Dynamic Traffic Monitoring System

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Abstract- *Road traffic and traffic congestion are the major problems worldwide, the conventional traffic patterns are nonlinear and complex and time dependent rather than traffic dependent. To avoid such problems traffic monitoring becomes important. The purpose of this project is to develop a system which monitors the traffic using image processing techniques by identifying the numbers of vehicles in a particular lane and allocate time dynamically to that lane to pass and thus reduces the waiting time of the vehicle and it also monitors whether someone is violating the traffic rules. If someone crosses the road when the light is red, the camera clicks the image of the vehicle and extracts the vehicle number and sends an e-chalan to the registered mobile number of the vehicle..*

Keywords- Traffic control, Traffic monitoring, Image processing, Camera, Traffic violation , e-challan

I. INTRODUCTION

Nowadays vehicular traffic surveillance is an important civilian application to improve road control, intelligent road accident detection and urban congestion. Traffic congestion is becoming a problem in every big city. Traffic congestion wastes money, resources and time of the government. And has a huge impact on the environment.The aim of this project is to develop a system which will reduce the traffic congestion significantly by using different techniques. The Dynamic traffic monitoring system is a real time system that captures the images of the road continuously from the signal, these images are then processed to find the no of vehicles on the street. Depending upon the number of vehicles the time is calculated which is sufficient to pass the traffic in that lane. This system will be updated daily by the historic data it has collected and will improve. The system will also predict the traffic and will adjust the timings according to it.This System is further integrated with e-challan system of RTO. If any vehicle passes the signal when it is red the photo of the number plate is captured and the challan is directly sent to the owner of the vehicle.

II. LITERATURE SURVEY

A. Design of Dynamic Traffic Signal Control System:The proposed DynamicTraffic Light Control (DTLC) operations have Infrared Sensors mounted on the road to detect frequency of the vehicles. The presence or absence of a vehicle is sensed by the sensor assembly mounted on each road,which acts as an input to the DTLC unit. This input signal indicates the density of vehicles on each road. In this system the basic operations are implemented using Microcontroller 89c51 AT. The output is given in the form of three lights: red green and yellow . Also it includes a feature for emergency cases in that situation: signal turns red for all the roads except on the lane in which the emergency vehicle is present [1].

B. Smart control of traffic lights systems using image processing: This system the work is divided into 3 parts. The first part is to acquire the image from a fixed camera. The second part is to process the captured image using image processing techniques. The third part is controlling the traffic lights using two Arduino UNO boards . The image is first captured and then transferred using usb cable; the further processing is done by using MATLAB . the captured image is converted into grayscale image by eliminating the hue and saturation information while retaining the luminance, using weighted method for further processing and the into binary images that contains only two colors and then the traffic density is calculated using some mathematical operation and according to the density the time is allocated for each lane output is given through three colours of led red ,green and yellow connected to the Arduino UNO boards connected through an computer [2].

C. Smart control of traffic lights systems using image processing: This system proposed a tracking algorithm based on mean shift and a projective Kalman filter and pixel based . The algorithm achieves robust tracking due to the integration of the projection equation of the vehicle onto the image plane of the CCD camera. In particular, the observation function of the projective Kalman filter models the trajectory of vehicles with respect to their ground distance to the camera. The results showed that both the standard and the projective Kalman filter algorithms achieve robust tracking at a rate of 30fps, even though the projective Kalman filter performs better on long distance vehicles Image processing is developed for use as traffic control sensor to obtain multi lane traffic volume, queue length and downstream congestion that may obstruct traffic flow exiting[3].

D. Traffic Congestion Investigating System by Image Processing from CCTV camera:The system uses an image processing technique to analyze for a traffic condition. It detects how many objects or cars are on the road. And then, the system connects a traffic condition result with a database for transportation planning. Moreover, it can be used with other systems such as a traffic light control system on the intersection. There are 3 kinds of results to notify for a traffic condition as flow, heavy and jammed [4].

III. PROPOSED WORK

Creating a dynamic monitoring system through which we can monitor the traffic. In the system we calculate the number of vehicles on one side of the road , we will repeat the same process for the other side of the road. Then we will dynamically allocate time according to the traffic on the road. We will capture the number plate of the vehicles which violates the traffic signals and rules and we issue an e-challan for that vehicle.

3.1 System Architecture

The system architecture is given in Figure 1. Each block is described in this Section.

A. Image Capture:In this system, the image is captured from the camera and it is then processed forward to the image processing.

***B. Image* Processing:**. The image captured is then passed to the YOLO V3 trained model. Which identifies the different vehicles like cars, bikes, trucks and ambulance. This data is stored for the further calculations. This model also checks whether any vehicle is violating any rules. Different techniques and filters are used to clean the image for the maximum accuracy. The vehicles are marked by rectangles around them with the label

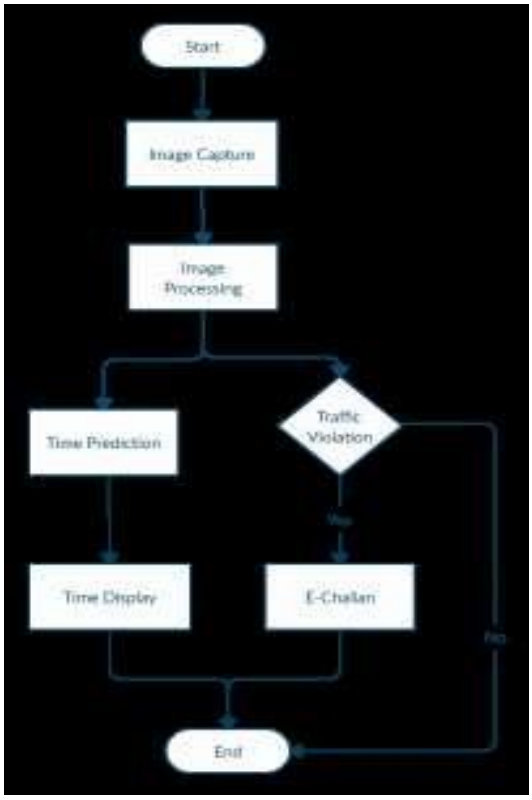

Fig. 1 Proposed system architecture

C. Time Prediction:This Application we need to provide the image of the lane with the traffic at that moment or either we need a camera that clicks the image when it is triggered. The image is the processed using using machine learning algorithms like yolo v3 and yolo v4 .It identifies the different vehicles and present the image it draws a box around the detected abject and the then labels it.The image is stored in the database with the location and the time when the image was captured. Then the program counts the different type of vehicles in the image it is stored in the tuple this tuple is passed as an argument to the model trained using regression algorithm with the dataset of the vehicles at a particular time using this model the time is predicted and the time is displayed on the LED display.

D. Timedisplay:The Time prediction will then be used , so that dynamic time will be displayed on the screen which the vehicle owner can see and drive according to it.

E. TrafficViolation:In this process the same image captured first is passed as an argument.In this part line is drawn on the image if the vehicle is detected ahead of the line then the vehicle detected is cropped then the cropped image is passed to the number plate detection function In this program the number plate is detected and then the vehicle number is extracted using Tesseract OCR algorithm and the Fine notification is send to the email Id registered with that number

also for motorbike detected it checks for number of persons on that motorbike and if the driver is wearing helmet is detected the rules violated the also the fine notification is sent to the registered email with the vehicle number.

F. E-challan:**The** vehicle which violates the traffic rules and signals will be fined according to rules of traffic violation and an e-challan will be sent to the person who violates traffic rules.

3.2. Algorithm:

YOLO : Object detection is one of the classical problems in computer vision where you work to recognize what and where — specifically what objects are inside a given image and also where they are in the image. The problem of object detection is more complex than classification, which also can recognize objects but doesn't indicate where the object is located in the image. In addition, classification doesn't work on images containing more than one object.

YOLO uses a totally different approach. YOLO is a clever convolutional neural network (CNN) for doing object detection in real-time. The algorithm applies a single neural network to the full image, and then divides the image into regions and predicts bounding boxes and probabilities for each region. These bounding boxes are weighted by the predicted probabilities.

YOLO is popular because it achieves high accuracy while also being able to run in real-time. The algorithm "only looks once" at the image in the sense that it requires only one forward propagation pass through the neural network to make predictions. After non-max suppression (which makes sure the object detection algorithm only detects each object once), it then outputs recognized objects together with the bounding boxes.

With YOLO, a single CNN simultaneously predicts multiple bounding boxes and class probabilities for those boxes. YOLO trains on full images and directly optimizes detection performance.

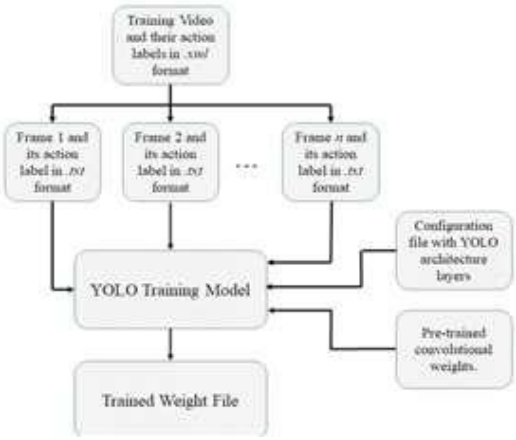

Fig 2 training of object detection model

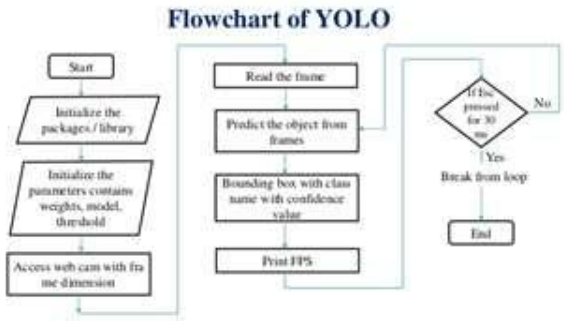

Fig 3.working of YOLO

IV. SCREENSHOTS OF WORKING PROJECT

V. ACKNOWLEDGMENT

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VI. CONCLUSION

In order to reduce the number of traffic which result in more time for traveling which eventually results in loss of time and money. This gives dynamic monitoring of signal and hence reduction in pollution and saving for the fuel are the most important advantages of this system. Most hurdles of traffic issues will be solved with this system which is cost effective and simple and it makes our life better, safe and time saving. The outcome of this project can be further applied in different applications to give an IOT based solution under different circumstances.

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