

# Traffic Signal Released as per Vehicle using Artificial Intelligence and Machine Learning

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**ABSTRACT:**The project is designed to develop a density based dynamic traffic signal system. The signal timing changes automatically on sensing the traffic density at the junction. Traffic congestion is a severe problem in many major cities across the world and it has become a nightmare for the commuters in these cities. 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. Junction timings allotted are fixed. Sometimes higher traffic density at one side of the junction demands longer green time as compared to standard allotted time. The object detection in the traffic signal is processed and converted into simulator then its threshold is calculated based on which the contour has been drawn in order to calculate the number of vehicles present in the area. After calculating the number of vehicles we will come to know in which side the density is high based on which signals will be allotted for a particular side.

**KEYWORDS:**Traffic congestion, object detection, Classification, Junction timings, traffic signal, etc.

## I. INTRODUCTION

We can integrate our system with an application for analysing the official traffic news web sites, so as to capture traffic condition notifications in real-time. Thus, our system will be able to signal traffic-related events in the worst case at the same time of the notifications on the web sites. Further, we are investigating the integration of our system into a more complex traffic detection infrastructure. This infrastructure may include both advanced physical sensors and social sensors such as streams of social media. In particular, social sensors may provide a low-cost wide coverage of the road network, especially in those areas (e.g., urban and suburban) where traditional traffic sensors are missing.

Imaging to pattern and object recognition for different purposes. One such application is object detection of mobile targets in a particular environment. Vehicle detection on roads is an example of such object detection which is used for traffic analysis, monitor and control. Hence, an initial step for traffic controlling is vehicle detection and classification using traffic measuring techniques. Image processing based techniques are one of the most widely used techniques which achieve this objective. Many algorithms have been proposed connected with vehicle detection and classification. In, image segmentation and edge detection methods are employed. background extraction and estimation techniques are used to isolate the vehicles of interest. Similarly, vehicle detection can be achieved with the help of vehicle shadows. This approach becomes difficult if shadows of other objects like overhead bridges overlap with the shadows of Classification of vehicles based on their sizes or shapes play an importation role in traffic management and flow control. Irrespective of the algorithm or technique being employed, camera positioning and the quality of camera play an important and critical role in vehicle detection. High altitude aerial camera is an example of camera positioning which is often used due to its wide area coverage.

## II. RELATED WORK

Many types of traffic control systems have been introduced in order to find the density of vehicles on road. A system in which the total size of the traffic can be calculated using image processing methods is discussed in [1]. Another similar system proposed controls traffic lights using image processing techniques which can be implemented in real time [2]. A web camera is used at each stage of the traffic light to record images of the

traffic lane we have selected. These captured images are then compared to a reference image of the empty road by image matching process. Canny edge detection method is used to determine the boundaries of the images. Here, the traffic is controlled depending on the percentage of match between the images. There are many papers based on edge detection methods [3]. Another system uses a video camera to capture images of the road and make use of that data to control traffic signals [4]. Instead of finding the total number of vehicles, they determine the traffic density corresponding to the total area occupied by vehicles on the road with respect to the total amount of pixels in one video frame. In [5], a similar approach for traffic control system is also proposed

Our proposed system controls traffic lights using image processing techniques. Here, the vehicles are detected by considering the captured images instead of using timers or electronic sensors which are placed on the pavement. A web camera is placed at the traffic light which captures images of the road through which the vehicle count is estimated and traffic is controlled. Using image processing in traffic control is found to be a better technique than the existing methods. It helps decrease traffic congestion without any wastage of time caused by showing green signal on an empty road without any vehicles. It is a better way to determine the presence of vehicles since it makes use of real-time images which makes it better than systems depending on the vehicle's metal content only.

### III. METHODOLOGY

Traffic light control is one of the serious technical hazards of the urban areas in almost every country around the world. This is due to rapid increase in number of vehicles. In order to reduce the time and complexity, a system that has to be combine the existing technology with artificial intelligence to think themselves. This newly developed project will enable the traffic light to switch from red to green based on traffic density. This system is concerned with the development and implementation of Sensor based Traffic Light System with Dynamic Control which in turn reduces the Average Trip Waiting Time.

A.System Architecture: - The proposed system divided in two modules first module is web service and second module is traffic signal released as per vehicles. In web service they have database. Traffic database is used for fast processing and storing high amount of data in to Database. For the classification algorithm is used for classify the traffic related notification. The main aim is detection traffic related event from social network. It acts as multi-class classification which is recognizing traffic, non-traffic due to the crash or congestion and traffic due to the external events. The system detects traffic event in real-time.

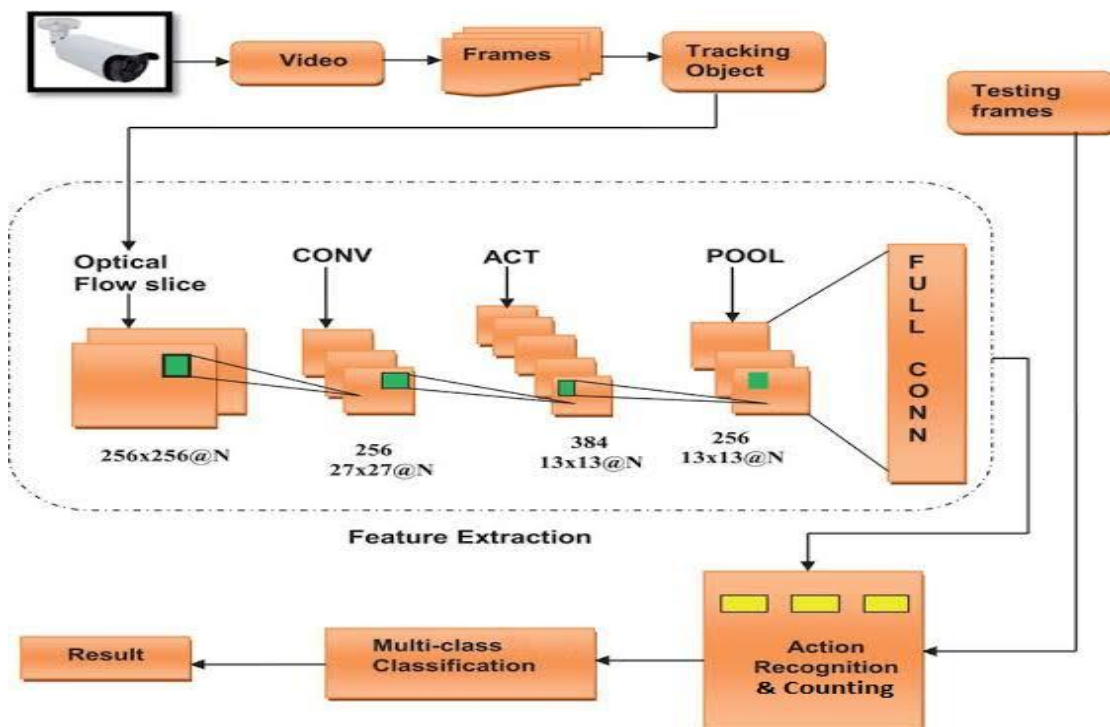


Fig.1: System Architecture

B. Vehicle Detection: - As described above that we have implemented Dynamic background subtraction for vehicle detection. In this method we use to extract the first frame of the video and consider it as our background then this background is dynamically updated according to the video. This background subtraction mechanism can also be done by using static background i.e. by using a constant background image, but this technique is overturn by intensity changes as light is the major factor for effecting the image brightness and quality. So this factor has been efficiently overcome by dynamic enhancement of background image. As the background updates with every incoming frame, so, it easily compensates for light fluctuations and weather conditions. This updated background is subtracted from current frame to identify the moving object in a certain frame. Moreover, by applying different morphological operations we clarify the detected object and plot a rectangle along the object. The aspect ratio and area of the rectangle is used to classify it as a vehicle or non-vehicle.

C. Pre-Processing: - Incoming video frames are pre-processed and enhanced in order to remove noise i.e. salt and pepper noise. This noise is voided by using morphological operations. This step is really important as it decreases the chances of false detection.

D. Traffic Management: The vehicle count value is updated at the processing hardware after a regular interval of time. Signal controlling algorithm works on the basis of updated vehicle count. It controls the electronic traffic signals according to number of vehicles on all roads, connecting at a specific central point like a square. Fault detection capability is also incorporated in this system. There may be an occasion when camera might fail or due to very poor lighting or weather condition the captured video is not good enough to get processed for traffic density estimation. In these cases, system detects irregular traffic patterns or it looks for no vehicle detection in the frames for a longer period of time. If this situation occurs, the system shifts all electronic signals to fixed times and traffic signals work in conventional way.

E. CNN Model: - We learn that CNN has the ability to extract spatial and temporal information of video clips. In this paper, we proposed a new C3D model for detecting abnormal behaviour in examination surveillance video. Table I shows the architecture of our 3D CNN model. The model has 2 convolution layers, 2 pooling layers, 2 fully-connected layers and 1 SoftMax layer. The number of filters for 2 convolution layers are 64 and 128. Two fully connected layers each have 256 and 128 outputs. The kernel size of the first convolution layer is 777 which represents that height, width and temporal depth of the feature map are 7. The kernel size of the second convolution layer is 773 which represents that height and width of the feature map are still 7 but temporal depth is 3. All convolution kernels have 1 stride. All pooling layers are max pooling with kernel size 222 and have 2 strides. At last, the soft max layer has 2 outputs, which means the proposed 3D CNN is a binary classification model. We train the model from scratch using mini-batches of 10 clips, with initial learning rate of 0.0005.

#### IV. EXPERIMENTAL RESULTS

Here, the intersection shown in figure 2 has been considered. The east traffic light is the first to run green (Simulation\_Step = 0) and then control moves in a clockwise order. Inputs for number of vehicles (Num\_Vehicles) were taken and the corresponding times for which the traffic lights run green (Timer) were calculated. The maximum waiting time (Max\_Time) for the first car to halt after the light turns red was also computed. The resultant values are given in the table.

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Simulation_Step	Num_Vehicles	Timer	Max_Time
0	12	12	0
1	10	10	12
2	5	10	22
3	15	15	32
4	8	10	35
5	20	20	35
6	27	20	45
7	9	10	50
8	30	20	50
9	15	25	50
10	17	17	55
11	23	20	62
12	13	13	62
13	35	20	50
14	9	10	53
15	58	29	43
16	20	20	59
17	16	16	59
18	18	18	65
19	32	20	54

Table 1. Table Showing Values of Num\_Vehicles, Timer and Max\_Time at different Simulation\_Steps

**V. CONCLUSION**

We can integrate our system with an application for analysing the official traffic signal, so as to capture traffic condition notifications in real-time. Thus, our system will be able to signal traffic-related events in the worst case at the same time of the result display by the console on the web sites. Further, we are investigating in feature scope the integration of our system into a more complex traffic detection infrastructure. This infrastructure may include both advanced physical sensors and social sensors such as streams of social media. In particular, social sensors may provide a low-cost wide coverage of the road network, especially in those areas (e.g., urban and suburban) where traditional traffic sensors are missing.

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