

Automatic Brake Assist during Traffic Light/ Sign Detection

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ABSTRACT- This paper introduces the real time traffic sign / light detecting system using "open cv" or CNN (convolutional neural network). With this approach we will be able to recognize different kinds of traffic lights / signs and with their output we actuate our braking system.

Our approach is mainly based on 1) implementation of the automatic brake actuating system based on our output which will be generated from sensors used for detecting various traffic lights / signs, when the driver can't apply brakes. 2) Automatic throttle controlling system during detecting the signals like (40 km speed limit, hospital ahead, school ahead etc)

Although this system is still in the process, our system was validated in real condition in our prototype vehicle that we are made.

KEYWORDS - Traffic sign detection and recognition (TSDR), Advanced driver assistance system (ADAS), Computer vision, traffic lights detection system.

1. Introducing the system

All over the world, the important information about the road limitation and condition is presented to drivers as visual signals, such as traffic signs and traffic lanes and traffic lights. Traffic signs / lights are an important part of road infrastructure to provide information about the current state of road, restriction, prohibitions, warning, and other helpful information for navigation.

If any failure occurs while notice these traffic signs may directly or indirectly contribute to accidents. However, in adverse traffic conditions, the driver may accidentally not notice traffic signs or signals.

In this circumstance, if there is an automatic detection and recognition system for traffic signs / lights, it can compensate for driver's possible inattention, decrease

driver tiredness by helping him follow the traffic sign and help him to follow the traffic sign and making the driver safer and easier. Traffic sign detection and recognition (TSDR) is an important application in the more recent technology referred to as driver assistance technology or system (ADAS).

Since traffic lights positioning and state like (ready, stop, cautions, wait etc) provide good knowledge of environmental factors.

To introduce our system, the paper outline is as follows, "section 2" is dedicated to the state of art, we will tell some of the previous works published on traffic lights / sign detection. the overview of this system is presented in the "section 3" and at last but not least the main step or our design will be detailed. Finally the result will be commented in "section 5".



Fig -1: various traffic signs

2. RELATED WORK

As shown in figure [1] different types of traffic signs which are different across the world, also there are different types of traffic lights, but we can distinguish

only one type mainly “suspended type traffic lights as shown in figure (2)



FIG- 2: SUSPENDED TYPE TRAFFIC LIGHT

In 2007, kim y.k.et.al [6] also showed that suspended type traffic light can be detected with an overall colour based thresholding and segmentation. Various algorithms were previously used to attempt to recognize traffic lights / signs

In our system we use a camera vision sensor for detecting the traffic lights / signs and with this we also combine radar sensors for detecting the other obstacles like pedestrians as well as other vehicles and their distance.

After this we installed the mechanism in it which helped to actuate the brake automatically when the driver failed to apply the brake during the warning system activated when he did not recognize traffic lights as well as signs.

3. SYSTEM OVERVIEW

In this we used different kinds of sensors (**radar sensor, camera vision**) which are used to see the traffic signals or signs and their **distance** and also other **pedestrians or objects** nearby over vehicles.

When the sensors sense the traffic sign or signal they send a signal to the controller (**raspberry pi**) also other sensors like **radar sensor** give input to our controller. After receiving signals from various sensors, the controller (raspberry pi) gives command to the actuator.

For example : let us suppose we go through with a vehicle suddenly traffic sign will convert into red signals but we can't recognize it, but our sensor will work and it

will recognize immediately and give signals to controller (**raspberry pi**), then suddenly signal will operate and gave a warning light with buzzer in instrumental panel before some distance of traffic lights, but after listening warning buzzer there will be come chances the driver will not slow down the vehicle, if driver can't stop or slow down the vehicle than our main design will work and actuate the brakes and slow down the vehicle.

And other system examples are when the driver will drive the car at 60 km/h but the speed limit is 40kmph then with this same process we will control our throttle and de-accelerate our vehicle so it can match the speed limit.

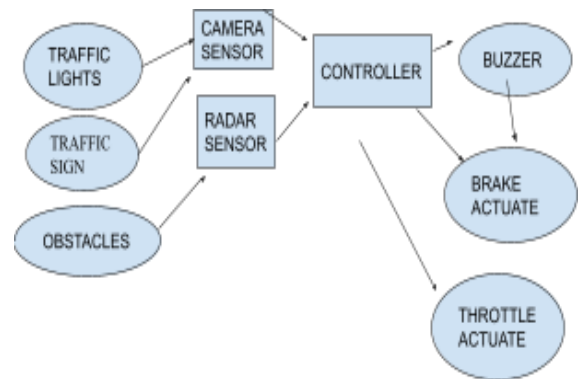


FIG-3: Block diagram of system working

4. WORKING / IMPLEMENTATION

In this there is a deep neural network or convolutional neural network, which can classify signs or signals present in the image into different categories. Convolutional neural networks are best for image classification purposes. for programming and for specifying traffic signals we can download various traffic signs or signals from google[1.1], and run in open cv, and build a convolutional neural network

The camera sensor is used to detect the various signs or signals, but there are also many sensors like (ultraviolet sensor, radar sensor) which help to detect the object or pedestrian. When we go through with our vehicle and by accidentally we can't recognize the traffic lights or we can say that when the traffic signals turn into red but we can't recognize it, then our camera sensor will detect the signals and send it to controller and gave a warning lights and buzzer to driver before reaching up to traffic light point, but if they can't stop vehicle after listening the

warning sound than the signal will go through controller and with the help of actuator the brakes will automatically applied ,also during braking



FIGURE [4]: camera sensor

we don't want to skid your vehicle so we add our mechanism through the ABS system .(NOTE there will be a time loop during the warning buzzer after this loop the brakes will automatically apply.

The actuator used for applying brakes is (solenoid type valve actuator). Solenoid valves are used to send the fluid from the master cylinder to the ABS and then send it to our wheels cylinder through which our brakes are applied. When we can't apply brakes during an emergency then the controller gives electrical pulses to solenoid and through solenoid the fluid is gone in the wheel and brakes will apply.

The another working system is to control our throttle during traffic sign recognition , that we are going with our vehicle at the speed of 60kmph but the speed limit is 40kmph than with camera sensor we will send signals to our controller and at last controller will actuate our throttle automatically and reduced the speed .

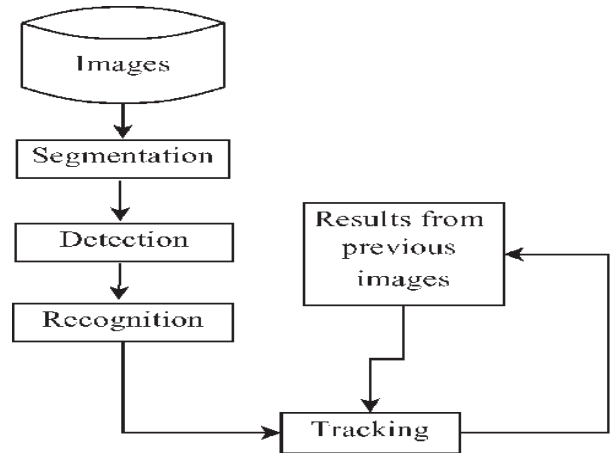


Fig- 4: Block diagram capturing signs and lights

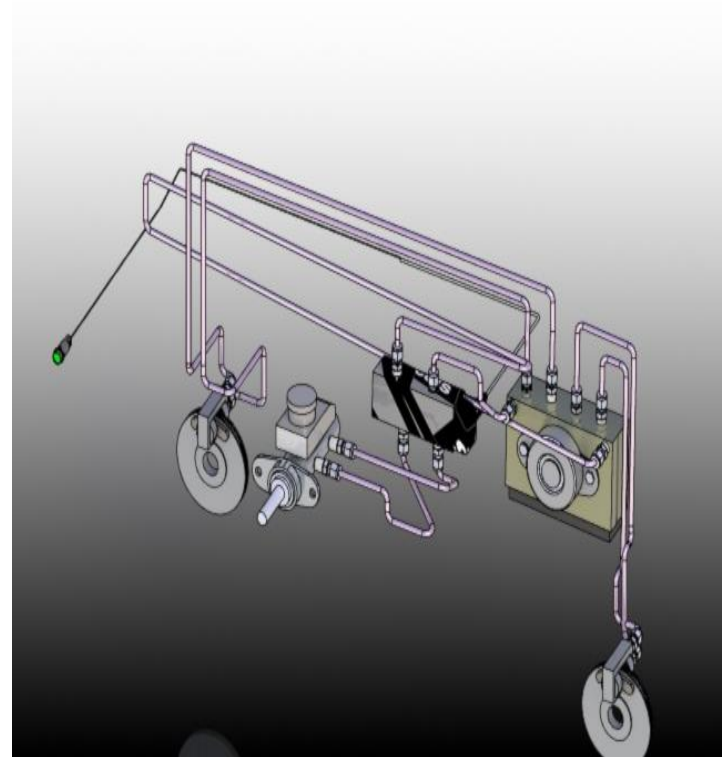


Fig- 5: Concept Design of the automatic brake actuating

5. CONCLUSION / RESULT

By the implementation of the system the driving condition will be more effective and convenient . also by implementing this, transport system will also better and apart from this death rate will also reduce

5.2 RESULT

1. With the implementation of this system the traffic rules will be maintained properly
2. Reduced accident rate which occurs due to avoiding traffic rules
3. The good point is that this system warns the driver about traffic signs / lights before reaching that point.
4. Also increase safety of pedestrians crossing the roads during traffic lights .
5. Maintaining the speed limit on the highway with this system .

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