Development of a Prototype Self-Controlled Car Using Computer Vision and Machine Learning Technologies

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Abstract— The paper in the journal describes the creation of a prototype self-controlled car system that makes use of computer vision and machine learning. To record and analyze video data, the system makes use of a Raspberry Pi camera and the OpenCV framework. The system could find and follow things on the road using frame-by-frame analysis. The information gleaned from the detected items is then used by an Arduino Uno and a motor driver to independently control the vehicle's movement. The C++ programming language is used to implement the system, and it goes through an extensive amount of testing. Results show that, when compared to a human driver, the self-controlled automobile prototype performs with an increased level of accuracy, dependability, and activity.

Index Terms— Raspberry Pi, Arduino Uno, Open CV Frame work, Frame by Frame Analysis

1.INTRODUCTION

Smart-controlled vehicles Autonomous automobiles, often known as self-driving cars, can operate with little or no input from the driver. The ability to observe a completely autonomous vehicle in action has long been a goal of many people. "Self-driving car" has recently gained popularity in the technology world because of developments in artificial intelligence (AI) and computer power, and it has an excellent future. Various automakers, including BMW, Bosch, and tech behemoths, like Tesla, NVIDIA, Qualcomm, and way so (formerly Google's self-driving car project), began investing in self-driving cars.

Why then all the hype? Why do we need autonomous vehicles?
The fact that accidents and fatalities happen every day shows that most of the time, human error is to blame. Self-driving cars have a lower mistake rate than other vehicles since they are machines, which lowers the risk of accidents. The easy and cozy way of living is another factor, in my opinion. Consider getting in your car and being driven home as you relax after a long day at the workplace. I see, nice! When a crucial distance approaches, the motorist will receive a warning to regulate speed and slow down. The system is meant to avoid crashes brought on by distracted driving, drunk driving, seat belt violations, and other factors [1]-[2].
The creation of self-driving cars is a key development in transportation technology that aims to improve efficiency and safety on the road. This entry in the journal describes a prototype self-driving car system that combines computer vision and machine learning methods. By combining these technologies, the vehicle can autonomously observe and analyses its surroundings, come to wise conclusions, and carry out the actions that are required [3].

2.METHODOLOGY

System architecture and design:
The Raspberry Pi camera module, OpenCV library, Arduino Uno, and motor driver are a few of the essential parts of the prototype self-driving car system. An overview of the system's design and architecture is given in this part, along with a discussion of how each element contributes to autonomous navigation.

Video Data Capture and Analysis:
Video data is captured using the Raspberry Pi camera and then analyzed with the help of the OpenCV library. For video analysis, a variety of computer vision methods are used, such as object recognition, feature extraction, and picture preprocessing. The approaches used for video data acquisition and processing are presented in this part, along with examples of how well they work for finding and following moving objects on the road[4]-[5].

Object tracking and control:
The self-driving car system uses an Arduino Uno and a motor driver to control the vehicle's motions based on the

objects that are detected. To determine how to accelerate, decelerate, and steer, the system analyses the geographical and temporal data of the identified objects. The object tracking and control systems that have been put in place are discussed in this part, with an emphasis on how they help the vehicle follow things that have been spotted.

Implementation and testing:

C++ programming is used to create the prototype self-driving car system. The system's precision, reliability, and performance are rigorously tested in comparison to human drivers [6].

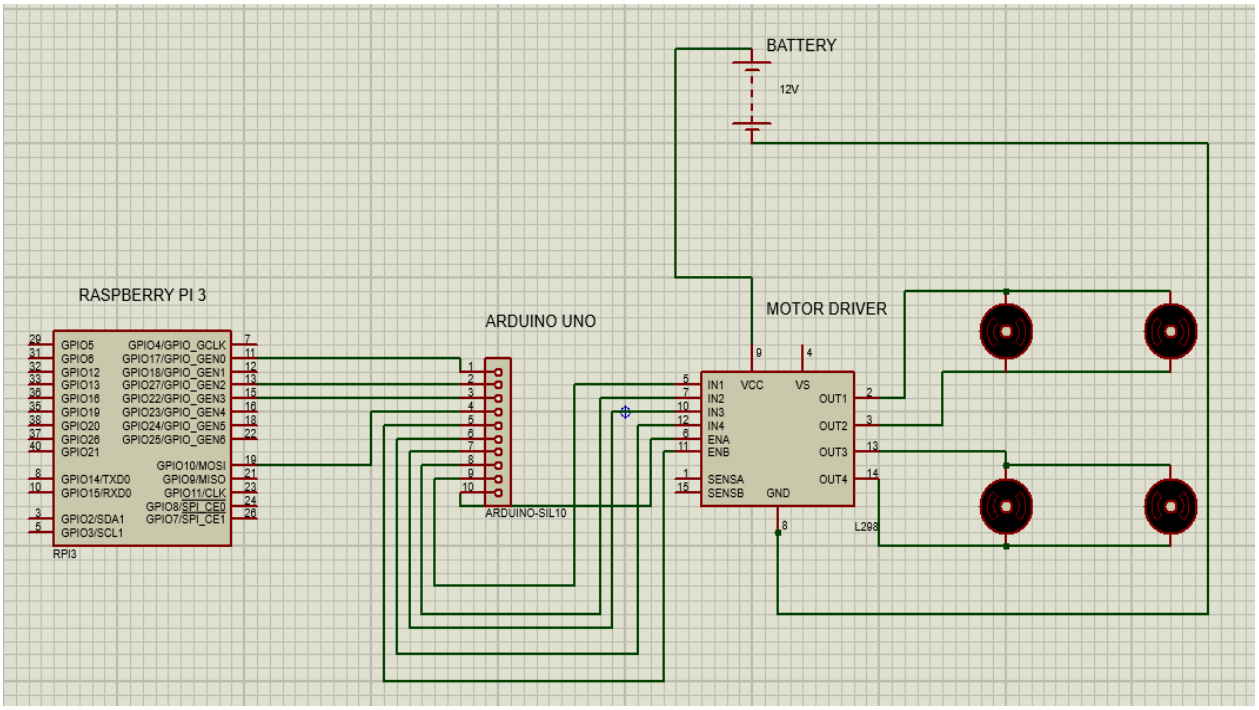

Figure: 1(Internal Circuit Diagram of Self Control Car)

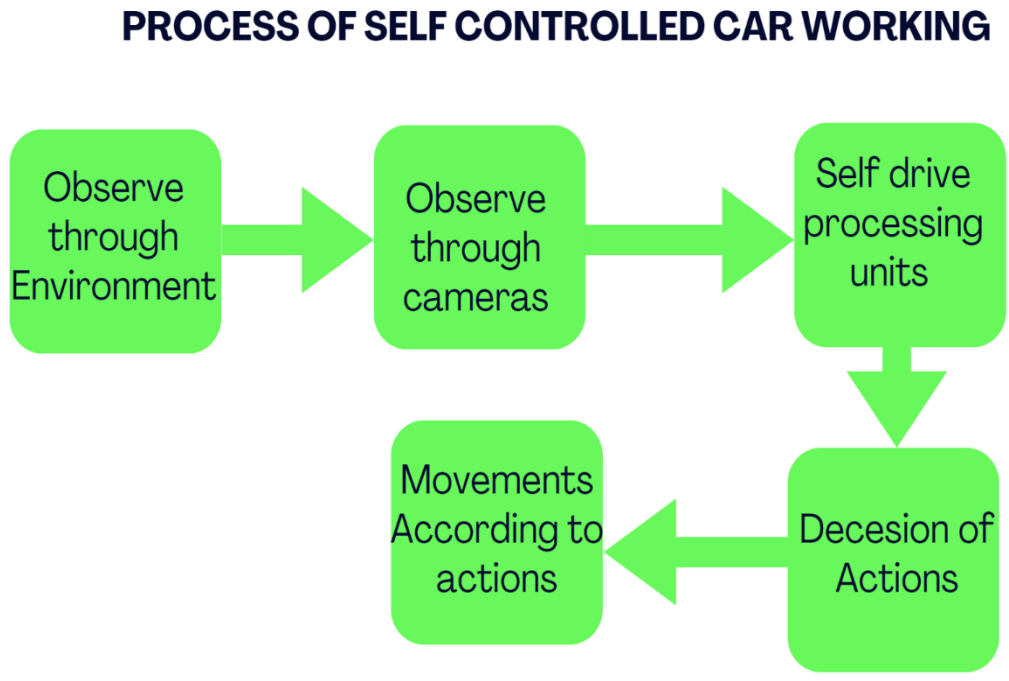

Figure 2: (Block Diagram of Self Control Car)

3.RESULTS

The testing findings show that, when compared to human drivers, the prototype self-driving car system performs at a high level of accuracy, reliability, and activity. The system reliably makes judgements and executes necessary movements while successfully detecting and tracking objects on the road.

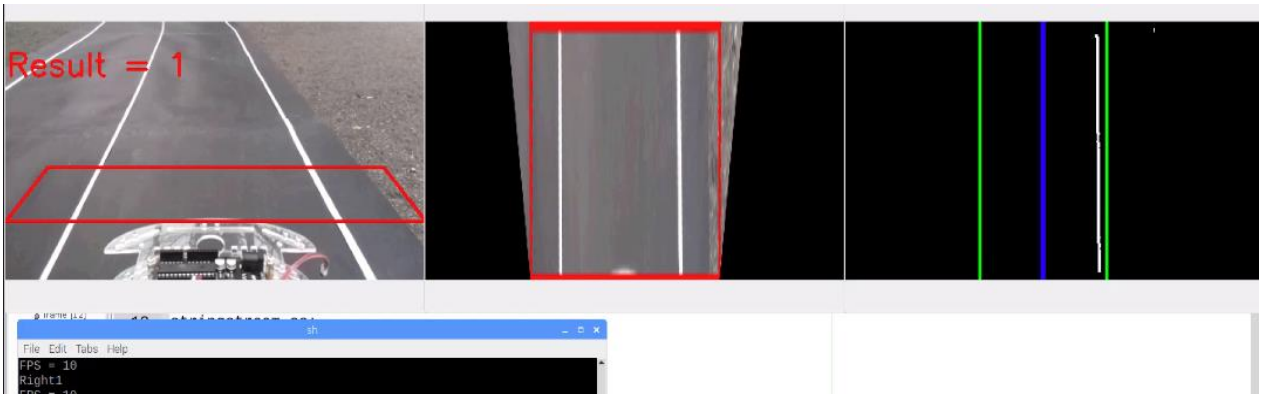

Figure1: - It indicates that the vehicle moved left because of 1 or positive result.

Figure2: - It indicates that the vehicle moved right because of -3 or negative result.

Figure3: - It indicates that the vehicle moved forward because of 0 result.

4.CONCLUSION

The paper in the journal describes the creation of a computer vision and machine learning-based prototype self-driving vehicle system. Details about the system's design, object tracking and control methods, video data processing, and implementation are described. The prototype has undergone extensive testing and has been shown to be very accurate, dependable, and useful when compared to human drivers. The results demonstrate the potential for

further development in the area and add to the continuous evolution of autonomous driving technology.

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