International Journal of Recent Advances in Multidisciplinary Topics
Volume 2, Issue 6, June 2021
https://www.ijramt.com | ISSN (Online): 2582-7839

Autonomous Car using Machine Learning

Sharad Jagtap[1], Purva Bhosale[2*], Nikhil Borse[3], Samadhan Borke[4], Shubham Rapartiwar[5]
[1,2,3,4,5]*Department of Electronics and Telecommunication Engineering, Anantrao Pawar College of Engineering and Research, Pune, India*

Abstract: **The autonomous car or the driverless car can be referred to as a robotic car in simple language. This car is capable of sensing the environment, navigating and fulfilling the human transportation capabilities without any human input. Autonomous cars sense their surroundings with cameras, radar, lidar, GPS and navigational paths. Advanced control systems interpret sensory information to keep track of their position even though the conditions change. The advantages of autonomous cars, such as fewer traffic collisions, increased reliability, increased roadway capacity, reduced traffic congestion as well as reduction of traffic police and care insurance, are compulsive for the development of autonomous car even though we have to overcome the issues of cyber security, software reliability, liability of damage and loss of driver related jobs. Autonomous cruise control or the Lane departure warning system and the Anti-lock braking system (ABS) are the early steps.**

***Keywords*: Artificial Intelligence, Camera Module, C++, Image Processing, Open CV, Python, Raspberry Pi.**

1. Introduction

Autonomous vehicles have been in development for over 65 years—in fact the first cruise control systems were introduced in 1948. Multiple car manufacturers estimate the first Commercial driverless cars to be released by 2020. The promise of saving 1.2 million lives a year and solving traffic congestion problems has struck a chord with scientists, engineers, and programmers around the world. Thanks to quantum leaps made in computing technologies in the past 30 years—cheap sensing, reliable object recognition, and real-time, portable, large-scale data analysis— automated vehicles are becoming a reality. Inspired by ongoing research today from around the world, this MQP aims to imagine a divergent take on autonomous vehicle technology by challenging modern vision algorithms combined with affordable sensing technology. The car would drive itself from one place to the other on its own it would possess integrated features like lane-detection, obstacle-detection and traffic sign detection. These features would help the car drive itself to the mentioned destination on the track properly, avid collisions, provide live streaming of the view in front of it with the help of camera mounted over the car and detect traffic signs and obey them accordingly so as to avoid accidents caused due to disobeying the traffic rules. All of this would ensure safer and more convenient mobility, hence providing a revolutionary step in the field towards automation and mobility.

2. Objectives

This project aims to produce an autonomous car using computer vision technique. This car will be able to navigate itself through the track with the help of computer vision. User will be able to watch the live view from the webcam that will be attached to the car. A two lane track will be build and when the car detects the obstacle, it will move to another lane to overtake the obstacle. The sub objectives are as below: To produce low cost autonomous car.

- The car is able to navigate itself through the track and overtake any obstacles by computer vision technique.
- The main goal of self-driving autonomous car is to avoid accident.
- People are free to concentrate on other tasks or to rest during their journeys.
- The present location of the vehicle can be known using GPS.

3. Literature Survey

1. "Prototype of Autonomous Car Using Raspberry Pi", April 2018 International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE) By- Tiple Anjali Hemant, Tiple Hemant P & Gurav Sagar Hanumant. The main objective of this work is the vehicles are focused to be automated to give human driver relaxed driving. In the field of automobile various aspect has been considered which makes vehicle automated. Most impact, including reduced traffic and parking congestion. [1]
2. "Automated Vehicle Driving using Image Processing", June 2017 International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering. By- Mrs. Susmitha B C, Karthik Sharma K, Pavithra N, Nandini M R & Punyashree M C.In this project methodology is focused on control and automation of intelligent road symbol detection system for vehicles in normal environment conditions. In this whole setup we have used python for image processing and a microcontroller interfaced with it for actual real time processing and actuation of commands. [2]
3. "Open CV Python Autonomous Car", Jan 2019 International Research Journal of Engineering and Technology (IRJET). By- Chetan S. More, Suanuska Debbarma, Nidhi Kandpal & Vibhuti Singh. This article presents the objective of this

*Corresponding author: bhosalepurva497@gmail.com

project is to develop an autonomous car, which is capable of both navigating itself through the track and overtaking any obstacle. In this project is an open CV python autonomous car which is designed to give the human driver a calm and stress-free driving. [3]

4. "Self-Driving Car Model using Raspberry Pi", February2020 International Journal of Engineering Research & Technology (IJERT). By Pratibha I. Golabhavi & B P Harish. This paper aims to presents the development of a low-cost prototype of a miniature self- driving car model using simple and easily available technologies. The objective of the work is to avoid accidents caused due to driver faults. In this prototype, Raspberry Pi controller and H-bridge drives two DC motors to realize vehicle automation. [4]

4. Methodology

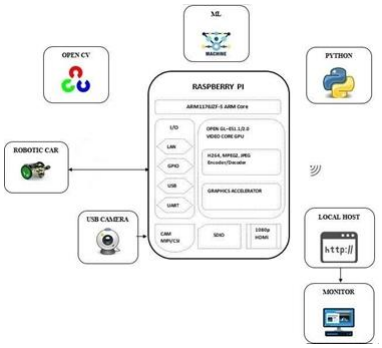

Fig. 1. Block Diagram

In the above Block diagram, for a self-driving camera, Camera is connected with the Raspberry Pi USB port, then the Raspberry Pi which is interfaced with the Car with 2 motors through the Driver IC (L293D). Based on the driving parameter, the signal is sent to Arduino to operate the Car. The monitor is connected as local host, using remote desktop as the same network to view the video stream of the Car. The processing unit (computer) handles multiple tasks: receiving data from Raspberry Pi, object detection (stop sign and traffic light), and sending instructions to the car through a Wi-Fi connection. In this project we have used the Haar feature-based cascade classifiers for object detection. The Haar classifiers use the shape-based approach. Since each object requires its own classifier and follows the same process in training and detection, this project only focused on the stop sign and traffic light detection. OpenCV provides a trainer as well as a detector. We collected the positive samples (samples which contain a target object) using a cell phone and these samples were cropped such that only the desired object is visible. However, the negative samples (samples which do not have a target object), were collected randomly. In particular, traffic light positive samples contain an equal number of red traffic lights and green traffic light. Thus initially the car will ask the user to enter the destination. Then the main task of the car is to reach the destination autonomously through the path while stopping whenever a stop sign is detected, also if a traffic light is in the way the car should wait for a specified period of time if the traffic light is red and if the traffic light is green the car should move continuously.

5. Component Description

A. Hardware Configuration

1) Raspberry pi

The Raspberry Pi 3 Model B+ is the latest product in the Raspberry Pi 3 range, boasting an updated 64-bit quad core processor running at 1.4GHz with built-in metal heatsink, dual-band 2.4GHz and 5GHz wireless LAN, faster (300 mbps) Ethernet, and PoE capability via a separate PoE HAT. . It has 1.2 Ghz quad core ARM cortex A53 and RAM 1GB. It required power upto to 5V, 2.5 amp which is negligible with respect to PC [5].

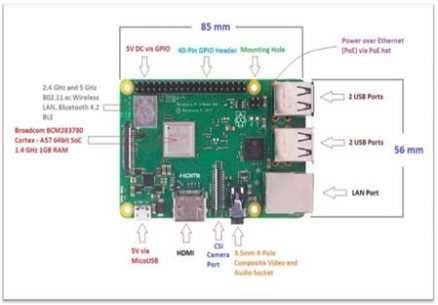

Fig. 2. Raspberry Pi 3B+ Board

2) Pi-Camera Module

Camera used in this project having 8MP resolution with fixed lens. It is capable to capture picture 3280x2464 pixel size [6].

Fig. 3. Pi Camera Module

3) DC Geared Motor (150RPM to 300RPM)

DC Motor – 100RPM – 12Volts geared motors are generally a simple DC motor with a gearbox attached to it. This can be used in all-terrain robots and variety of robotic applications. These motors have a 3 mm threaded drill hole in the middle of the shaft thus making it simple to connect it to the wheels or any other mechanical assembly.

Fig. 4. DC geared motor

4) L298N Dual H Bridge

This is the popular L298N Dual H-Bridge Motor Controller, typically used to control motor speed and rotation direction. It can also be used for other products such as with LED arrays, relays, and solenoids, etc. Its powerful little motor driver with a heavy duty heat sink. Capable of powering 5-35V motors with a max of 2A.

Fig. 5. L298N dual H Bridge Module

5) Arduino Board

Arduino is a single board microcontroller kit for building digital devices and interactive objects in the physical and digital world. It allow to program in C language. It has internal analog to digital convertor.

6. Software Description

1) Raspbian OS

Of all the operating systems Arch, Risc OS, Plan 9 or Raspbian available for Raspberry Pi, Raspbian comes out on top as being the most user-friendly, best-looking, has the best range of default software's and optimized for the Raspberry Pi hardware. Raspbian is a free operating system based on Debian (LINUX), which is available for free from the Raspberry Pi website.

2) OPENCV

It (Open Source Computer Vision) is a library of programming functions mainly aimed at real-time computer vision. It has over 2500optimized algorithms, including both a set of classical algorithms and the state of the art algorithms in Computer Vision, which can be used for image processing, detection and face recognition, object identification, classification actions, traces, and other functions.

3) Python

Python is a widely used general-purpose, high-level programming language. Its syntax allows the programmers to express concepts in fewer lines of code when compared with other languages like C, C++or java.

7. Results

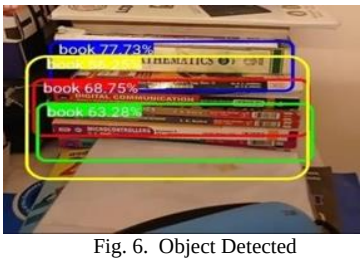

Fig. 6. Object Detected

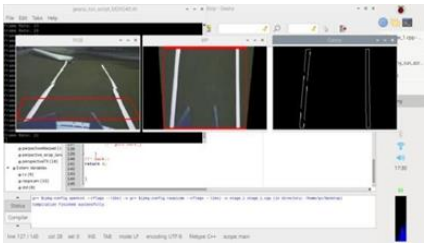

Fig. 7. Lane edge detected

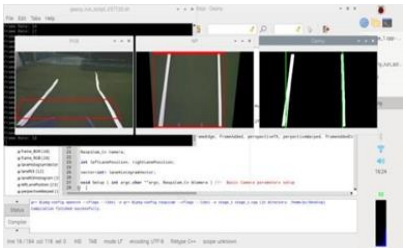

Fig. 8. Lane detected

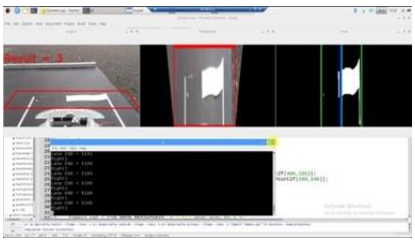

Fig. 9. Lane end detected

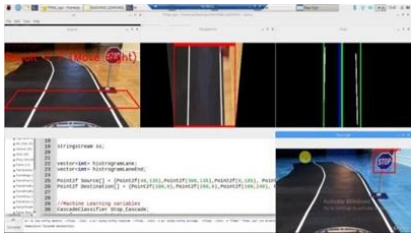

Fig. 10. Stop sign detected

8. Conclusion

Driverless car revolution which aims at the development of autonomous vehicles for easy transportation without a driver. For the economy, society and individual business this autonomous technology has brought many broad implications. In this paper, a method is determined for marked road edges are explained in detail relying upon OpenCV. Cars that drive themselves will improve road safety, fuel efficiency, increase productivity and accessibility; the driverless car technology helps to minimize loss of control by improving vehicle's stability as they are designed to minimize accidents by addressing one of the main causes of collisions: Driving error, distraction and drowsiness. The algorithm mention in this paper has been successfully implemented in prototype of Autonomous car.

9. Future Work

The work could be enhanced by improving the algorithm by adding advanced machine learning to it. Using advanced algorithm we can improve Image processing algorithms. Multi

layered processors can be used for fast processing. The present obstacle detection algorithm just detects the obstacle and stops, but in future it can be improved by the avoiding the obstacle, and go through another way using advanced obstacle detection algorithm.

References

[1] T. A. Hemant, P. T. Hemant, and G. S. Hanumant, "Prototype of Autonomous Car Using Raspberry P," in *IJERECE*, vol. 5, no. 4, April 2018.

[2] B. C. Susmitha, K. K. Sharma, N. Pavithra, M. R. Nandini, M. C. Punyashree, "Automated Vehicle Driving using Image Processing," in *International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering*, vol. 5, no. 6, pp. 69-74, June 2017.

[3] C. S. More, S. Debbarma, N. Kandpal, and V. Singh, "Open CV Python Autonomous Car," in *International Research Journal of Engineering and Technology*, vol. 6, no. 1, pp. 595-597, Jan. 2019.

[4] P. I. Golabhavi and B. P. Harish, "Self-Driving Car Model using Raspberry Pi," in *International Journal of Engineering Research & Technology*, vol. 9, no. 2, pp.176-180, February 2020.

[5] Raspberry Pi 3 Model B+ https://static.raspberrypi.org/files/product-briefs/Raspberry-Pi-Model-Bplus-Product-Brief.pdf

[6] https://cdn.sparkfun.com/datasheets/Dev/RaspberryPi/RPiCamMod2.pdf