AUTONOMOUS CAR PROJECT

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PROBLEM

Autonomousvehicles, which are the indispensable technology of the future arising from the combination of artificial intelligence and automotive, have many features such as going to a certain lane, self parking, detecting objects and avoiding obstacles. However, these vehicles are not yet capable of changing lanes to detect and guide higher priority vehicles such as ambulances and fire trucks.

Ourproject aims to detect vehicles with higher priority in traffic with various sensors and cameras mounted on autonomous vehicles and to recognize the emergency vehicle and clean its roads, thereby minimizing the losses caused by traffic density in emergency

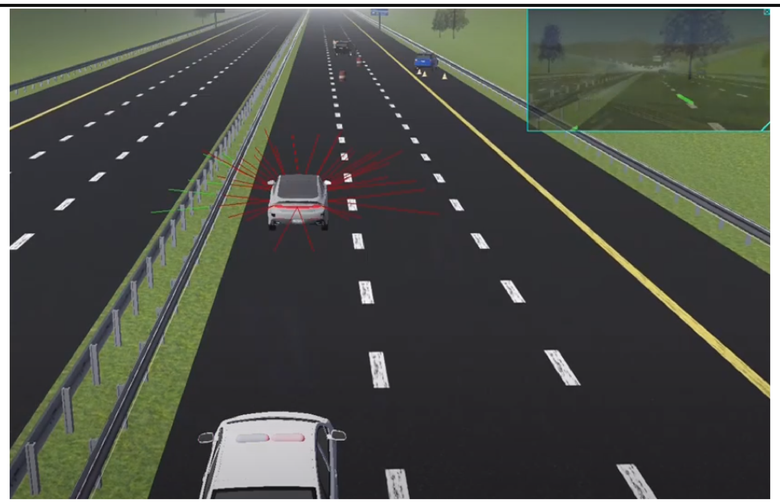

Figure 1
Finished Product

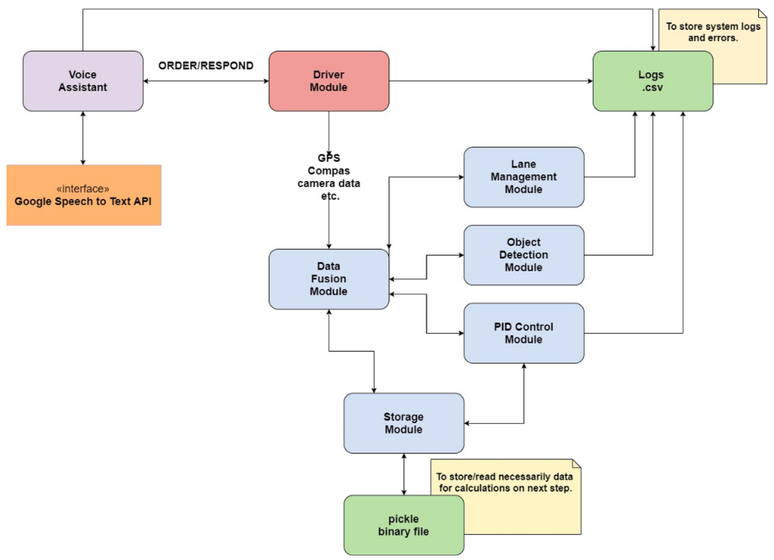

Figure 2
System Architecture

SOLUTION

Our project performs functions such as detecting vehicles with higher priority in traffic and recognizing the emergency vehicle and cleaning its roads with various sensors and cameras mounted on autonomous vehicles. This software was developed with libraries for autonomous cars in Webots Simulator and Python. The Autonomous Vehicle Driver Simulators we use have developed the software that we have made by simulating LIDAR, GPS, radar, and providing potential sensor outputs with these outputs and trying out possible traffic scenarios. We used Image Processing- Hougs Probabilistic Line for line detection. We used the Ziegler-Nichols method for the PID Controller. We applied the Momentum Balance formula to apply the speed changes of our vehicle. Our autonomous car has Voice Assistant, which uses the Google Speech to Text API. We start communicating with the voice assistant by saying 'Jarvis'. Jarvis runs the commands of 'speed of the car', speed up/down, change lane, exit.

For calculating the momentum balance formula:

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m*(dv(t)/dt)=Fp*u(t)-(1/2)ρ*A*Cd*v(t)^2
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Ziegler-Nichols Formula for PID :

Control Type	K_P	T_i	T_d	$K_I = K_P/T_i$	$K_D = T_d K_P$
PID (classic)	$0.6\ K_U$	$T_U/2$	$T_U/8$	$1.2K_U/T_U$	$0.075\ K_U T_U$

ACKNOWLEDGEMENT

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INTRODUCTION

Emergency vehicle priority is an important issue in the traffic. If we clear the way for emergency vehicles as quickly as possible, we can increase the survival rate of the patients or people on the emergency situations. Our project aiming to add vehicle priority awareness feature to autonomous cars.There are no official researches by big companies on the same problem, but some engineers wrote blogs and articles about it. They offered wireless communication system between cars to be able to solve the problem. Inorder to solve this problem, we used cameras, audio sensors. Firstly, our cars checked all lanes if one right side is available it started driving from there to be able to balance the traffic on the all lanes with Image Data from the front camera. With audio sensor the vehicle recognized sirens and with back camera it checked if emergency vehicle is behind of the car and not on the opposite side of the road after emergency vehicle move away the car returned its previous lane.

Results & Conclusion

The simulated autonomous car that has been coded;

- can be able to detect emergency vehicles, their location and direction with the sensors and cameras which are mounted on it.
- When the autonomous car recognises the emergency vehicles, it will change the lane to clear the emergency vehicle's way.
- AutoCar have features such as lane detection and tracking, object recognition and automatic braking, voice assistant, and emergency vehicle priority awareness.

We realized all test scenarios to understand that our system is working as intended. We kept processing time while executing test cases. According to the test results, the Exit criteria were met.

We learned how to use many different algorithms in our project and how we can run them with each other. We aimed to make a positive contribution to the developing technology. We made a lot of information that we learned in our school period concrete and created a project. Our goal is to develop this project and adapt it to real life.