

# DESIGN AND IMPLEMENTATION OF A DENSITY-BASED TRAFFIC LIGHT CONTROL WITH SURVEILLANCE SYSTEM

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**Abstract:** The arrangement we accommodate Traffic the board by having an uncommon knowledge which the pictures of street feed from the cameras (PC Camera) at traffic intersections for constant traffic thickness estimation utilizing picture preparing. It likewise centers around the calculation for exchanging the traffic lights as per vehicle thickness out and about, accordingly targeting diminishing the traffic clog on streets which will help bring down the quantity of mishaps. Thusly, it will give safe travel to individuals and diminish fuel utilization and holding up time. It will likewise give huge information which will help in future street arranging and examination. In further stages numerous traffic lights can be synchronized with one another with a point of even less traffic clog and free progression of traffic. The vehicles are identified by the framework through pictures as opposed to utilizing electronic sensors installed in the asphalt. A camera will be put nearby the traffic light. It will catch pictures arrangements. Picture preparing is a superior method to control the state change of the traffic light. It shows that it can diminish the traffic blockage and maintains a strategic distance from the time being squandered by a green light on an unfilled street. It is likewise progressively dependable in evaluating vehicle nearness since it utilizes genuine traffic pictures.

## 1. Introduction

Car influx is an extremely large issue in creating urban areas, In actuality it's consistently expanding step by step nature makes it hard to discover where the traffic thickness is more progressively, so that to plan a superior traffic signal control and powerful traffic steering. The main driver of this can be of various circumstances like clog in rush hour gridlock like inadequate Road width, Road conditions because of climate, excessive interest, huge postponement of Red Light and so forth. While inadequate limit and unreasonable interest are some place interrelated, the postponement of individual light is hard coded and not subject to traffic. To be sure, manual control is must, Therefore, so as to lessen labor, the requirement for reproducing and streamlining traffic control to fulfill the expanding request emerges. Innovation in the ongoing past utilizing picture handling for observation and wellbeing, which is broadly utilized in vehicle and traffic the board for explorer data. The traffic thickness estimation can likewise be accomplished utilizing Image Processing.

## 2. Literature survey

This paper discusses the camera-video-perception limits of following across over different and moved road environments including revelation of vehicles. The structure is planned to screen the prosperity level of roadway and motorways, it could recognize the unlawful turning of the vehicle and it can work both in brilliant and swirling seasons. The structure is delivered using different processor speed and was made under GNV-Linux with C programming genuineness with OpenCV work. Framework created for the primary crossing points of the street. Microcontroller utilized is BeagleBoneBlack/Rasp Pi, calculation utilized is Haar Cascade. The framework demonstrates that it can limit traffic mobbing and decrease holding up time of vehicles before traffic signal. To make continuous examination of traffic in current cities, the creators of this task have designed and coupled genuine traffic pictures taken with microcontroller and guarantees that the normal holding up time of vehicles before traffic sign will be lesser than present traffic control framework. This paper figures the quantity of vehicles present and as per the number the thickness is determined. Raspberry Pi is utilized as a microcontroller which gives the sign planning dependent on the traffic thickness. This paper is intended to build up a framework which performs execution dependent on thickness of vehicles i.e checking of vehicles, utilizing raspberry-Pi as a microcontroller. It reasons that video handling is a superior system for count of traffic thickness and controlling the state change of traffic light additionally utilization of OpenCV library for video preparing is acceptable device as a product. This paper presents the progression of thickness based movement structure using video taking care of with OpenCV. Constant vehicle thickness is discovered using mass computation from live video continue. Perceive emergency vehicle using OpenCV library group planning and offer need to emergency vehicle report encroachment of movement manage everything. This task identifies the traffic from video input and dissects the traffic condition, additionally, it checks the quantity of vehicles and dependent on that the conditions of traffic and broke down information the traffic sign will be changed. This paper centers around the traffic observation framework which performs execution dependent on thickness of vehicles i.e checking of vehicles utilizing Raspberry Pi as a microcontroller. The framework is structured with the reason to clear the traffic as per need.

## 3. Existing System

The serious issues in kajang are traffic clogs and long lines at crossing point during top hours Increasing of going occasions because of expanding quantities of street clients and restricted assets gave by current foundation Inability of existing technique in deciding rush hour

gridlock request and give appropriate time split when the traffic volume surpasses its ability is another fundamental factor which prompts traffic blockage. These issues are fundamentally because of poor coordination.

**3.1 Manual Controlling:** Traffic police officials are allotted to control a requisite area of the city traffic. In the manual controlling system more man power is needed. Since the strength of traffic police is poor it is not possible control traffic manually in all areas of a city or town. The problems in the case of human traffic control are as follows:

- Only skilled operators can make suitable judgments and decisions as the traffic scenarios, especially in urban cities are very challenging to control.
- The work load on skilled operators is very high, because they always make decisions according to traffic condition at very short time intervals and a loss in concentration or focus could prove fatal.

**3.2 Automatic Controlling:** Automatic traffic light control systems are controlled by timers and electrical sensors. The lights are automatically switched ON and OFF depending on the timer value changes. Using electrical sensors, the system captures the presence vehicles in each of the lanes. Depending on the vehicle presence detected by the sensor, the lights automatically switch ON and OFF.

Another solution is to simply assign a pre-determined amount of time to each the lanes at a signal irrespective of the density of vehicles in each lane, thus providing semi-intelligent systems. But it was observed that even these systems fail to check traffic congestions and do little in easing commutation pains.

## 4. Proposed system

In this system a method that can be utilized for traffic control utilizing picture preparing. As indicated by the traffic densities on all streets, our model will assign keenly the timeframe of green light for every street. We have picked picture preparing for computation of traffic thickness as cameras are particularly less expensive than different gadgets, for example, sensors. The proposed model is developed as follows: We have a Node MCU that is associated with 4 arrangements of LED that speak to the traffic lights. It is the way toward observing the traffic thickness of each side and change the sign as indicated by the thickness toward each path.

### 4.1 Block diagram:

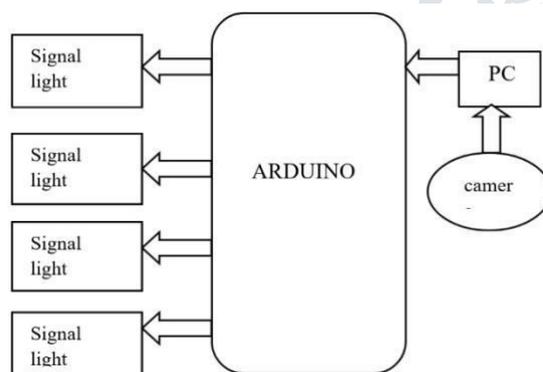


Fig. 4.1.1. Block diagram

**4.1.1 Image Preprocessing:** Picture Preprocessing is a system of picture handling. This procedure is utilized to standardize the differentiation and splendor impacts. Basic preprocessing step is to subtract the picture power. While managing shading pictures, a shading space change may assist with showing signs of improvement results. Constant picture is caught from the web camera ceaselessly. The caught picture is as RGB shading position. RGB shading picture is changed over into HSV picture. HSV pictures have a lot of additional data that isn't fundamental for handling. The picture is streamlined by extricating the essential pixels by leaving the undesirable pixels. To get the picture pixels unmistakably sifting is applied. Sifting activity required lower and upper qualities. Lower and upper HSV values are put away in the clusters. The resultant pictures are then sifted utilizing lower and upper limit clusters. The sifted picture is taken for the following procedure.

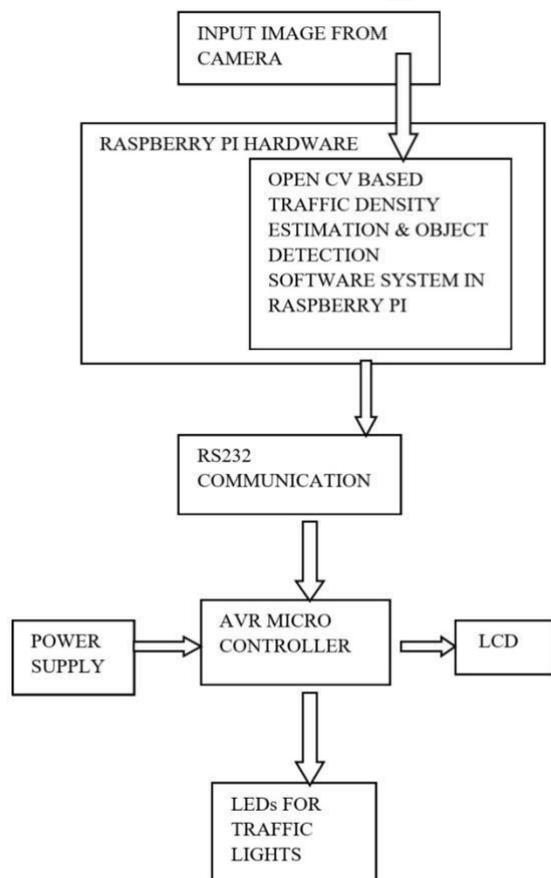
**4.1.2 Density Detection:** There are a few different ways to perform vehicle discovery and checking. A simple method to do vehicle recognition is by utilizing Cascade classifiers. Course classifiers are utilized to identify the items. Initial a classifier is prepared with two or three hundred example perspectives on a specific article (i.e., vehicle) which is called as positive models that are scaled to a similar size and negative models – subjective pictures of a similar size. After the classifier is trained, it can be applied to an area in an information image. The classifier yields a "1" if the district is probably going to show the vehicle and "0" in any case. To look for a vehicle in entire picture outline we can move the pursuit window over the picture and check each area utilizing the classifier. The classifier is structured so it very well may be effortlessly resized so as to have the option to discover the items (vehicles) at various scales. The resultant classifier comprises of a few easier classifier. Course classifier distinguish MultiScale work recognizes various

sizes in the information picture. The recognized objects(vehicles) are returned as a rundown of square shapes. Morphological changes are some basic activities dependent on the picture shape. These changes are applied to the recognized articles (vehicles). The operations are disintegration and expansion. In widening the splendid territories of the picture get greater, while the dull zones gets thinner. In the outcome the brilliant zones of the picture get more slender, though the dim zones gets greater.

**4.1.3 Library-OpenCV:** OpenCV is written in C++ and its essential interface is in C++, yet it despite everything holds a less thorough however broad more seasoned C interface. There are ties in Python, Java and MATLAB/OCTAVE. The API for these interfaces can be found in the online documentation. Wrappers in different dialects, for example, C#, Perl, Ch, Haskell and Ruby have been created to support appropriation by a more extensive crowd. The entirety of the new improvements and calculations in OpenCV are presently evolved in the C++ interface. In the event that the library discovers Intel's Integrated Performance Primitives on the framework, it will utilize these exclusive upgraded schedules to quicken itself. A CUDA-based GPU interface has been in progress since September 2010.

**4.1.4 Arduino Uno:** The Arduino Uno is an open\_source microcontroller wide dependent on the microchip ATmega328P microcontroller and created by Arduino.c.c. The board is outfitted with sets of computerized and simple information/yield sticks that might be interfaced to different extension board (shields) and different circuits. The board has 14 advanced pins, 6 simple pins, and programmable with the Arduino IDE (coordinated improvement condition) through a sort B USB link .it very well may be controlled by a USB link or by an outer 9-volt battery, however it acknowledges voltages between 7 to 20 volts. It is likewise like the Arduino Nano and Leonardo.

## 5. Architecture Diagram



**Fig. 5.1.** Architecture diagram of proposed system

## 6. Working

There are two moving vehicles seen in the input frame. Since the background is relatively static, background is estimated, as shown in Fig. 4, using a mean filter applied to each of the pixels on each of the frames. The foreground is extracted using background subtraction. After foreground extraction in Fig. 5, the frame seems noisy. This noise interferes with the blob analysis and number counting operations. Therefore, it is necessary to filter the frame. This can be done using Morphological Filters. The morphological filters applied here are opening and closing, which removes those small isolated nonforeground blobs. After morphological transform the image is seen to be clearer as shown in Fig. 6. After this step, Blob Analysis technique is used to determine the number of vehicles. The fig shows the result of blob analysis. It is shown that there are two vehicles detected in the frame. This is for one of the lanes. A similar process will be done for the other lanes to find the traffic density. The output will be shown. The Fig shows the number of vehicles detected at each lane of junction. In accordance with the number of vehicles, the green signal will be switched ON for a pre-determined time for each lane.

**6.1 Decision making based on the number of cars:** The ideal opportunity for green light sign is given by accepting the quantity of vehicles as info. On the off chance that the quantity of vehicles is more prominent than a pre-decided limit number, at that point the green light sign is turned ON for a more prominent timeframe for that specific path. This system is conveyed forward for all the paths in a cooperative way by accomplishing ideal synchronization between video preparing and the controlling of the traffic lights.

**6.1.1 Cloud:** Cloud storage is a model of data storage in which digital data is stored in logical pools. The physical storage spans multiple servers and the physical environment is typically owned and managed by a hosting company. Cloud storage services may be accessed through a co-located cloud computer service, a web service application, a programming interface (API) or by applications that utilize the API, such as cloud desktop storage, a cloud storage gateway or Web-based content management systems. In this work, an RPi server is set up by using Owncloud to store and access real time traffic video as is shown in Fig.10. Access to the videos is for authorised personnel only, who possess the password to the server (Fig.9). The server can be accessed in two ways viz. Locally connecting to the Rpi or accessing the Owncloud API with prior knowledge of Pi's IP address and the Owncloud authorisation credentials. Fig 3 shows how OwnCloud login page appears.

**6.1.2 Internet of Things (IoT):** For a shrewd city, the resident must be associated with the framework that runs it and completely use and continue the offices. The data/information caught and handled by the camera and framework in the proposed work is exceptionally valuable for managing the traffic as well as to keep away from it also. In the event that individuals can get the most recent updates and clog status quite a bit of further clogs can be kept away from. Thus, the utilization of IoT. The stage utilized is thingspeak.com. ThingSpeak is an open source, IoT application and API to store and recover information from gadgets on the IoT utilizing the HTTP convention over the Internet or by means of a Local Area Network. ThingSpeak empowers the production of sensor logging applications, area following applications, and a social system of things with status updates. One of the fundamental favorable circumstances of utilizing the application "ThingSpeak" is that it has coordinated help from the numerical registering programming MATLAB from MathWorks. Permitting its clients to dissect and imagine transferred information utilizing MATLAB without requiring the acquisition of a MATLAB permit from MathWorks.

## 7. Results



Fig.7.1. Original input frame



Fig.7.2. Background estimated using mean filter



Fig.7.3. Extracted Foreground

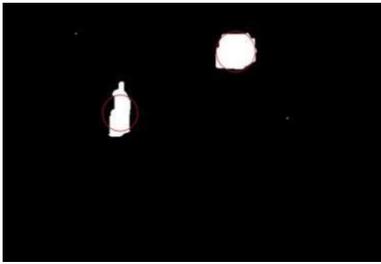


Fig.7.4. Blob Analysis to count the number of cars

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===== RESTART: C:\Users\SHRIHANT\DESKTOP\CV\final.py =====
1788.0
Vehicle count in lane
lane1:0
lane2:4
lane3:0
lane4:4
>>> |
  
```

Fig.7.5. Number of cars in each lane displayed

## 8. Conclusion

A framework is proposed for controlling traffic lights powerfully. There are a few methods accessible, however video preparing is the strategy utilized right now. Prior in existing rush hour gridlock control frameworks, there was wastage of time because of void streets. This procedure keeps away from this issue. The proposition was seen as more productive than the existing simple traffic frameworks, giving a progressively precise and computerized approach. The said approach likewise makes utilization of a cutting-edge stream of innovation, for example IoT which makes it socially as well as time applicable. During the work numerous unanticipated difficulties like the synchronization of the traffic signals were survived. The framework can be actualized ongoing with various paths being engaged with a solitary hub of a traffic light.

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