TRAFFIC CONTROL SYSTEM USING RASPBERRY-Pi
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ABSTRACT: The existing Traffic control system is based on the "time" which is already assigned in the system. According to these times the signals are working in each lane. But in these system condition occurs as all vehicles in lane( L1) are passed and vehicles in another lane (L2) still in waiting state because time is not over and hence signal is still red. These systems are very inefficient because they are unable to handle various simple situations which are occurs throughout the day. Major drawback is it has unnecessary waiting time and there is no facility to handle emergency vehicles. The project is designed to develop a system which perform execution based on density of vehicles(Vehicle Count). After calculating the number of vehicles we will came to know in which side the density is high based on which signals will be allotted for a particular side. Raspberry pi is used as a microcontroller which provides the signal timing based on the traffic density. And can provide facility to handle emergency vehicles automatically and efficiently.

KEY WORDS: Traffic Control, Raspberry Pi, Image Processing, Vehicle Counting, Open CV

I. INTRODUCTION
India is a large country and around the world India is second most populous country and fast growing economy , In today's life we have to face different kinds of problem one of which is increasing amount of vehicles it becomes increase in traffic and chaos. Infrastructure growth in India and growth in number of vehicles is not equal , because of large population speed of increase in no of vehicles is much faster than infrastructure growth. Roads capacity and interaction along the roads (cross-roads / junctions) are not capable to handle higher number of vehicles. Major drawback of Indian traffic is non-lane based and chaotic. So for Indian traffic the solution system is required which is different from developed countries. The paper is grouped into different part. We discuss each part one by one for better understanding.

II. LITERATURE SURVEY
India is the second most populous Country in the World is a fast growing economy. It is seeing increased no of road congestion problems in its cities. Infrastructure growth is slow as compared to the growth in number of vehicles, due to space and cost constraints [3]. Conventional traffic light system is based on fixed time concept allotted to each side of the junction which cannot be varied as per varying traffic density. Some time it will be not provide sufficient time to pass vehicles because traffic signal time is pre define [1]. Nowadays traffic problem are increasing because of the increasing number of vehicles and the limited resources provided by the current infrastructures. Due to this, there is a need to wait more time in front of the signals [2].

We propose a system for controlling the traffic light by image processing. The system will detect vehicles through capture camera images instead of using electronic sensors embedded in the pavement. A camera will be installed alongside the traffic light. It will capture image sequences. The image sequence will then be analyzed using digital image processing for vehicle detection, and according to traffic conditions on the road traffic light can be controlled [4].

III. PROPOSED SYSTEM
The existing system is based on the “time” which is already assigned in the system. According to these “time” the signals are working in each lane. But in these system condition occurs as all vehicles in lane( L1) are passed and vehicles in another lane (L2) still in waiting state because time is not over and hence signal is still red. These systems are very inefficient because they are unable to handle various simple situations which occur throughout the day. Major drawback is it has unnecessary waiting time. We propose a smart traffic signal controller system. The proposed system tries to minimize the possibilities of traffic jams, caused by the traffic lights, to some extent by clearing the road with higher density of vehicles. Through which less number of vehicles in waiting state and can reduce time consuming. And our system also provides the clearance for the emergency vehicle if any. For example fire emergency, ambulance emergency and VIP persons vehicles. The system is based on the AVR micro controller technology. The code for this project is compiled in high tech C compiler and the simulated with Proteus software.

Complete system of Automotive traffic control System Separated in Following Seven Stages:

1. Image Acquisition
2. Image Pre-Processing
3. Morphological Processing
4. **Blob Analysis**  
5. **Count Density (No of Vehicles)**  
6. **Find vehicle Emergency or Not**  
7. **Send Signal.**

**Image Acquisition:** Image of the vehicle is captured using video camera and transferred to the image processing system in Open CV.

**Pre-processing:** Acquired image is enhanced using contrast and brightness enhancement techniques.

**Greyscale conversion:** It involves conversion of colour image into a gray image. The method is based on different colour transform. According to the R, G, B value in the image, it calculates the value of gray value, and obtains the gray image at the same time.

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**Image Binarization:** Greyscale image is converted into black and white image i.e. binary image using thresholding operation.

**Traffic Density Calculation:** By applying Morphological filtering, and Blob analysis on the binary image number of vehicles will be count and compare with Traffic density threshold.

**Identify Ambulance:** By using Binary image, Morphological filtering, and Blob analysis ambulance will be detected.

**Send ambulance signal to the microcontroller:** The identified ambulance is send to AVR microcontroller through serial port.

**IV. PROPOSED SYSTEM FLOW**

![Proposed System Flow Diagram](image)

Proposed system Flow is as shown in figure.  

**A) Camera:** Continuously record traffic video.  

**B) Read Image:** Take one frame per second from video using image processing.  

**C) Image Subtraction:** In system we already save background image without vehicles (Initial Condition) and subtracts current image of traffic from background image.  

**D) Convert Image to Binary:**
- Creates black and white image.  
- Vehicle=White. Background= Black
E) Morphological Processing:
   - It Performs Image Filtering.
   - Uses 2 processes -
     Open: Remove White dots other than vehicle.
     Close: Remove Black dots other than back ground.

F) Blob Analysis: -
   a. Checks current density of vehicle.
   b. Checks tags on vehicle if any.

G) Find Vehicle Emergency or not: -
   a. Verify emergency vehicle is present or not.
   b. If present then generates green signal.
   c. If not then count number of vehicles and generates
   Greater density lane = green signal , and Other lane = Red.

V. SOFTWARE AND HARDWARE REQUIREMENTS SPECIFICATION

A) Open CV
Open CV Stands for Open Computer Vision it is source library of functions. Open CV is released under a BSD license hence it is free for both Academic and Commercial used. It is open source library written in C/C++. Open CV support many languages like C, Perl, Ruby. It is originally developed by Intel. Mainly aim at real-time computer vision. It is a cross-platform (Linux, OS X, Win2K, Win XP).

B) Visual Studio
Microsoft visual studio is an integrated development Environment [IDE] from Microsoft. It support different programming language and allows code editor and debugger to support nearly any programming language and provide language specification service. Also visual studio generate native an managed code.

C) Raspbian OS
Raspbian is free OS based on debian optimized for the raspberry device an operating system is the set of basic programs and utility that make your Raspberry pi run. Raspbian provides more than a pure OS it’s comes with over 35000 packages, precompiled software bounded in easy format of installation on your Raspberry pi device.

   Front End
   - Linux as Terminal
   - Raspbian OS

   Back End
   - .C++
   - Open CV

Hardware Requirements Specification
1) Raspberry pi device.
2) RAM: - 1GB
3) External SDHC: - Maximum 16 GB
4) OPERATING SYSTEM: - Raspbian OS
5) Micro-controller: - AVR Micro-controller
6) Camera: - 2 Megapixel
7) LED Lights

VI. CONCLUSION
This proposed system reduces the possibilities of traffic jams, caused by high red light delays and provides the clearance to the emergency vehicle, to an extent and successfully. Here we designed the system with the purpose to clear the traffic in accordance with priority. In this system, we find the traffic density using Morphological filtering, and Blob analysis. The road with the highest priority is cleared first. The proposed system also gives importance to the ambulance. If any ambulance is waiting in a signal then the particular lane is given a higher priority and the traffic in that lane is cleared. Emergency vehicle is detected by using image processing. Whenever the emergency vehicle enters the lane, by using camera image, Morphological filtering and blob analysis detects vehicle and sends it to micro controller. Micro controller gives the high priority to the lane with the emergency vehicle and clears that particular lane.

REFERENCES
[NOV 2015].