the four roads and sending it to the PC. PC will process the received images using

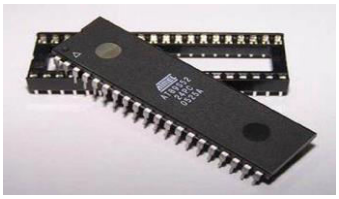
MATLAB software and process the information about the traffic density and emergency vehicle if present on roads in both IN and OUT lanes.

2. USB to TTL :

USB to TTL is used for serial communication between PC and microcontroller. PC will send information of the processed image to the microcontroller using USB to TTL cable. The cable is easiest way ever to connect to your microcontroller/Raspberry Pi/WiFi router serial console port. Inside the big USB plug is a USB<->Serial conversion chip and at the end of the 36" cable are four wire - red power, black ground, white RX into USB port, and green TX out of the USB port. The power pin provides the 5V @ 500mA direct from the USB port and the RX/TX pins are 3.3V level for interfacing with the most common 3.3V logic level chipsets.

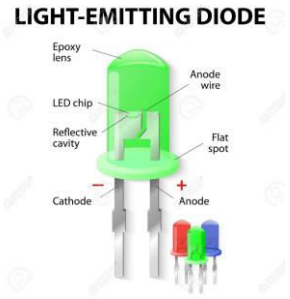
3. Control Unit:

This is the main backbone of whole traffic signal lights control system. This determines the inputs from the image processing unit and controls the traffic signal lights according to the density of vehicles present on roads. The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

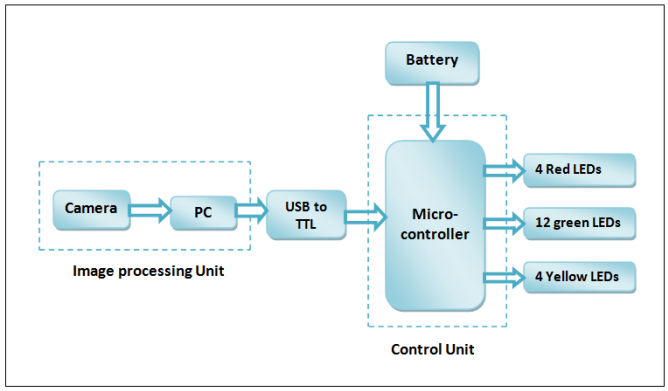


4. Traffic Signal:

LEDs used as traffic signal lights for four roads. The priority and timer is given to LEDs by the microcontroller. Four Red LEDs, one for each road is used to stop the vehicle flow and twelve green LEDs, three for each road are used to surpass the traffic for given time. LEDs offer benefits such as small size, long lamp life, low heat output, energy savings and durability. They also allow extraordinary design flexibility in colour changing, dimming and distribution by combining these small units into desired shapes, colours, sizes and lumen packages. LEDs are solid state semiconductor devices. LED illumination is achieved when a semiconductor crystal is excited so that it directly produces visible light in a desired wavelength range (colour). LED units are small, typically 5mm.



- **BLOCK DIAGRAM**



- **WORKING**

1.Capturing of image:

Initially, the camera is used to capture the image of roads. The camera is placed such that it will capture the entire image of road. The captured image is further given to pc for image processing in MATLAB software.

2.Processing of captured images:

We are using image processing in MATLAB to identify the number of vehicles present in each IN and OUT lane. Image will go through colour thresholding algorithm where threshold value and number of pixel for ambulance are preset to detect

them into a captured image. After colour thresholding image will get converted into grey scale. This grey scale image now will go through blob detection algorithm to detect vehicles present on roads in respective IN and OUT lanes and detected blobs will get labelled to return count of blob detected in an image with their respective lane.

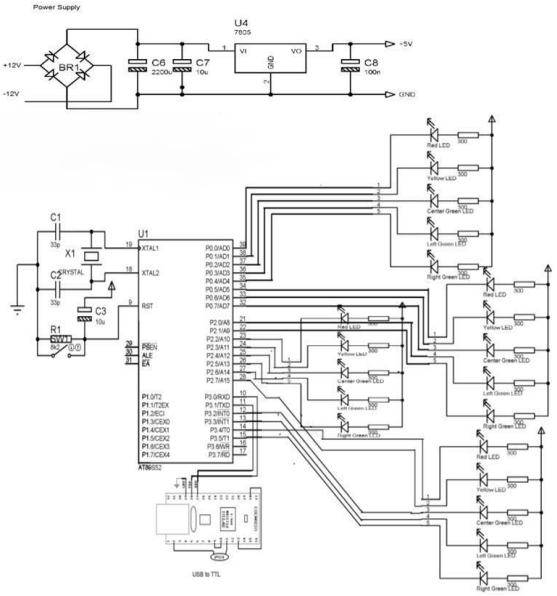
4.Use of Microcontroller to set priority and timer:

Once the detection of ambulance and counting of vehicles is done, microcontroller will set priority and priority depends on IN lane. If ambulance was detected then first priority will go to ambulance and then as per traffic density respective lane will get priority. If ambulance is not detected then priority will be given based on traffic density. The traffic signal timer depends on OUT lane. So based on number of vehicles present in OUT lane timer will be set.

5.Techniques Used In Proposed System

- **Emergency Vehicle Detection:** In this proposed system image captured by a camera will be a colour image initially. Thus we will use colour based thresholding in which thresholding is to be done based on colour values in natural images [5] to detect an ambulance in an image. Where image will be compared with the predefined criteria of ambulance detection in which blue colour intensity of siren with number of pixels used to define a region of siren set by the MATLAB programmer.
- **Vehicle counts in respective lane:** Once the process of emergency vehicle detection is completed, initially captured colour image is then converted into grey scale image for lane detection, vehicle detection and its count. First, we build a background Traffic model to segment foreground objects [2], [4]. Then we apply blob detection [3], which returns the count of blobs present in that image. we have mentioned the different regions for different lanes in background model, so accordingly it returns the total count and depending on the regions we can decide the vehicle count in that particular lane. We put region of interest in each lane and gets the count for respective lane.

- **CIRCUIT DIAGRAM**



- **SUMMARY OF LITERATURE REVIEW**

As a result of the fast growing trend in Electronics engineering, a good number of electronic instruments that exists in advanced countries should also exist in our country.Object detection has become a wide area research in image processing.Many methods has been proposed for object detection in digitally proposed images such as background subtraction,edge detection,block detection etc.There are several applications of objects detection in digitally processed images.Vehicle detection is one the applications of object detection widely used in smart traffic surveillance system.M>Fathy and M.Y.Siyal in developed a new background updating and a dynamic threshold selection technique.In this an alternative object detection technique used in image processing based on edge detection techniques.However, an edge detector extracts the edge of the object of a scene irrespective of whether it belongs to the background details method based or the object,Therefore to separate this two extra information is required.They have developed

a new detection method based on background differencing and edge detection techniques,which separate the objects from their background and works well under various lightning and wheather conditions.The image detection technique can be used together with other techniques for calculating traffic parameters,for example counting number of vehicles.

- **SUGGESTION FOR FUTURE USE**

1. The present system uses a single camera for monitoring traffic at an intersection; by using a separate camera for each road at an intersection will allow the system to use video processing which can improve the system efficiency further.
2. The vehicle objects can also be categorized into various classes depending upon the geometrical shape of vehicle for blocking the passage of large vehicles e.g., trucks during day times.
3. The emergency mode can be refined further by installing a GPS receiver in ambulance so that the base station will keep track of the ambulance location on a continuous basis and clear the road whenever will be required.
4. The present system uses wired connection between camera, PC and microcontroller. This connection can be made wireless by using wireless module e.g. Raspberry pi.
5. The system can be wireless using IOT, and system can be design to communicate with other system present in nearby area for intelligent control over big areas.

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- **CONCLUSION**

In this project, a method for controlling the traffic signal using Image Processing is presented. This is done by using the camera images captured from the lanes, each image is processed separately and the number of vehicles had been counted and according to that priority is given and green signal is operated based on timer.

We verified image detection methods such as edge detection, background subtraction and blob detection which will be well suited to give exact count of vehicles by comparing their result. Thus we conclude that blob detection is best method compared to other methods for vehicle detection and it also helps to return the count of vehicle.

We also verified colour thresholding method based on threshold value of required colour and region of interest by defining number of pixel to detect ambulance in an image which worked successfully in our project.

The advantages of this new method include such benefits as use of image processing over sensors, low cost, easy setup and relatively good accuracy and speed. Seeing that this method has been implemented using Image Processing and MATLAB software, therefore production cost is low while achieving high speed and accuracy.

- **ACKNOWLEDGMENT**

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