Autonomous Vehicle with automatic lane following

Antaruo Mama, Liam Soragham
Faculty Mentor: Dr Hassan Ferdowsi
Mechanical Engineering

NORTHERN ILLINOIS UNIVERSITY
College of Engineering and Engineering Technology

Abstract

The objective of this project is to design and produce a scaled vehicle that can automatically detect lanes, follow the lanes that are detected, and avoid obstacles impeding the vehicles path. The components of this vehicle included on the platforms allow the vehicle to perform as described above. These main components include an RPlidar, along with multiple cameras (Intel Realsense D435 and Intel Realsense T265) and finally the Nvidia Jetson Xavier. The RPlidar will be used to measure range by sending light in form of a laser while the two cameras are for vision. The D435 is used for RGB and depth sensing while the T265 is used for tracking. The Jetson Xavier is used as a mini-Linux computer that connects the programming to the connected sensors.

Introduction

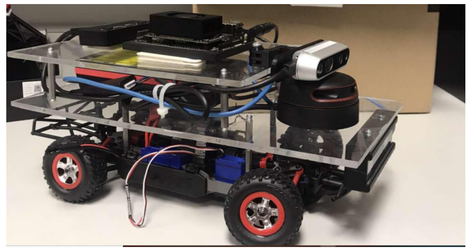
This project will focus on building an autonomous vehicle with automatic lane following, lane changing, and obstacle avoidance. The objective of the project is to make a small scale self-driving vehicle that uses several sensors to drive itself by avoiding any obstacles that can be encountered on the road. The motivation behind this project is to expand on previous research and studies of autonomous vehicles on a smaller scale with lower budget. With most existing autonomous vehicle being valued at high prices, Team 59's project will help future RC autonomous vehicles to be more cost efficient. The work done on a small-scale vehicle will create an opportunity to further the university's research on autonomous vehicle as well as transfer knowledge and technology to the automotive industry.

Methods and Materials

The method used to conduct this project is completed through the Jetson Xavier. The RPlidar will scan the area where the vehicle is by sending a red light that look like a laser, from this beam, the laser will reflect back giving the Xavier data of the surrounding. From this retrieved data, the program will calculate any obstacle ahead so it can avoid it. The two sensors are programed through the Jetson Xavier through VI and are useful in the lane detection and following of the vehicle. The program language used in this project is Python version 3.0.

Results

After the loss of a group member due to him dropping out of the university, Dr. Hassan Ferdowsi allowed us to use only the D435 and the T265 sensors due the increase in workload on the remaining members. With this change in in the project, Team 59 successfully used the Jetson Xavier to program both Intel Realsense cameras and write a feedback loop program that allowed these sensors to receive the intended data and give that data to the Jetson Xavier. With the known data constantly changing, the vehicle was able to move lanes and avoid obstacles .Below is what the hardware final product looks like.



Discussion

Team 59 began this semester with three members in the group, however due to unfortunate circumstances, a group member was lost I the middle of the second semester. With the team being short handed, the client Dr. Hassan Ferdowsi made modified the project by removing the use of the lidar on the vehicle. There fore, the sensors used will be the D435 and the T265. Finally, Dr. Hassan wanted us to primarily focus on the lane following.

Conclusions

While researching and developing new information on this project, Team 59 was able to expand on the project statement, background ideas, and purpose of the project, which is to create an autonomous vehicle that can change, follow the lane, detect obstacles in front of the car and on the side the car, and automatically change lanes

Acknowledgements

Team 59 would like to Acknowledge Ian Gilmour, Dr. Hassan Ferdowsi with all their support and time they dedicated to Team 59. Team 59 will also want to thank Dr. Peterson, Justina and all the senior design faculty members for their guidance throughout the semesters.