Design of a CAN Bus Module for the Analysis of Real-Time Data

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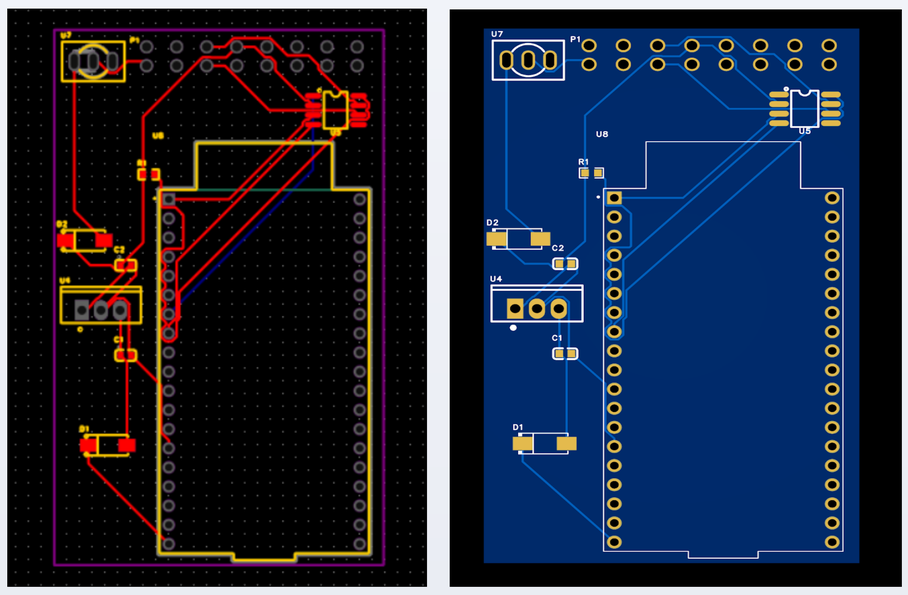
ABSTRACT

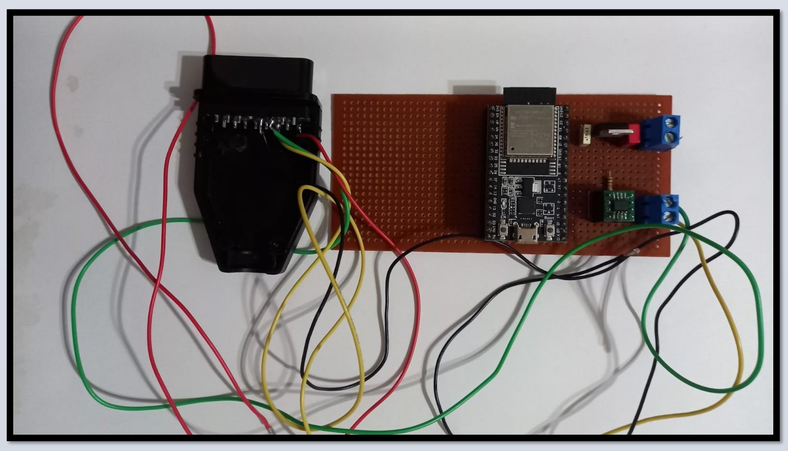


Developing a cost-effective CAN Bus module for the purpose of real-time and diagnostic is one interest of this project-an attempt to defy limitations associated with existing proprietary OBD-II diagnostic tools. Using an ESP32 microcontroller, CAN transceivers, and open-source software, the system retrieves diagnostic trouble codes and live sensor data via an OBD-II interface. A key part of the project is that this interfacing allows for such a web-based interface for neat and easy visualization of much live data speed, rpm, fuel consumption, etc., along with advanced filtering and search capabilities. The system was tested on a Toyota C-HR 2016 Hybrid for modern vehicle compatibility. It is a scalable and low-cost solution that can serve as a preliminary-level fleet management, predictive maintenance, and advanced vehicle diagnostics system all at once, cutting across high-priced proprietary tools and hobby-accessible technology.

OBJECTIVES

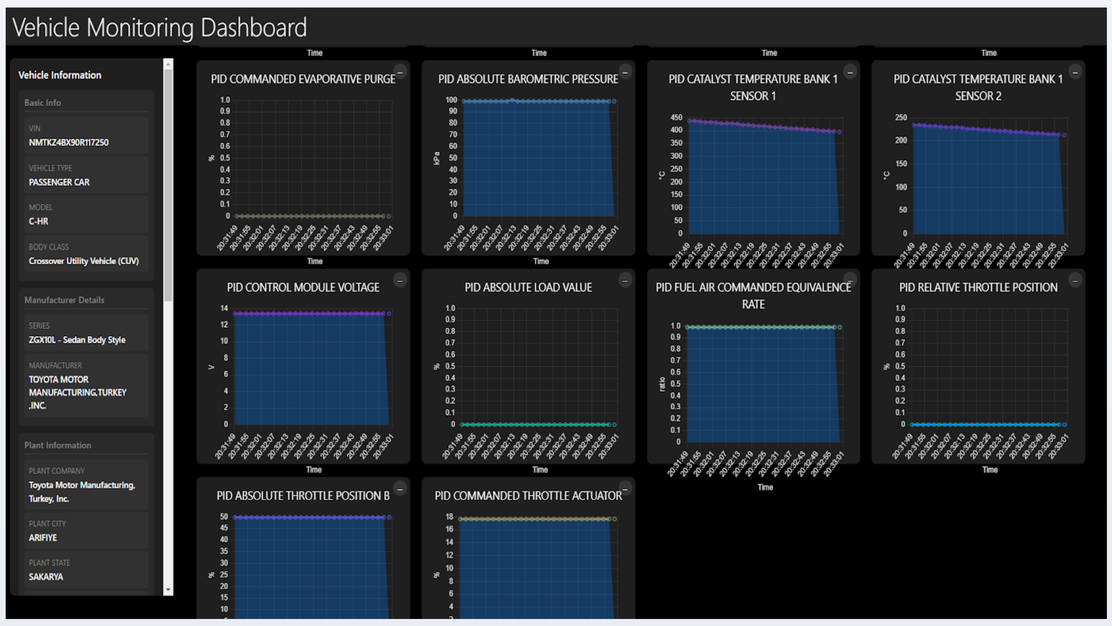
- Developed a system for real-time vehicle diagnostics using the CAN bus and OBD-II interface to retrieve fault codes and live sensor data efficiently.
- Integrated online monitoring features for fleet management, enabling centralized tracking and maintenance.
- Ensured compatibility with existing OBD-II standards and support multiple vehicle types for versatile usage.

PROJECT DETAILS



These are the major components necessary in the hardware design of the CAN Bus module, to ensure a reliable performance matching that of the modern-day vehicles. The ESP32-WROOM-32D microcontroller acts as a microcontroller, integration for real-time processing and web use through dual-core CPU, WiFi, and Bluetooth capabilities on the equipment. The SN65HVD230 CAN transceiver allows a high-speed connection between the microcontroller and the vehicle CAN as it performs the conversion of digital signals to differential CAN signals under ISO 11898-2. Overall, it derives stability in power by using an L7805 voltage regulator that uses the 12V input supply from the OBD-II port and generates 5V constant supply for the smooth operation of all components.

PROJECT DETAILS II



The OBD-II interface will be the physical interface that connects to the vehicle, following an ISO-compliant pin configuration to facilitate standardized diagnostics.

This data is streamed live into a very friendly web interface that serves to show parameters like RPM, speed, and fuel consumption. The interface has advanced filtering and searching functions that allow metrics to be isolated for analysis. This web-based dashboard is accessible on both desktop and mobile devices for flexibility and usability.

The system was tested on a Toyota C-HR 2016 Hybrid to evaluate how well it would work with real-world automotive systems and performance associated with it.

CONCLUSIONS

This module developed under the project is for CAN Bus dedicated to real-time vehicle diagnostics, and this module has been developed in a manner that is very cost effective, scalable, and innovative in delivering real-time vehicle diagnostics. This is a system that interfaces between proprietary, today used diagnostic tools, and affordable more flexible alternatives by enabling open-source tools and cheap hardware. This direct punch will deliver key characteristics such as live streaming data of primary parameters like speed, RPM, and fuel consumption, all captured through an intuitive and interactive web interface. This way, users can closely track the performance of their vehicles, thus making linking it to individual involved users, as well as somewhat applicable for fleet usage.

Although testing was limited to a single vehicle, this project has satisfactorily validated compliance with the standards of OBD-II, which promises a wider potential vision of application.

REFERENCES

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