Ankit Kumar et al. International Journal of Recent Research Aspects ISSN: 2349-7688, Vol. 5, Issue 1, March 2018, pp. 37-39

Smart Traffic Rule Violation Monitoring System

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***Abstract*-In today's world due to population increase and fast pace of life the number of vehicles on roads have increased which leads to violation of traffic rules. This also leads to occurrence of frequent accidents. This paper proposes a technique used to control traffic rule violation. The technique is related to object detection and recognition, by which we can control traffic rule violation. We will be using poles in certain intervals on the roadside, object detection cameras and centralized database for matching the objects - face of the driver and number plate of the vehicle. The poles which will be present on the roadside will have cameras and speedometer installed on it. When a person driving, break's the traffic rule regarding speed then the camera will take picture of the driver and the number plate of the vehicle. These pictures will be matched with a centralized database which will be on cloud. The image of face and number plate should correspond to the vehicle owner. If there is a mismatch than the number plate image is given more priority. The details of the vehicle owner will be tracked from the database and compensation will be charged instantly from his or her bank account. The bank account deduction message comes instantly to the driver which psychologically stops him from committing the next violation**

***Keywords*— Object detection, IOT, facial recognition, camera.**

I. INTRODUCTION

All Facial recognition is one of the best method in bio-metric technique for identification of a people and growing popular among different sectors. As in today's world with the increase in population number of vehicles are also increases which led to effect many living beings. It is not possible to control traffic violation in India like country where population is really huge. So for that we need to be automation to control traffic violation.

To reduce this we are using this face recognition technique for controlling traffic violation. Here we are using VIOLA-JONES algorithm. We are using pole in which high end cameras and speedometer are installed which are present on roadside which captures images of different are moving vehicle with their number plates along with driver photograph. When object(driver) breaks the rule then his/her face is captured by high end cameras and start matches with the database storage if image of object is not recognized then number plate of that vehicle is given more priority. After successfully matching it sends that information to police headquarters along with that it sends a notice to the owner's address.

II. FACE RECOGNITION PROCESS

An effective way to recognize a face is by using VIOLA JONES algorithm. The viola-jones object detection method is introduced by Paul viola and Michael Jones in 2001. It known as first object detection framework to provide object detection in real time. Viola-jones algorithm needs a proper full view frontal upright faces for detection. This method read input image with window which is looking for human face features. When we found enough features, then this window types of image reported to be face. For different images we need to scaled window and this process is again repeated. There are 4 ways to identify an image are- Haar feature, Integral image, Ada boost and Cascading.

CREATING AN INTEGRAL IMAGE -

An image representation is called the integral image. First process of viola-jones is converting image into an integral image. This can be done by adding corner value of a patch. We add values from top to left.

1	1	1
1	1	1
1	1	1

IMAGE

1	2	3
2	4	6
3	6	9

INTEGRAL IMAGE

Integral image also allow us for calculate sum of all pixels inside any given rectangle using only four values at the corners of the rectangle.

A 1	B 2	
C 1	D 4	

To find all pixels of rectangle D , we subtract first diagonal with the second diagonal of rectangle D.

D=1+4-2+3

D=A+(A+B+C+D)-(A+C+A+B).

So we get the pixel of a patch by just using this equation.

ADABOOST AND CASCADE :-

In integral image it uses 24*24 block which gives around 160000+ features which is very time consuming process, so for that we use ADA BOOST which identify the relevant feature and subtract the irrelevant feature

$$F(x)= \alpha 1 f1(x)+\alpha 2 f2(x)+\alpha 3 f3(x)+\ldots\ldots..$$

↓ ↓

WEAK CLASSIFIER

STRONG CLASSIFIER

WEAK CLASSIFIER - It means relevant feature.

We need 2500 features in one classifier to make strong classifier.

CASCADING :-

If we have image of 400*250 pixel image then we need many 24*24 block to calculate and every 24*24 block contains 2500 features which again a time consuming process. So for that we use cascading in which out of 2500 we kept 10 feature in one classifier and so on. Which make tye process more faster.

III. BLOCK DIAGRAM. (THIRD LEVEL)

The following block diagram depicts the procedure which will be followed for traffic rule violation. The input data is extracted as the face or the number plate of the vehicle. The facial recognition may be clear or unclear. But number plate recognition will be quite accurate and it will definitely match with vehicle registration database to find the owner of the vehicle. Once vehicle owner is identified his address, phone number are extracted from the database and information sent to police authorities as well as fine information is sent to the concerned vehicle owner immediately via sms with the notification of fine to be deducted or some other form of punishment. The immediate notification will make the person aware of the situation and prevent him from increasing his speed of the vehicle.

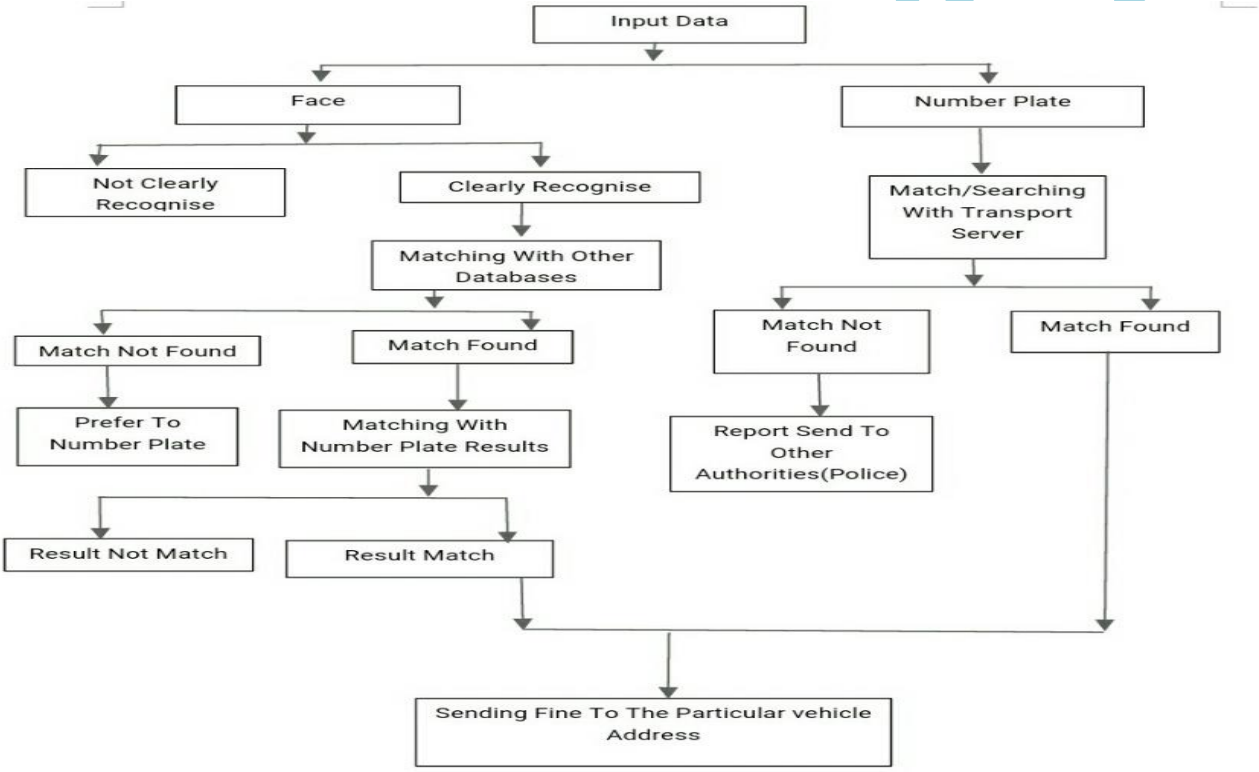


FIGURE 1.1 BLOCK DIAGRAM OF PROPOSED SYSTEM

CAMERA (Forth Level). In Today's life cameras are ready made eyes which works all the time and not get tired like humans. Here are some cameras for the purpose of this project. The following two cameras may be mounted besides or over a road or installed in an enforcement vehicle for traffic regulation and traffic violation.

1. Red light cameras

This is the first type of camera that triggered and take the image or picture of the particular vehicle that goes through an intersection where the traffic light is red. It also triggered when any vehicle goes across the road above a specific time after the signal has turn right. This camera work only for traffic light violation vehicles.

2. Speed limit enforcement cameras

This is second type of camera which is very advanced in camera Technology. It is used to monitor the compliance with over speeding or we can say that with speed limits. It includes different functions or applications within it like ANPR which is automatic number plate recognition camera.

This camera system simply works as follow it measures the time taken by a vehicle to travel between the two or more points separated by a minimum distance of 1 to 2 km and this way it calculates the vehicle average speed for that particular journey between these points on spots.So if the driver tries to over speed the vehicle above the declared speed limit then it's ANPR camera take the picture of the vehicle and also take a small 15 to 20 second video of the vehicle then send these

information to the related authority.Then these information gathered from that vehicle light number plate and driver picture matched with the available database information.
Now these two cameras are our main purpose cameras and they are fully Independent and do their work very fast and accurately.
The kiddies cameras only send the information to the relative authority and that authority match the information with their available database is like license database and vehicle database.
So that define should be sent to the correct person. So we can say that these cameras with their powerful ability make our traffic running smooth in a well manner way.
These cameras should be installed on that sensitive places where the traffic violation mostly occurs or in more accident prone areas so that we can reduce these accident by warning the peoples who violate the traffic rules .

IV. COST

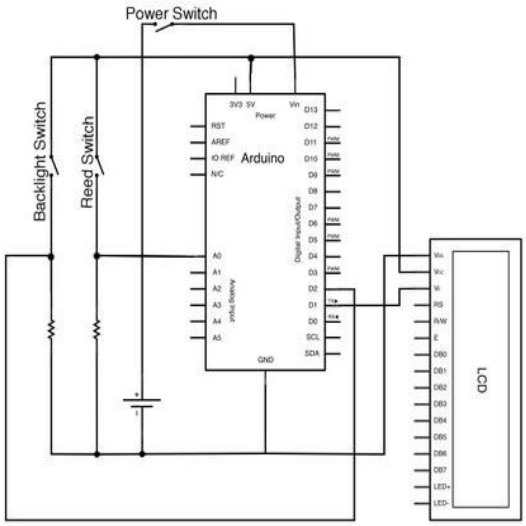
Cost effective mode of this project needs camera and speedometer and we make our equipment working with both with direct power supply and from solar energy which is a greater source of alternate energy .If the cameras not able to get power from solar energy then it automatically switches to the main power supply. Through this we can promote use of alternate energy in smart projects.
Estimated cost of implementation of this idea:
1km distance = 20 spot (cameras in every 50 meter)
No of camera and speedometer - 20*2=40
Solar panels =20 panels
Cost:
Camera + solar plates + pole +speedometer
(40*8,000) + (20*8000) + (20*10,000) + (3200*40)
3,60,000+3,20,000+2,00,000+128000
Total cost=1008000

SPEEDOMETER
We have so many devices to measure the speed of any vehicle but the best and very advanced devices is LIDAR(Light Detection And Ranging). This device used laser light technology to record the speed of the particular vehicle.
Does Laser technology has the benefit of being vehicle specific it measure the distance of the vehicle from the point of the device through Laser technology and then by simple mathematical formula

Time = Distance /Time

This way this device can easily detect the speed of and a speeding vehicle.

FIGURE: 1.2 CONNECTION OF SPEEDOMETER WITH ARDUINO



V. CONCLUSION

This project is done to fulfill the need of our traffic mechanism.To make our roads fully safe for everyone .So our camera and our technology help us to full-fill this need.
The conclusion of this project is that it reduces different types of problems on the road and high ways like accident and mishaps. It increases the efficiency and ability of functioning of our traffic and transport authority.
It also have some complications with its face recognition concepts but it will be fully applicable in future for less populated countries .So it mainly makes our road systems easy to run and make it safer than the previous system. It saves lives and help the authorities to take actions against the main culprit.

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