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Abstract - Self-driving cars are robotic vehicles that can be driven by themselves without any human interference and has the potential to mark the technological revolution of the next decade. Here work represent the evolution of blueprint of an atomic self-driving car model using easily available software and technology. The main objective of the work is to avoid the accidents caused due to driver faults. In this blueprint, Raspberry PI model 3 + controller and H-bridge motor Drives four DC motors to realize vehicle automation. Technologies such as Camera to distinguish lane and obstacle detection and avoidance using computer vision for image processing and deep learning for Intelligent systems have deployed. This prototype for self-driving autonomous work better than human driver, visualizing and analysis speed to take decision more accurate for self-driving car.

Keywords- Image Processing, Lane Detection, Raspberry Pi, Convolution Neural Network, Traffic light Detection.

I. INTRODUCTION

According to World Health Organization, Every year an estimated lives about 1.3 million people die as a result of a road accident. From 20 million to 50 million more people suffer from non-fatal injuries, with many incurring a disability as a result of their injury.Road traffic injuries cause huge economic losses to individuals, their families and to nations as a whole. These losses come from the cost of treatment and loss of productivity of those killed or disabled as a result of their injuries, as well as family members who need single member to take care for the injured. Road accidents cost many countries 3% of their gross domestic product.

According to Times of India, Deaths due to road accidents have increased by 12% across the province from January-October in 2021 as compared to the correlate with 10 months in 2020. Recent data, Given by the state crime branch with the transport department said, altogether 4,074 people died in road mishaps during January-October previous year. The casualty data had stood at 3,637 during the first 10 months in 2020. With respect to BBC news , M4 crash: Drink and drug driver jailed for causing deaths of two children.

With the advancements in the automobile industry, there is a need for auto-pilot cars just like airplanes to minimize the chances of accidents due to human errors. The automobile industry is looking to save lives, reduce injuries, and spread mobility equitably. We can do this by addressing the major challenges of systems engineering and design, implementation of more artificial intelligence, sensor improvements, and education of the end consumer. With the launch of Tesla cars, now it has been possible to drive an autopilot car. Tesla cars come with the hardware needed in the future for full self-driving in almost all circumstances. The system is designed to be able to conduct short and long-distance trips with no action required by the person in the driver's seat.

II. RELATED WORK

With the rapid development of technology, Scientists are proposing new ideas for building 'Self-driving cars' to ensure safe transportation. Companies like Google, Uber and Tesla lead a global campaign in the construction and production of autonomous vehicles. This is an important for saving time as we can work in car even the car is driving by itself in city traffic during rush hours to the office. There is different technique that work in real world with better accuracy and confident. A convolution neural network based mobilenet- Single-shot multibox Detection technique is suggest to detect and track the real-world objects. This blueprint has achieved excellent results of detection and tracking results trained model with 99% accuracy at 98.2% confidence level, which prevent the robot from accidents [1]. A mathematical model is proposed to explore the characteristics of a two-wheel self-balancing robot and control its behaviour on a planar surface and on an inclined plane [2]. This prototype is using a modelled car having a Raspberry pie to process the captured images from the camera and send it remotely on remote computer process it and send back. Along with, various sensors around the car to detect the surrounding obstacles and camera will be able to capture specific pattern on the road and traffic sign [3]. The main idea of this map is Raspberry Pi controller and H-bridge driver to move two DC motors to realize vehicle automation and GPS to access location, sonar sensors allow obstacle detection and avoidance, image processing used for pedestrian detection, computer vision work for processing images and machine learning for intelligent systems. In case with an accident, if detected with an accelerometer and an alert message and live location are sent to the registered mobile number and E-mail of a contact person using Geocoding through Twilio application [4]. A monocular vision-based self-driving car prototype using Deep Neural Network on Raspberry Pi is deployed to control the autonomous car without human interaction [5]. In this paper, the accuracy and reliability of image processing technologies, which use camera systems, have been enhanced that allow to detect the lane in rainy dark condition and the experiment shows highly reflective lane under rainy dark [6].

III. PROPOSED SYSTEM

Initially, tracks are deployed on surface to gather data through video streaming using webcam with help of OpenCV which is open-source computer vision library. After the collection of data, deployment of image processing such thresholding, Hough Line transformation to find the Centre point and frame point. With help of these Centre and frame point, we are able to find the curve/turn value of car and traffic sign to distinguish different classes i.e right, left, forward and stop.

After this, we are able to collect the dataset for our model to make self-automation vehicle. Dataset contain the image and csv file which contain image location and curve value of turn. These datasets are collected manually which leads to innovate the model according to environment we provide to the car. After collection of data, OS operation are performed to extract the data and label it from location then image processing technique are applied to get better feature result from image and such technique may be augmentation, thresholding, Hough line detection and some preprocessing like gaussian blur and resizing the image were required to remove noise and equal size

dimension. Thereafter, we were ready make model using CNN which performance is better on image or video using many hyperparameters.

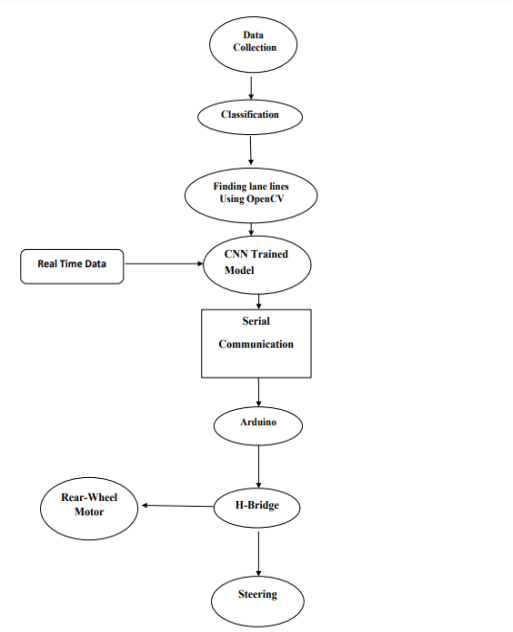


Fig.1 Architecture of the proposed system

The Architecture of the proposed system consists of various box as shown in the fig (1) as follows.

First, collecting image and its respective value of curve and stop in csv file using webcam and Raspberry pi help of OpenCV library. After that image processing are applied to remove some noise and extract the details. Model are made ready using convolution neural network and real data are provide using raspberry pi camera to model to predict the steering angle to move autonomous car.

1. OpenCV

OpenCV is a great tool for image processing and performing computer vision tasks. It is an open-source library that can be used to perform tasks like face detection, objection tracking, landmark detection, and much more. It supports multiple languages including python, java C++.

2. Scikit Image

It is an open-source library for the python programming language used for image processing. It contains different kinds of algorithm for segmentation, geometric transformations,colour space manipulation, analysis, filtering, morphology, feature detection and many more. It is identified to standardized with the python numerical and scientific libraries such as NumPy and SciPy.

2.1 Image pre-processing

In real world, data we get are not perfect to make model that why pre-processing are required. Image pre-processing is the designation of work on pictures at the lowest level of abstraction. These activities do not increase image information details but it may decrease if entropy is an features measure. The main idea of pre-processing is an improvement of the image data that quash unnecessary distortions or enhances some image features relevant for further processing and analysis task. Some basic image pre-processing techniques are pixel brightness transformations, Geometric Transformations, Image filtering and Segmentation, Fourier transform and Image restauration. This operation is performed to analysis the image to get proper image data for training for making model.

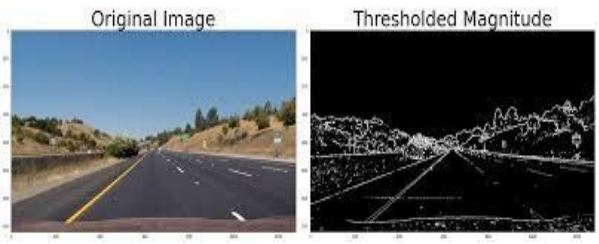
2.2 Image processing

Image processing could be a technique performed on a image to induce an improved image or to extract some useful information from it. It is a sort of signal processing where the input is a image and therefore the output could also be a image or features / features associated with that image. In Today world, image processing is fastest growing technologies. Build a core research area within engineering and engineering subjects yet. Image processing basically involves the subsequent three steps:

- Image import with image detection to
- Image analysis and editing
- Effect where the effect is often changed to an image or report supported image analysis.

2.2.1 Thresholding

It is a type of image segmentation where it manipulates the pixels of an image to make the image easier to analyse. It converts colour or grayscale into a binary image. Similarly, Binary image contain black and white pixels i.e 0 or 255. Mostly threshold is used to select region of interest of an image, while to ignoring the parts which are not concerned. We can manipulate the threshold value manually as well as automatic to separate the pixels. One such automatic thresholding methods is Otsu's method.



2. Deep learning

In real world, Accuracy matters, Deep learning reaches recognitions accuracy at higher level than ever before. This help consumer electronic meet user expectations, and it is crucial for safety-critical applications like driverless cars. Recent advance in deep learning have improved to the point where deep learning outperforms humans in some tasks like classifying objects in images.

Two main reasons it has only recently become useful:

1. It can perform smoothly on large amounts of labelled data. For example, Driverless car
2. It needs considerable amount of computing power. High-performance GPU have parallel architecture that is efficient when combined with clusters or cloud computing that enables development teams to reduce training time of deep learning network .

Deep learning models are trained by using large sets of labelled data and neural network architectures that learn features directly from the data without the need for manual feature extraction.

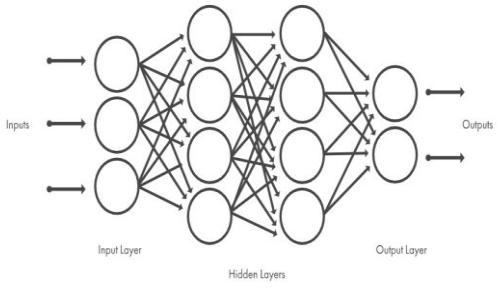
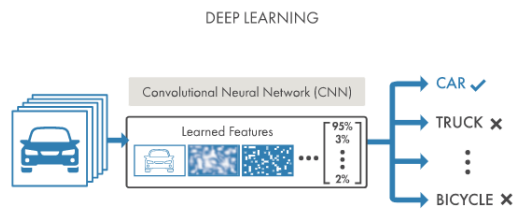


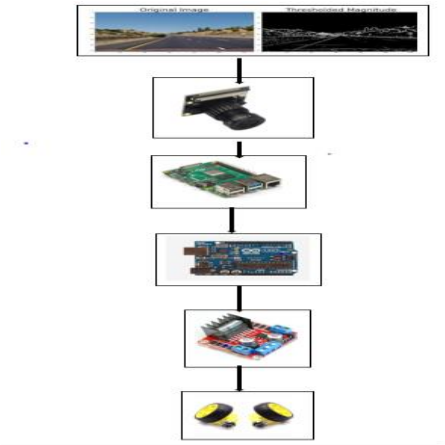
Figure 1: Neural networks

The main advantages of using deep learning network are that model improve as the size of data increases.



3. Hardware

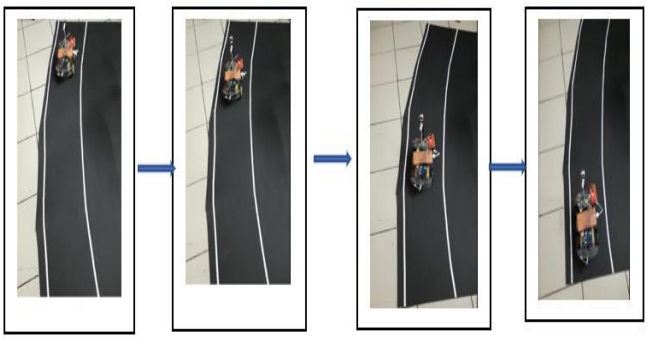
The prototype to make a self-driving car, we required various kind of hardware. Raspberry pi for main processor and laptop for remote controller. We used Webcam for collecting input data through live streaming and these images are feed in trained model to receive signal to control motor driver which further control the servo motor as shown in fig.



V. RESULTS AND DISCUSSION

In this prototype, we have used basic subset of deep-learning such as convolution neural network with various hyperparameters. Many hyperparameters have to be tuned to have a robust convolutional neural network that will be able to accurately classify images. One of the most important hyperparameters is the batch size, which is the number of images used to train a single forward and backward pass. In this study, the effect of batch size on the performance of convolutional neural networks and the impact of learning rates will be studied for image classification, especially for traffic sign.

Here, we have three module types. First Module is data collection, This module collect the road image and get predicted traffic sign value, turning curve value to store in csv file to for making model. Second is training module to make model using convolutional neural network using hyper tunes function to get best result from real time data. Third module is implementation that our software protype loaded in hardware to provide performance according to its surrounding like turning left, right, sign detection and its response accordingly, stop. After implementation, we found model prediction on sign was 98% accurate but communication of signal between raspberry pi and Arduino was poor due to serial communication. Performance of system was also affected by its surrounding materials like Improper light intensity, overview by camera.



VI. CONCLUSION

In project, a chassis car has been used for making a blueprint of driverless car. The basic concept behind an automation-driving car is to sense its environment and take actions respectively. The steering angle of the car was measured using a value difference between frame center and lane center. Movement in the wheel affect a value difference between frame center and lane center based on value difference turning take place. The motors are used to drive the car which is controlled by using an H-bridge motor driver. The signal to the motor driver shield was given through the Arduino board using PWM. The Arduino board gets the signal from a Raspberry Pi which runs the computer vision algorithm to navigate the car. Cascade trainer gui which uses HAAR cascade model has been used to train data to move the car chassis on pre-defined paths. HAAR cascade model is implemented along with the powerful computer vision techniques to enable the car to navigate autonomously.

In this prototype, we can do various change using sensors and camera to get better performance. There should be utilization anti-light resolution camera to get clear raw data for processing and predicting. Here, better hardware should be utilized to get for fast communication and response.

VIII. REFERENCES

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