Universal Smart Car Kit

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Abstract:
In 2019, a study done by the National Highway Traffic Safety Administration concluded that 94% of the serious vehicle accidents that occurred in 2018 were due to human error. They believe that with the incorporation of autonomous vehicles in American society we can save the lives of the nearly 36,560 people that died in 2018 [1]. That is why the aim of this project was to advance, develop, and deploy autonomous vehicle components and instruments in an older vehicle to assist in the modernization and progress of the autonomous/smart vehicle. In this project, you will see that it is possible to implement these similar autonomous vehicle components into a 2002 Lexus IS300, which has very limited technology and resources. The significance of this study was to show that as we wait for a society filled with autonomous cars we can build and install kits into our very own personal cars to assist in a safer transportation experience. These kits consist of blind-spot monitoring, backup camera, and engine monitoring. Using a Raspberry Pi and a microcontroller we can implement all these features onto an interactive screen to display to the driver.

Background:
Smart car kits are available online from retailers such as Amazon.com. However these kits are often very expensive, difficult to integrate into an existing vehicle, and do not have all the features a user wants and needs for a safer driving experience.

Methods And Materials:
The smart car kit design incorporates two microcontrollers, one for managing the blind spot monitoring system and one for getting live data from the car’s Engine Control Unit, a Raspberry Pi that acts as the driver for the GUI and the entire system. It also contains a touchscreen for IO, a camera for the backup camera, a relay to trigger the backup camera, and two ultrasonic sensors used for blindspot detection.

The system works by communicating with the Engine Control Module using an ELM327 microcontroller and an OBD2 python library. The data is queried and output to the screen. The system is also checking if the car is in reverse by checking for voltage on the reverse light bulbs that were tapped into with the relay. Lastly the ultrasonic sensors are always checking if an object is within 6 feet of the vehicle, if so the microcontroller emits a signal telling the GUI to light up what side the vehicle is detected on.

Results:
The prototype is able to run a backup camera, blindspot monitoring system and live data module while outputting all of this to the user through a real time GUI.

Conclusion:
The Universal Smart Car Kit prototype works as designed and expected. It provides the driver with a fully functional backup camera, blindspot monitoring system, and live data from the car’s Engine Control Unit and a stylish GUI.

REFERENCES: