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AUTONOMOUS CAR DRIVING USING MACHINE LEARNING

Implementation of autonomous driving car with machine learning

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Abstract : Autonomous vehicles are Self-driving cars that can drive by themselves without any human interference so it is a bit profitable to the mankind, it is similar to having personal driver except that this car does not involve human interaction, this amazing car gives a man sudden advantages with disadvantages too. This is the prototype of self-driving car; it is a small scale a four-wheel vehicular robotic has been designed that will follow the lane and avoid obstacles. Self-driving cars are autonomous vehicles which will drive by themselves without any human interference and has the potential to mark the technological revolution of subsequent decade. This work presents the event of a low-cost prototype of a miniature self-driving car model using simple and simply available technologies. the target of the work is to avoid accidents caused thanks to driver faults. during this prototype, Raspberry Pi controller and two DC motors to understand vehicle automation, pi camera. Machine learning libraries for obstacle detection and avoidance, image processing for pedestrian detection, computer vision for processing images and machine learning for intelligent systems are deployed.

IndexTerms **- Autonomous Car, Computer Vision, Image processing, inference, Machine Learning.**

I. INTRODUCTION

An autonomous car is also known as a self driven car. It is designed to travel in the absence of a human operator. Self-driving cars are autonomous vehicles that can drive by themselves and has the potential to mark the technological revolution of the next decade. that are Open CV, C++ programming, Machine learning technology. The development of self-driving cars is one of the most trending and popular directions in the world of machine learning. Driverless cars can recognize objects, decode the situations, and make decisions based on object detection and object classification algorithms; This is implemented by detecting objects, classifying them, and interpreting what they are. Database Support provides comprehensive data annotation services to help train the machine learning algorithm to make the right decisions when navigating the roads. Raspberry Pi is heart of our Autonomous car. Most of images are captured by the camera module, on this images image processing techniques are used to achieve machine learning.

II. LITERATURE SURVEY

A robot, efficient of executing numerous duties for the handicapped, has been made. To avoid crash from upcoming objects, the machine enables ultrasonic radius spotters for spotting and plotting [1]. The object avoidance measure applied for this robot is printed. Because the method is determined basically on the execution of the ultrasonic rangefinders, the sensors and therefore the effect of their limitations on the thing avoidance algorithm are discussed intimately [2]. The system's intent is to make a self-driving car prototype with Raspberry Pi because the main functioning chip. A camera together with an ultrasonic sensor is placed to work out needed data from the present feed before the car[4]. The car will reach the given place safely and intelligently by limiting the chance of human mistakes. Driver mistakes are the foremost common explanation of road accidents, and with mobile phones, in car entertainment systems, more traffic and more complicated road systems; it isn't likely to travel away. a technique or measure to see the uneven, marked or unmarked road edges/sides are explained thoroughly in Open CV[6].By using Open CV for distance calculation, the collisions with objects like vehicles and pedestrians are kept away[7]. the strategy laid out in their proposed system has been rightfully executed on a self-driving car. Road path line segmentation and spotting algorithm evolved from IPM. Results specifies that the proposed algorithm has strong robustness to non-track line sketching and automobile shadows, and also the track line will be accurately detected under the complex pavement conditions[9][10]. Nowadays we will notice an enlarging need for an in-depth road protection method to reduce the

danger of collisions. There's an outsized sum of vision systems evolved for automobile control, crash avoidance and lane leaving hazard, which are grown.

III. METHODOLOGY

For a self-driving Camera is connected with the Raspberry Pi USB port, the Raspberry Pi that is interfaced with the automobile with two motors. Fig. 3.1 supported the driving parameter; the signal is distributed to Arduino to control the Car. The monitor is connected as local host because the same network to look at the video stream of the Car. The car which has the main system as Raspberry Pi, which interfaced with the camera, it can stream the video to the Monitor as localhost,it supported the detection like pedestrians, vehicle or road sign and signals, commands are sent to the Arduino serially to work the car. Since Raspberry Pi is doing a video streaming to the computer. To operate the car, control commands are sent to the Arduino from the Raspberry Pi. Whereas running, the camera interfaced with the car, notices any of the detection parameters, if it notices any parameter like road sign, is reported in the display. The car will move as per parameter.

Red Light & Lane End Detection-

Have red light down the road, car will detect that light and will stop for until the green light is on, after turning on the green light car will continue to drive. Next, have lane end detection so car will simulate the turn so that it can go to the second lane.

Object Detection-

Object detection when some other car down the street is treated as object then will you turn signal to move to the second lane so that it over take that object then it will again come to the same line.

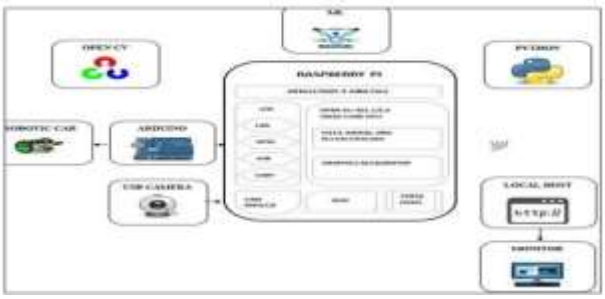
Stop Sign Detection-

Next, we will have stop sign detection when car found the stop sign it will stop for all most 3 seconds.

Visual perception beholding is important for a self-driving car, i.e., it's necessary to spot the traffic signals. Nowadays, most traffic signals are designed for the human vision; therefore, it's necessary to acknowledge the traffic light. Besides, the machine vision is additionally used for location, navigation, to guage the motion then on. However, it's complex that environment perception use vision thanks to the massive amount of data and inefficient algorithms. Fig. 3.2 specifically, the foremost complex beholding is the way to make sure the reliability and robustness of the algorithm. There are two main development directions in visual-perception-based intelligent vehicle navigation. One is primarily visual Simultaneous Localization and Mapping (SLAM) supported the map. Another is visual understanding supported the understanding of captured image, which use the machine vision and machine learning to process the image, the self-driving car then reconstructs the 3D scene for navigating and recognizing the traffic lights, traffic signs and stop line. So, during this project we used Camera to captures the pictures and used machine learning algorithm to recognition of traffic signals.

IV. EXTERNAL INFORMATION

Vehicle control means vehicle speed and direction control. Fig 3.3 Generally, the functionalities of auto control are the vehicle's status perception and thus the event of vehicle's control method. To understand vehicle speed and direction calculation, the environment perception, vehicle status, driving target, traffic regulations and driving knowledge are fed as input into the perception module, then the vehicle control algorithm performs the calculation of the control target, which is then transfer into the vehicle system . Finally, the vehicle system executes all these instructions to manage the vehicle's direction, speed, light, horn then on.



3.1 Obstacle detection sub-system algorithm:

A machine learning based Hear Cascade classifier is used. Hear Cascade classifier is an effective object detection approach where a cascade function is trained from a lot of images both positive and negative. Based on the training then it is used to detect the objects in the other images.

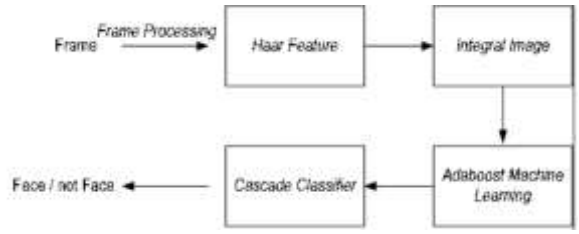


Fig. 3.3: Obstacle detection System

The first feature selected seems to concentrate on the property that the region of the eyes is commonly darker than the region of the nose and cheeks. The second feature selected relies on the property that the eyes are darker than the bridge of the nose. But a similar windows applied to cheeks or the other place is irrelevant. So how can it select the simplest features out of 160000+ features? it's achieved by Adaboost . AdaBoost could be a combination of multiple learning algorithms which will be utilized for classification. It overcomes over fitting in comparison with the other machine learning algorithms and is usually sensitive to outliers and noisy data. So as to make one composite powerful learner, AdaBoost uses multiple iterations. So, it's termed as adaptive. By adding the weak learners iteratively, AdaBoost creates a robust learner. a replacement weak learner is appended to the entity and a weighing vector is adjusted so as to concentrate on examples that were classified incorrectly within the prior rounds. A classifier that has much higher accuracy than the classifiers of weak learners is that the result.

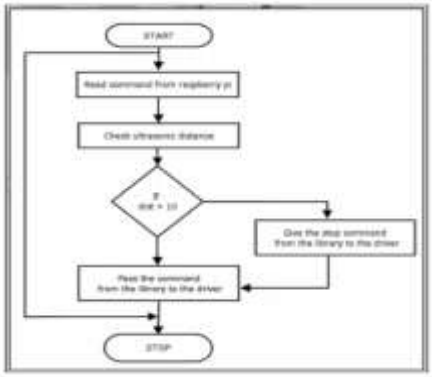


Fig. 3.4 Working of Cascade Algorithm

3.2 LANE detection:

To perform the LANE detection operation, it's important to convert image into Gray scale as follow. After detection of lane, image appears as if below picture. that's lane in image marked is total white because of thresholding of image. The white pixels from the region of interest are considered only. Count of this image will give the position of lane on the road. The region of interest is slide vertically with relevancy speed of car.

4.1 COMPONENTS USED

The region of interest is slide vertically with relevancy speed of car. Hardware Used

- Raspberry Pi 3 B+
- LN298 Motor Driver IC
- Pi-Camera Module
- Arduino UNO
- Robot chassis
- Robot wheels
- Battery Pack

The study comprised of non-financial companies listed at KSE-100 Index and 30 actively traded companies are selected on the bases of market capitalization.And 2015 is taken as base year for KSE-100 index.

4.2.1 Raspberry Pi 3 B+

The processor used in the proposed system is the Raspberry Pi 3 B+ model with a 1.4 Giga hertz 64-bit quad-core processor. Raspberry Pi 3 B+ has 1 Giga Byte of Random-Access Memory and has 40 pin General purpose Input /Output header. It consists of four Universal serial bus ports and a power input port of 5V of 2.5A. It is applied in the proposed system as the core central processor to synchronize the functionalities, take suitable inputs and then take actions accordingly.

Fig. 4.2.1: Raspberry Pi 3B+

4.2.2 L298N Motor Driver IC:

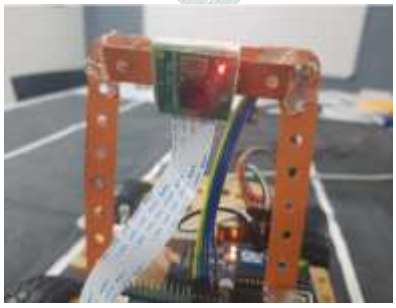
L298N motor driver Integrated Circuit is a fifteen-lead peak voltage, peak current motor driver Integrated Circuit. L298N motor driver Integrated Circuit is a dual full bridge driver Integrated Circuit which may manage 2 motors at the same time with separate inputs. The basic minimum supply voltage is 5V but the acceptable reserve energy are high as 45 volts and the highest output current per channel is at most 2 Ampere.

Fig. 4.2.2 L298N Motor Driver

4.2.3 Pi- Camera Module :

Pi camera module is used for the real-life streaming of the transfer ahead of the car and to take picture of the traffic signs and traffic signals on which processing is done by the Raspberry-Pi later. It uses a Sony 5-mp sensor. It is mounted to the Raspberry-Pi 3 B+ via a fifteen cm ribbon cable. Pi camera supports videos of 1080 pixel per 30 frames, 720 pixels per 60 frames and VGA 90 modes.

Fig. 4.2.3 Pi-Camera Module



4.2.3 **Arduino UNO**

Anyone can easily understood Adriano UNO and they get fruitful experience with this board. It is programmed using Arduino IDE software which is introduced by Arduino.cc. we called Arduino program as a sketch it need to unload into the board. The sketch is set of instructions that allow the board to perform define functions as per requirements. while using Arduino boards no need of other peripherals and components to run the boards. Arduino is the complete board that comes with GPIO & similar pins, as well as microcontroller as the heart of the board. A microcontroller, is a chip where all the necessary parts like microprocessor, RAM, and Flash Memory are coordinate into a single chip.

4.2.4 RESULT

System aim was to make a vision autonomous car prototype using Raspberry Pi as a processing chip. An camera with an ultrasonic sensor is employed to produce necessary data from the important images to the car. The car is capable of reaching defined destination safely and intelligently so, it avoiding the danger of human errors. Lane detection, obstacle detection algorithms are combined together to supply the required control to the car. In this system used a Object programming , after run the program will see the frame per second, and also see a distance from an object and car will stop for nearly 10 second. It will customize this distance supported our requirement also, car stop at 14 cm before at stop sign, next it've a Lane it'll follow an equivalent continues path again and again .

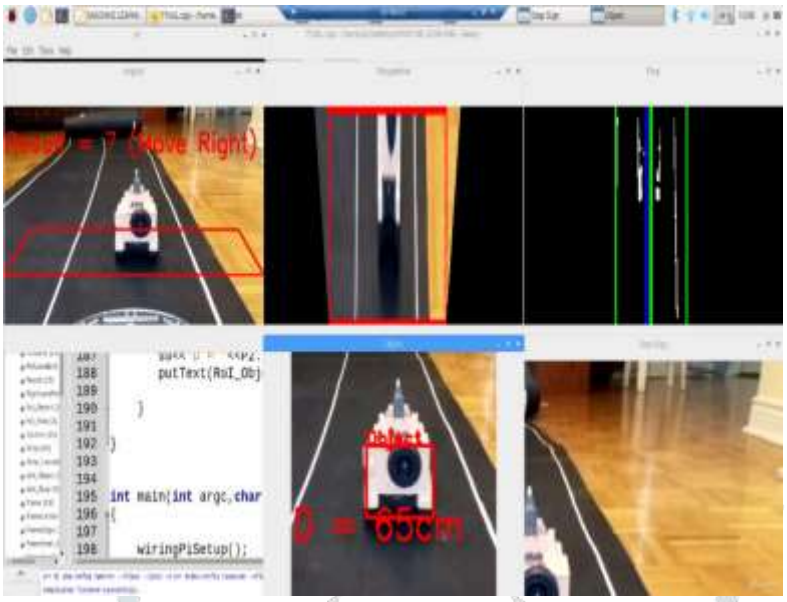


Fig. 4.2.5 Views of Visual from Camera and Controller

5. CONCLUSION

DRIVERLESS CAR REBELS WHICH AIMS AT THE DEVELOPMENT OF SELF - GOVERNMENT VEHICLES FOR EASY TRANSPORTATION WITHOUT A DRIVER. FOR THE ECONOMY, SOCIETY AND INDIVIDUAL BUSINESS THIS AUTONOMOUS TECHNOLOGY HAS BROUGHT MANY BROAD IMPLICATIONS. A METHOD IS DETERMINED FOR MARKED ROAD EDGES ARE EXPLAINED IN DETAIL RELYING UPON OPENCV. CARS THAT DRIVE WILL IMPROVE ROAD SAFETY, FUEL EFFICIENCY, INCREASE PRODUCTIVITY AND ACCESSIBILITY; THE SELF-DRIVEN CAR TECHNOLOGY HELPS TO MINIMIZE LOSS OF CONTROL BY IMPROVING VEHICLE'S STABILITY AS THEY ARE DEVELOPED TO DECREASE RATE OF ACCIDENTS BY ADDRESSING ONE OF THE MAIN CAUSES OF COLLISIONS: DRIVING ERROR, DISTRACTION AND DROWSINESS. THE ALGORITHM MENTION HERE WAS SUCCESSFULLY IMPLEMENTED IN PROTOTYPE OF AUTONOMOUS CAR.

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REFERENCES

1. **[1]** Johann Borenstein Yoram Koren, Obstacle Avoidance with Ultrasonic Sensor, IEEE Journal of Robotics and Automations, VOL. 4, NO. 2, APRIL 1988, pp. 213-218.
2. G. O. Young, "Synthetic Structure of Industrial Plastics (Book Style with Paper Title and Editor)," In: J. Peters, Ed., Plastics, McGraw-Hill, New York, 1964, pp. 15-64.
3. Chen, W.-K. (1993) Linear Networks and Systems. Belmont. Wadsworth, Boston, 123-135.
4. Li, M., Zhao, C., Hou, Y. & Ren, M. , A New Lane Line Segmentation and Detection Method based on Inverse Perspective Mapping, International Journal of Digital Content Technology and its Applications. Volume 5, Number 4, April 2011, pp. 230-236.
5. Matt Richardson, Shawn Wallace, Getting Started with Raspberry Pi, 2nd Edition, Published by Maker Media, Inc., USA, 2014. Book ISBN: 978-1-457- 18612-7.
6. Gary Bradski, Adrian Kaehler, Learning OpenCV: Computer Vision with the OpenCV Library, "O'Reilly Media, Inc.". Copyright. September 2008, 1st Edition, Book ISBN: 978-0-596-51613-0.
7. Chandan G, Ayush Jain, Harsh Jain and Mohana, "Real-time object detection and tracking using deep learning and OpenCV," III International Conference on Inventive Research in Computing Applications (ICIRCA 2018).
8. Tiple Anjali Hemant, Tiple Hemanth P and Gauravsagar Hanumanth, "Prototype of autonomous car," 2018 International Journal of Engineering Research in Electronics and Communication (IJERECE 2018).
9. Tiago Moura, Antonio Valente and Vitorphilipe, "The traffic sign recognition for autonomous robot," 2014 International Conference on Autonomous Robot System .and Competitions (ICARSC 2014).
10. Nikky Kattukaran, Arun George, Mithun Haridas T P and Balakrishna M, "Intelligent accident detection and alert system for emergency medical assistance," 2017 International Conference on Computer Communication and Informatics (ICCCI 20170).