Integrated On-Board Diagnostic-II and Direct Controller Area Network Access for Vehicle Monitoring System

Authors : Kavian Khosravinia, Mohd Khair Hassan, Ribhan Zafira Abdul Rahman, Syed Abdul Rahman Al-Haddad

Abstract : The CAN (controller area network) bus is introduced as a multi-master, message broadcast system. The messages sent on the CAN are used to communicate state information, referred as a signal between different ECUs, which provides data consistency in every node of the system. OBD-II Dongles that are based on request and response method is the wide-spread solution for extracting sensor data from cars among researchers. Unfortunately, most of the past researches do not consider resolution and quantity of their input data extracted through OBD-II technology. The maximum feasible scan rate is only 9 queries per second which provide 8 data points per second with using ELM327 as well-known OBD-II dongle. This study aims to develop and design a programmable, and latency-sensitive vehicle data acquisition system that improves the modularity and flexibility to extract exact, trustworthy, and fresh car sensor data with higher frequency rates. Furthermore, the researcher must break apart, thoroughly inspect, and observe the internal network of the vehicle, which may cause severe damages to the expensive ECUs of the vehicle due to intrinsic vulnerabilities of the CAN bus during initial research. Desired sensors data were collected from various vehicles utilizing Raspberry Pi3 as computing and processing unit with using OBD (request-response) and direct CAN method at the same time. Two types of data were collected for this study. The first, CAN bus frame data that illustrates data collected for each line of hex data sent from an ECU and the second type is the OBD data that represents some limited data that is requested from ECU under standard condition. The proposed system is reconfigurable, human-readable and multi-task telematics device that can be fitted into any vehicle with minimum effort and minimum time lag in the data extraction process. The standard operational procedure experimental vehicle network test bench is developed and can be used for future vehicle network testing experiment.

Keywords : CAN bus, OBD-II, vehicle data acquisition, connected cars, telemetry, Raspberry Pi3
Conference Title : ICSAE 2019 : International Conference on Sustainable Automotive Engineering
Conference Location : London, United Kingdom
Conference Dates : April 24-25, 2019