RASPBERRY-PI BASED ROAD SIGN RECOGNITION FOR AUTONOMOUS VEHICLE

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Abstract: **At present situation the human beings are faced many accidents during the road ways transportation. At the same time they lose our life and valuable properties in those accidents. To avoid these problems the system designed with the help of Raspberry pi. The Digital image processing plays important role in the sign capturing and detection system. The image processing algorithms to takes the necessary action for resizing the captured signs. The Raspberry pi camera port used to capturing the road signs with image enhancement techniques. The embedded system small computing platform studies the characteristics of speed signs. In that daylight vision time to take the shape analysis for recognizing the signs using CNN 2D convolution, Tensor flow DNN, Pandas, numpy. Automatic Cruise control (ACC) Algorithms. The objective of the proposed work is to implement the available technique to traffic signal with the help of raspberry pi3 board.**

Index Terms **– Raspberry Pi, Speaker, Web Camera etc.**

1. INTRODUCTION

Automatic Road sign identification and acknowledgment is a basic task of Advanced Driver Assistance Systems, has been of mind blowing excitement for continuous years for automated vehicles. It improves wellbeing by illuminating the drivers about the present status of traffic signs out and about and giving significant data about safeguard. Street signs are put either along the edges of street or above as route guides. With persistent raise in street traffic, disasters risks moreover raises. Street security measurements exhibit that about 1.24 million individuals pass on every year on street due to mishaps. Subsequently, the examination has zeroed in as of late on keen frameworks that can keep away from the impacts and accidents. They are created to upgrade Road security and driving solace.

Each individual, regardless of whether a traveler, driver, passerby would have seen along the side of the road different sign board that fill significant needs. These significant street stuff help us as course directs, alerts and traffic controllers. As control gadgets for traffic, signs need complete consideration, regard and proper driver's reaction. With the approach of mechanized traffic and its expanding tension on street, many have taken on pictorial signs and normalized their signs to work with worldwide travel, where language contrasts would make obstructions. In antagonistic rush hour gridlock conditions, the driver may not see traffic signs, which might cause mishaps. In such situations, programmed street sign recognition happen [1].

The primary goal of proposed framework is to identify the street sign naturally while driving and control the speed or makes the go as indicated by that Road sign. Street sign acknowledgment is utilized to caution the occupied driver, and forestall his/her activities that can lead a mishap. The objective is to stay away from mishaps by both manual and mechanization measure in which every one of the activities will be performed dependent on the identified Road signs. An ongoing programmed speed sign identification and acknowledgment can help the driver, essentially expanding his/her security. To keep away from mishaps and gridlock street signs are for the most part positioned close bended regions, clinic zones, school zones and so forth Driver needs to see the street signs and control the speed or makes the go as per it. Because of different issues, drivers are less mindful of street signs which lead to mishaps. In Existing System, a thought is proposed to stay away from mishaps in which street signs are perceived consequently by web camera utilizing Image handling methods and Raspberry Pi [2, 3].

2. LITERATURE SURVEY

Nivas V M, Gopi Krishnan, Chyrilfredrhic A,"Automated Guided Car(AGC) for Industrial Automation" This paper portrays the use of mechanization engines in ventures for shipping merchandise, stacking, and dumping explicitly in the assembling and trading units. The significant trouble is to present mechanization in practically all fields of industry. This paper is to recommend a driverless battery vehicle which runs mechanically excepting help of the driver and it is typically perceived as Automated Guided Car (AGC), This courses us to chose spot naturally all alone by utilizing detecting climate, exploring around the space and satisfy the human requirements, it can also clarify the essentials of tasks of every unit while crossing that extraordinary unit as it contains preloaded data. [2]

Drawbacks:

 Slight hard to handle as it needs a smooth and ramped area to move

Andrew Ydenberg, Navtej Heir, Bob Gill,"Security, SDN, and VANET Technology of Driver-less cars", This paper depicts Driverless autos become ebb and flow innovatively progressed inside the vehicle exchange. Along these lines, they are expected to change the vehicle by crediting more secure, a great deal of comfort, and decent power. Nonetheless, there are a great deal of specialized issues with the area of driverless vehicles, and grievous results are the insurance gives that having public. Having fit assurance gauges inside the district for driverless vehicles establishes inconvenience to the acknowledges the general public, and one among the best forbidding issue. This paper examines in regards to oneself supporting study of driverless engines and consequently the assurance issues with this innovation. Investigating the current correspondence applied studies of vehicular specially appointed systems administration, and the way unbelievable neural organizations and accordingly the product characterized organization will help to shield the driver-less autos from malignant attacks. [5]

Drawbacks:

- It delays while responding time
- It suddenly uses a break when the object is closed without any prior indication of the obstacle

Xin Zhang, Maolin Chen, Xingqun Zhan," Behavioral Cloning for Driverless Cars using Transfer learning", This paper depicts driverless engines utilizing a machine dominating algorithmic principle for choosing in driverless route is created. This methodology is implemented by recommends that of adjusting gift confirmed convolution neural organizations to the state of the art disadvantage. Contrasted with the ordinary strategies upheld by calculations from pc designs in camera work, this switch dominating procedure will in general streamline all interaction ventures simultaneously, subsequently coming about to the better though moderating an inordinate exhibition to-cost extent relation.[6]

Drawbacks:

- The effective range and the factor lead time is very less

R. M. Fouad, A. Onsy, Osama A. Omer," Improvement of Driverless cars passengers on Board Health and Safety, using Low-Cost Real-Time Heart Rate Monitoring System" This paper might be a period unnoticeable coronary heart worth watching framework was arranged and upheld. This gadget objectives to screen the pulse of the travelers by utilizing alower-evaluated digi cam embedded inside the vehicle, which can be immediately installed in the vehicle's rearview reflect. Additionally, they are forward-thinking this gadget with the principle device of a check driverless car, and they propose anyway driverless vehicles got answer in light of genuine clinical crises. In addition, they audit anyway that framework will take a reward from the promising so ptions of Google I/O and Google AI. The methodology depends all on Remote Photoplethysmography (RPPG), inside which the coronary heart worth is recognized from the delicate little changes going down inside the pores and skin tinge of the face for the time of each and every throb. The face is naturally identified and half-followed, then, at that point the crude sign is determined from each casing over every 10-seconds in a sliding window[9-11]. From that point onward, a progression of sign preparing ways region unit applied to the crude alarms and recuperates the middle worth frequency.[7]

Drawbacks:

- Decreasing the window length of the car degrades the accuracy

Abdulla FawazAljulayfi, Karim Djemame," Simulation of an Augmented Reality Application for Driverless Cars in an Edge Computing Environment" In this paper, we are visiting to examine the outcomes and organization boundaries and their estimations in a position climate. Edge registering could be a circulated processing worldview that brings calculation and information stockpiling nearer to where it required. With the help of IoT, these days edge figuring is contacting more individuals. the most point is to move PC capacities and assets nearer to the sting of the network.[4]

Drawbacks:

- Limited Redundancy
- Longer output time
- Potential loss or corruption of data

Sandhiyaa S, Vijayan M," Traffic Light and Detection for Autonomous Land Vehicle Using Raspberry PI", This paper expects to execute light related sign recognition double-dealing picture measure procedures for a self-ruling and vehicle. Traffic sign acknowledgment framework is used to see traffic signs, caution a driver and advise sure activities. Speedy strong and period programmed traffic sign identification and acknowledgment will help the main impetus and significantly works on driving wellbeing. Programmed acknowledgment of traffic signs is to boot fundamental for machine-controlled astute driving vehicles. The test result shows the high right arrangement of traffic signs design with cutting edge foundation pictures extra because of the outcomes achieved in decreasing the machine cost of this arranged letter.[8]

Drawbacks:

- Light intensity faced major problems

3. METHODOLOGY

A. *Existing System*

The fundamental work of existing framework is to identify the sign sheets like stop board. For this, framework will continually attempting to decide between the lower and upper scope of the red tone and a square shape be shaped on the red signs. The square shape framed on the red light sign has a proper region by the utilization of that space framework makes a sign that control the GPIO pins of the raspberry pi. For the identification of the stop board sign framework utilized course classifier in which it look at the xml document of various size of stop word with the info

accessible from genuine universe of traffic billboards utilizing camera. After match discovered it creates a sign so the raspberry pi conveys a control message to the L298 to control the engines of the undercarriage.

B. Proposed System

The main problem exists in accuracy of recognizing traffic signs .Recognition of traffic sign avoids the accidents /fines and good control input ACC for autonomous driving.

In this project work mainly concentrated on the recognition of traffic signal while travelling. The camera live input mainly used to detect the tracks on the road. In front vehicles, traffic signs, directions etc. Here in this project work used machine learning algorithm for better accuracy in recognizing the traffic signs.

In this project work raspberry pi was used for processing of video and image .Open computer vision and tensor flow are used for developing the machine model for recognizing the traffic signs. The traffic data set of German traffic signs are used here in this project, as it is similar road signs as in India. In this dataset nearly of 42 signs and nearly of 40000 images used to train the machine model and achieved better accuracy.

4. IMPLEMENTATION

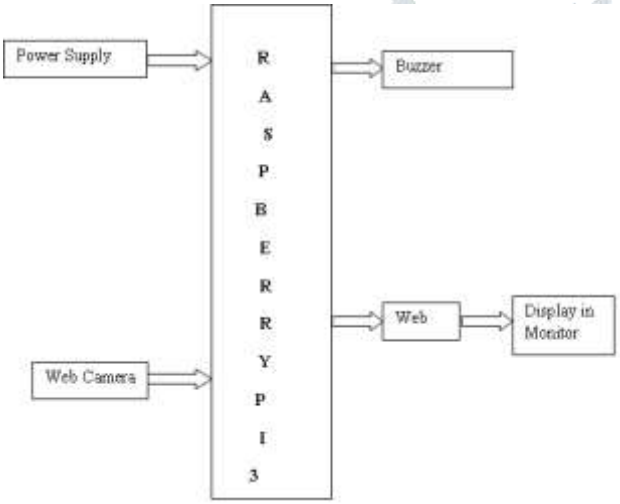


Fig.1 Proposed Block diagram

For autonomous vehicle the complex processing of image and video is possible by using Raspberry pi. it is portable easy to integrate. Needs 5 volts of power supply that can get from battery supply from the vehicle. It has 40 IO related pins .it supports all protocols mainly CAN protocol which is used mainly in automobiles. It also supports I2c, serial, Wi-Fi Ethernet, USB. As the work main intention to build autonomous vehicle effective traffic sign recognition.

Cameras is connected to raspberry through USB and configures and select the port for read the image or video by using OPENCV and ESPEAK used so that after detecting the traffic sign it produce voice output of the detected sign.

A. Hardware Used

1. Raspberry Pi

Raspberry pi is a little chip of single board PC .There are different model of raspberry accessible in the market for example the Raspberry Pi1 Model B, Raspberry Pi1 Model B+, Raspberry pi2,Raspberry Pi3 Model B. These all are vary in memory limit and equipment highlights like Raspberry pi3 has inbuilt Bluetooth and Wi-Fi modules while in past adaptations these modules were not accessible .It has 1.2 GHz 64-bit quad center ARMv8 CPU with 1 GB of RAM.

Fig.2 Raspberry Pi Controller

2. Web Camera

Camera is utilized to take the nonstop pictures to get the traffic signs and flags from this present reality. As per the pictures accessible through the camera we can send these pictures to the raspberry pi to play out vehicle's control activity.

Fig.3 Web Camera

3. Speaker

Speakers are perhaps the most well-known yield gadgets utilized with PC frameworks. A few speakers are intended to work explicitly with PCs, while others can be snared to a sound framework. Notwithstanding their plan, the motivation behind speakers is to create sound yield that can be heard by the audience.

Fig.4 Speaker

B. Software used

1. **Python software**

Python is a significant level, universally useful programming language utilized broadly in ventures and research work additionally utilized in making universally

useful activities. It's product comes in different form for example Inactive python 2, python 3 additionally in these two sorts diverse adaptation of python IDLE are accessible for programming the python language.

2. Open CV

It represents Open Source Computer Vision .It has a library of programming capacity basically for constant PC dreams. It has over more than 2500 upgrade calculations for set of old style calculation just as for the condition of workmanship calculations in the PC dreams is essentially utilized for picture preparing in which we utilized it for the face location, object discoveries, picture acknowledgment, follows and furthermore for different capacities.

C. Proposed System Flow Chart

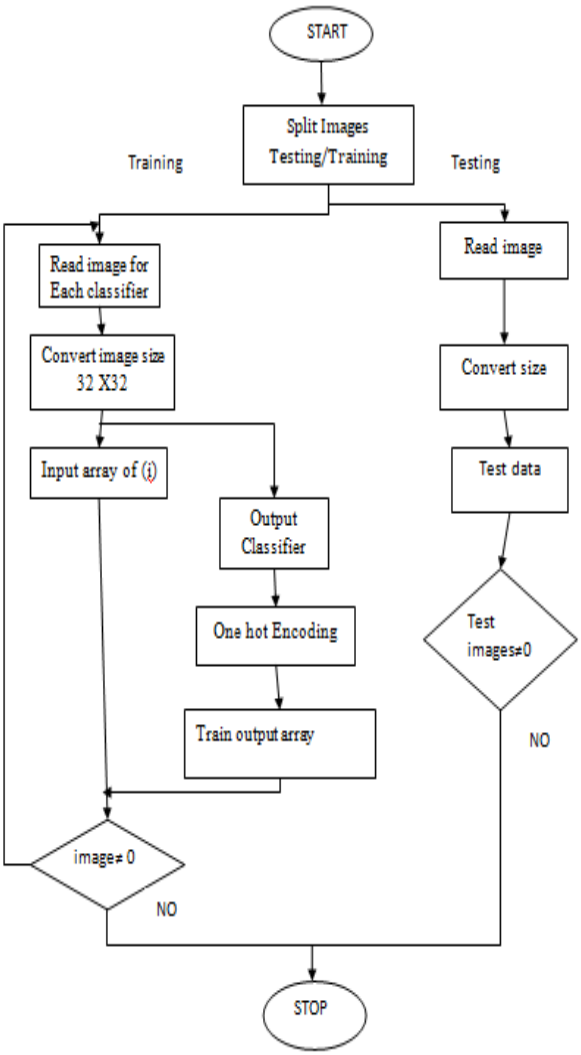


Fig.5: Flow chart for Dataset for training and testing

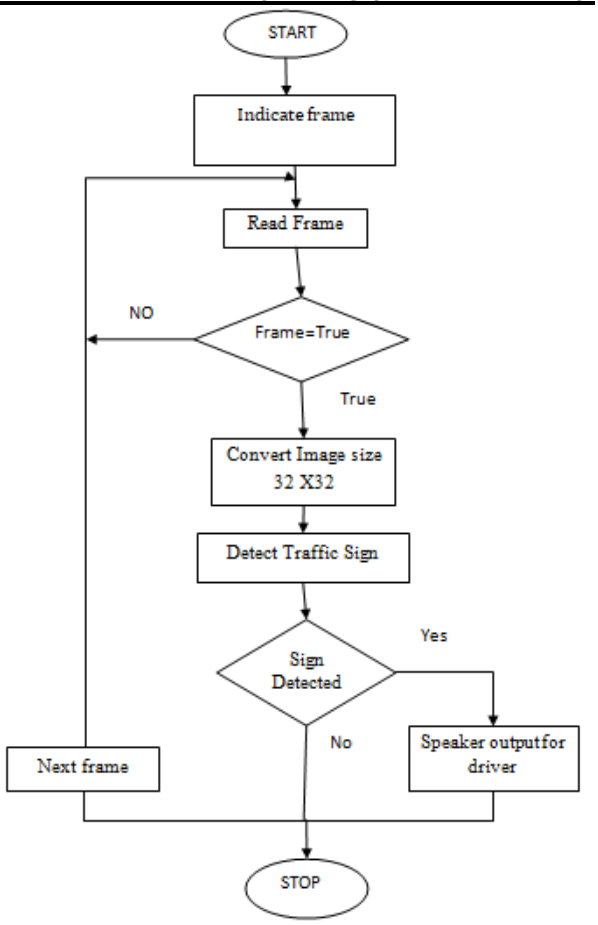


Fig.6: Flow chart for Traffic Sign Reconisation

5. EXPERIMENTAL RESULTS

A. Experimental Setup

Fig. 7 shows the Experimental arrangement of this venture. Raspberry Pi 3 processor is the fundamental controlling unit in the Framework. A webcam is interfaced with the Raspberry Pi 3 which persistently catches the casings of the street sign during movement of vehicle. As per the code in the Raspbian OS the caught outlines are handled and are shown in the screen. The pictures are handled with Output classifier and one hot encoding and train the yield cluster for sign discovery and characterization.

Fig.7 Experimental Setup

B. Result Analysis

The outcomes are been taken in Open CV, which is introduced in Raspberry Pi 3 unit. The model is created utilizing python. The accompanying bundles are required and introduce utilizing ESPEAK for advancement of the model. The yield of the model is 43 length clusters. In reality the yield names are encoded to one hot encoding of length 43 for preparing of 43 classes of traffic signs.

Model 1:

In this model the input size of the img is 32x32. Training in of this model took 24 hrs in 2GB ram system .the accuracy of this Model1.

Total params: 111,275
Trainable params: 110,955
Non-trainable params: 320
Test data Accuracy: 95%

Fig.8 Accuracy in model 1

Model2:

In this model the input size of the img is 32x32. training in of this model took 24 hrs in 2GB ram system .the accuracy of this Model2.

Total params: 242,251
Trainable params: 242,251
Non-trainable params: 0
Test data Accuracy: 94%

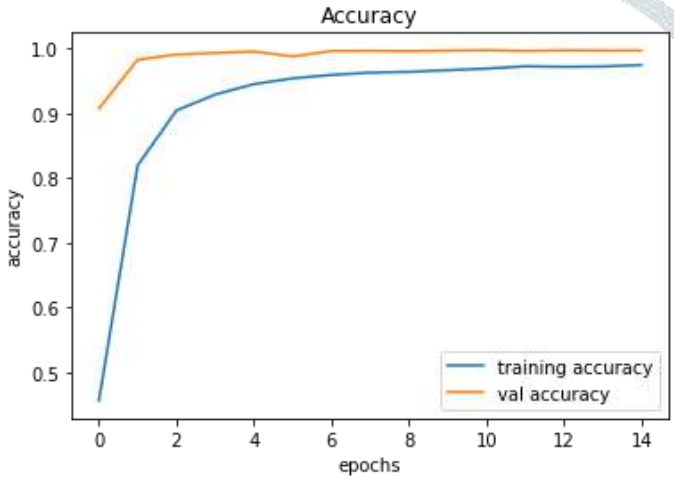


Fig.9 Accuracy in model2

Model3:

In this model the input size of the img is 32x32. Training in of this model took 24 hrs in 2GB ram system .the accuracy of this Model3.

Total params: 612,427
Trainable params: 612,427
Non-trainable params: 0
Test Data accuracy: 98.09184481393508

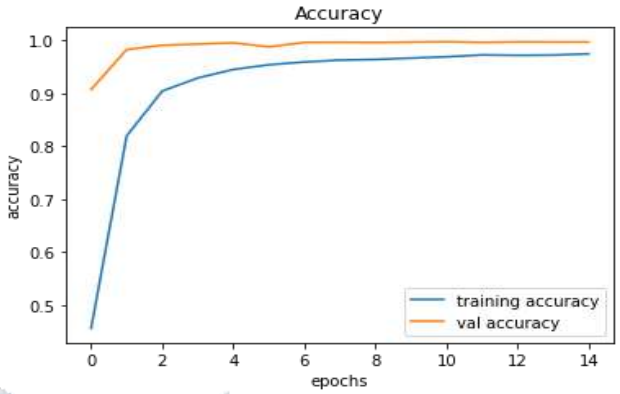


Fig.10 Accuracy in model3

The following figure was predicted output of few traffic signs while testing images**.**

Fig.11 predicted output of few traffic signs while testing images.

The anticipate yield is of 43 length cluster. Each list determines the traffic sign. The anticipated sign specific record yield make them stay all will be zeros. The following is the case of the anticipate model yield of Road work traffic sign.

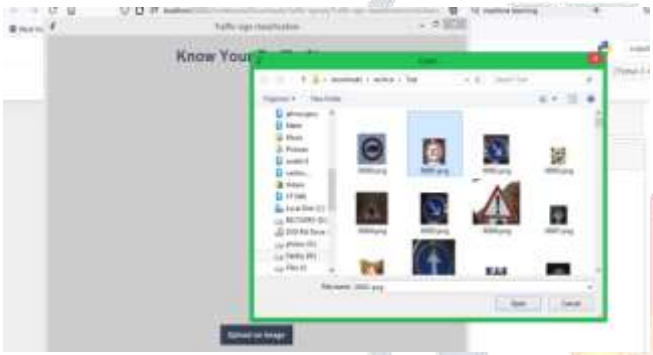
Fig.12 Predicted output

C. Running to Model Using GUI While Developing

1. Used tinker for visualization.

2. Run the program displays the GUI to select the image for classification

3. Load the image.



4. After uploading click the button for classification

5. the predicted output of the image

6. The following screenshots are outputs of different traffic signs.

D. Comparison of Model 1,2 & 3

Parameter	Model 1	Model 2	Model 3
Accuracy	96.6436	95.0445	98.0918

In the above table showing the Accuracy in different models. Here the highest accuracy got in model 3 compare to other 2 models. So model 3 is choosing to detect the traffic sign for autonomous vehicle.

6. CONCLUSION

At last, the acknowledgment and order of these potential street signs is finished by a data set of street sign examples and controls the speed as indicated by it. The exhibition of this thought relies upon the nature of the info picture, comparable to its size, contrast and the way the signs show up in the picture. This framework is completely founded on robotization measure which replaces the current manual activity. Computerization measure, thusly diminishes the human blunder, expands the exactness, handling pace and unwavering quality. In this task use AI calculations can be utilized so it very well may have the option to decide each items .The current presentation is more proficient by utilizing AI calculations.

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