ON BOARD DIAGNOSTICS (OBD): A DTC (Diagnostic Trouble Code) Study

Prachi Yadav[1], Mr. Peeyush Kumar Pathak[2]
Department of Computer Science & Engineering
Goel Institute Of Technology & Management, Uttar Pradesh
prachiyadav7500k@gmail.com

Abstract: The performance of road vehicles is continuously assessed by body parameters (temperature, air flow, rotation rate); those measurements are detected by electronic sensors and are notified, through the internal vehicle communication system, to the Central Control Department for further processing. In this paper we present our options for monitoring critical vehicle performance and briefly describe the sensors used to recover these parameter values. Prices are issued via the OBD-II diagnostics protocol and are related to vehicle performance and fuel consumption. As evidenced by the concept, a focused test has taken place, with a distance of 5 km with low and heavy traffic. Values obtained for OBD-II scanner were presented and discussed. According to the experiment, the green prices and calculated costs associated with fuel consumption are compared with the manufacturer's standards and user behavior is identified as the most important factor influencing fuel consumption in a particular model.

Keywords: OBD: On Board Diagnostics DTC: Diagnostic Trouble Code ECU: Engine Control Unit, SAE: Society of Automotive Engineers MIL: Malfunction Indicator Lamp PID: Parameter Identification, DLC: Data Link Connector

1. INTRODUCTION:

The OBD-II port (see Figure 1) is commonly located at the foot of the driver's side of the vehicle and has been approved for new vehicles in the United States since 1996 (OTAQ, 1996). The OBD-II standard itself defines the recognition of electronic messages and messages, in particular the Test Problem Codes (SAE Standard, 2002). The OBD-II was designed to be used as a standard vehicle for any manufacturer in collaboration with private repair shops and retailers to assess emission levels. Car manufacturers have seen, however, that the port could be upgraded to provide a richer set of repair shop data.

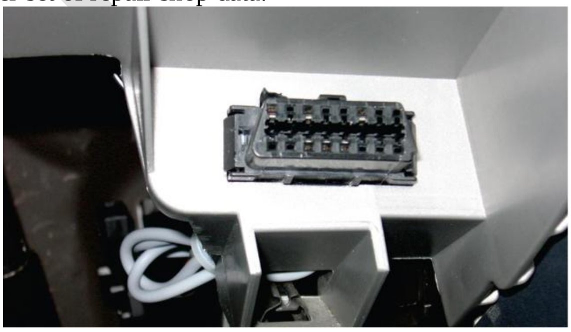

Figure:1

The OBD-II is a 16-pin connector, although only 9 pins are authorized by itself (see Table 1). Many vehicles include additional communications, such as the General Motors LAN or the Chrysler CCD (Chrysler Collision Detection) Bus. This additional connection provides connection to the back of other buses within the car itself. They are used to sell, for example, upgrade software to ECUs, perform additional tests, or solve problems directly related to automotive and model applications.

2. Our Objective:

Now a days to handle problems related to home appliances or else moving vehicles very easy with the enhanced technology. IOT is mirror to the world to get advance and innovative world created with this technology. OBD is the technology that is used for diagnosis of vehicles that decreases work of a mechanic and provides easy handling of vehicles.

With OBD every vehicle company facilitating error code detection to monitor our vehicles. Everyone want to go with technology that's why engineers are trying to provide such a world where everything can be possible with computational devices or we can say a new automated world made with such technologies. OBD is going to provide very easy diagnosis of vehicles which is definitely decrease human efforts for mechanical problems related to vehicle and it is also good for mechanic to diagnose the vehicle and get repair easily and surely it will save time for mechanic and owner of vehicle.

3. Motivation

Today world is growing very fast everyday new inventions are made by scientists and engineers; new techniques and technologies find for the growth of world and making life easy to survive in this world. Why not make work so easy that human efforts can be decrease? With this statement engineers are really trying to make everything easy and possible in this world.

We have seen nothing is impossible in this world only a approach and thinking is required to get the idea of changing the world this is the reason that today the world is growing very rapid and it is possible only with the enhancement of technologies.

4. Problem Statement

The Previously diagnosis of vehicle was very worst and time taking that really takes a long process to diagnose the vehicle manually every section of vehicle is diagnosed many times after that real problem was found but now this time no need to waste time and hard work to diagnose the vehicle; rather it is very easy to diagnose the vehicle with the help of OBD. Therefore, it is very much required to ease the work of mechanic and owner of vehicles.

5. Related Work

Monitoring the performance of a car engine has long attracted researchers who were interested in effective monitoring, understanding and improving their use. Gilman introduced a driving assistance program called Driving Coach that looks at specific parameters to help increase fuel efficiency depending on driving style [2]. USzalay et al. mimicked two scanning methods (CANBus and FMS CANBus) that allowed third party access and found that the measurements were almost identical [3].

Kushiro et al. data monitored by OBD and transmitted to the telematics center via a mobile network. This data is used for the prognostics model (in python), as it is built on the connection between error codes (warnings / warnings from sensors in the car), to prevent possible deterioration of objects [4]. Sik compared OBD and CAN sample travel with the Sensor HUB Framework and using GPS made predictive model helps drivers with their route recommendations (avoid traffic jams, find empty parking) [5]. D'Agostino used OBD data to make the standard car development model hybrid. Therefore, by operating in pure electric mode or hybrid mode (depending on which gear you work), the kit can help achieve 18% -22% fuel savings and CO2 emissions [6]. While interest in remote monitoring and control is growing, we expect that this will gradually be used to fund new real-time value-sharing services in cloud facilities for effective monitoring, logging and pattern extraction [7].

In our work we have used established methods and procedures and third-party tools (excluding shelves) to extract the sensor values of the CAN (Controlled Area Network) using the OBD-II protocol. Similarly we have continued with the validation of prices and their effectiveness in calculating more complex parameters. In the past our research team has investigated part of the new energy harvesting methods to support auxiliary vehicle modules [8].

6. Parameters Selection:

An important decision of our research work was the selection of the parameters to be considered. A rich portfolio of parameters can be considered during the operation of a car engine. Our selection is based on the importance of these parameters as they relate to their integration with key combining parameters (including use), the consequences of their inefficiency and the potential for their discovery of CANBus and subsequent translation of the OBD-II protocol. Next, the selected return parameters are displayed and the reasons for their selection.

The oxygen level in the finished gases as measured by the Lambda Sensor. The Lambda sensor (λ) returns the ratio of stoichiometric Air - fuel (14.7: 1 for petrol engines with the correct value of 1 fire). The signal is sent to the ECU (Electronic Control Unit). Air and fuel ratio affect horse performance and efficiency, emissions (Nitrogen Oxides, Carbon Monoxide) and its use. The use of the appropriate scale prevents drilling and knocking of the engine, while supporting the converter time.

Fuel price adjustment as measured by Short-Term Fuel Trim (STFT) sensor. When the driver presses the accelerator pedal, the airflow of the engine is changed. The fuel injection is then controlled by the ECU. Sensors are used to measure air flow and send the right pulse to the center wing, to match air flow by adjusting (increasing or decreasing) the amount of fuel and maintaining a stoichiometric measure. This adjustment is called Fuel Trim. The Short Term Fuel Trim (STFT) is related to the rapid changes in fuel flow that occur several times per second, while the Long Term Fuel Trim (LTFT) also includes the most common changes over time.

Air flow as measured by Mass Air Flow Sensor (MAF). MAF measures air flow rate in an engine and is included between the air filter and feed duplication. There are two types of MAF sensors: a hot wire sensor, in which the wire is electrically heated. When the airflow passes, it gets cold and a small stream is needed to keep it warm. This current is equal to the air flow and is sent as a pulse to the ECU. A cold phone sensor, with the same purpose as a hot wire but with the addition of a cold wire that measures the surrounding air as a reference point. Thereafter the temperature of the two wires can be compared. MAF's malfunctioning sensor can cause problems in the engine unit such as: Rich running idle, fuel efficiency, suspension and inactivity.

Vehicle Speed Sensor (VSS). VSS is responsible for speed calculations and is usually placed in a gearbox release trap. Speed is usually measured using the Hall output sensor, which uses the reference power from the PCM (Powertrain Control Module) to generate DC power in the ECU. The speed of the car is the key parameter as seen by the driver and will try to be integrated with its use. The temperature of the engine coolant as measured by the Engine Temperature Cooling Sensor (ECT). PCM detects this signal and activates other features (such as the engine cooling fan to maintain the correct temperature). PCM uses a variety of techniques arranged in its viewing tables for hot and cold operating conditions. This signal affects the flow of the EGR valve (Exhaust Gas Recirculation), improves fuel combinations, and torque converter delays or A / C compressor engagement. Excessive resistance in the connector anywhere in the circuit can convert the signal to PCM, increase the injector pulse width and extend the engine temperature time. When the engine reaches a working temperature the cooling sensor allows a lambda sensor. Cooling temperature affects engine temperature, affects its health, and fuel consumption.

7. System Architecture

The proposed system is able to collect, store, and long-term vehicle data analysis. Raspberry Pi pulls car data using OBD-II scanner on Bluetooth interface. Collected data is then processed and sent to cloud servers (such as azure,aws, thingspeak, etc.) using Internet connection. To drag data to the cloud server for performing calculation statistics the state of the engine, we find the error coming from something the part of the car that touches the car. And all of these diagnostic parameters are real indicators of the unpopularity of taxpayers we see on mobile application. The system performs two major roles throughout the diagnosis-

1-Receiving data from OBD-II adapter (ELM327) – the

OBD-II adapter is connected to the vehicle's DCL. Another side Raspberry Pi Nano Bluetooth Dongle connected on raspberry pi and connect Raspberry pi with OBD-II via Bluetooth and car communication using OBD2 parameter IDs (PIDs). Each PID provides for sure vehicle details, eg, speed, engine rpm, fuel consumption, and error codes. The details obtained are as follows sent to a cloud server.

2- Monitor Vehicle- A virtual reality unsupported mobile the application contains a Complex Event Processor (CEP). Processing complex events can be considered a service finds and resembles low-level and productive events high-profile events in real time. In this application, it pulls Vehicle diagnostic data stored on cloud servers. CEP has the ability to detect relevant events in incoming data streams according to a predefined set questions. For example, questions will be added to warn the driver, because the car is needed to operate or no. It also provides driver safety protection. It will provides the Engine Cooling Temperature parameters, Engine calculated load, Engine oil temperature, Fuel pressure, Engine RPM, car speed, car battery

8. Vehicle Diagnosis

System monitoring parameters used for diagnostics maintenance vehicle.

My parameters are as follows:

1. Cooling Engine: Cooling temperature approx. nationality from OBD2 adapter from time to time and transmitted to CEP engine in mobile application found temperature readings were measured more than two times of minutes using the time window. If the estimated value is greater than the given temperature limit (use 104 ° C). The driver was immediately notified about possible heat.

2. Engine Oil Temperature: Engine oil temperature can obtained using OBD2 Mode 01 PID 5C If oil the temperature is very low while the engine rpm boosts production water and Sulfur as products from the fire system can build up acids and damage the engine heads. The system generates a warning, if the engine oil ,the temperature is not in the working range you want. When the engine rpm ratio is greater than a certain the limit. As the operating range and rpm limit it varies from car to car that is adjustable inside application with a standard rpm time window.

3. Fuel Consumption: Mathematical equations were used to calculate certain parameters:

4. Fuel Economy: The fuel rate, beside the speed can be used to calculate the fuel economy. for a certain time duration, the average fuel rate and the average speed are calculated.

5. Vehicle Battery Voltage: Battery voltage will be retrieved from the OBD2 adapter using the AT commands

6. Engine Load Monitor: Load is a vital issue for the vehicle operation. Once the automotive isn't fast, engine loading comes from forces are acting against the motion of the engine.

9. Conclusion

In this work we have selected and returned the values of key parameters related to the operation of road vehicles. Depending on the equipment and tools used, the work progressed without seamlessly ensuring the integration of the basic vehicle platform with the student and the OBD-II software. This is also confirmed when the parameter (speed and load) is detected in vivo and verified by the car parts, as found in the driver.

During our testing, we returned the set parameters and processed them. The results were consistent and the diagnostic rules and hardware and software were operational as expected. Combined parameters are calculated, including load and fuel consumption.

Fuel consumption statistics are aligned with manufacturer's expected prices. It has been proven that driving behavior affects consumption, as random start and stop runs on high fuel consumption and normal driving without strong acceleration - slowing down gives a solid gas consumption. The aggressive driving style that creates unpredictable changes in engine load is the biggest factor leading to increased use. Low consumption has emerged at higher speeds in anticipation of higher fuel consumption. It has also been shown that cars are more fuel efficient when traveling at high speed. Systematic vehicle management. As the OBD-II standard is becoming mandatory not only in the U.S. and EU countries but in many other countries as well, especially in Asia, the vehicle self-diagnosis system is expected to have much greater marketability in the future. The applicability of the vehicle self-diagnosis system will have to be improved in the future, however, to satisfy more diverse environments, by developing App Store applications for all smart phones and by promoting the mobile-contents market.

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