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Designing On-Board Vehicle Diagnosis Fault Monitoring System Using IOT

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Abstract
Architecture of the IOT Software Framework and IOT-based technology on-board diagnostics system (OBD).The driver also has a user interface to pick from the chart, so that users can interpret some sensor values. Included in the device settings are the identification of function faults, warning of abrupt driver modifications and description of the cause for the malfunction. The device setup involves the detection of faults in parameters, warning of abrupt driver shifts and the cause of the crash.

Keywords: On-Board Diagnostic System (OBD), IOT Prototype Platform

1. INTRODUCTION

IOT technology has now put the cars at the center of the whole digital devices network, presenting consumers with several benefits, including improved performance and reliability, more detailed customer interface and a wider product selection. The OBD present in vehicles for the purposes of monitoring, sensing and analysis and predicting various faults related to the vehicle is such an application. Their use to analyze the Vehicle efficiency is particularly important. OBDs consist of an electronic unit (ECU) array fitted with many sensors covering the vehicle. Depending on the control parameter, the type of sensors will differ. The regulation of engine temperature, headlight, fuel pressure etc. are among the parameters. The first to implement OBD was Bavarian Motor Works (BMW).On the dashboard panel they placed the check engine button. Previously, it was designed to monitor emissions, but later all vehicle manufacturers were obliged to implement OBD in their automobiles.

2. Objective

- The project's main goal is to develop a diagnostic wireless vehicle.
- The main purpose of this system is to monitor parameters of different sensors and locations of fault and give cloud or other surveillance device feedback. So user can easily understand the fault reason and also can solve easily.
- Capable of control the engine temperature, pressure check, control of the exhaust gas's harmful content, control of the accelerator, control of the vibration of the chassis, open window, closer control, etc.

3. Methodology

The project has mostly been built with an IOT system that makes the system smarter and more effective than the previous project version

- Replacing the Automotive IOT diagnostic tool kit gives less time for updating ECU data and

Wi-Fi can be used in networking other vehicle areas.

- The vehicle diagnostic technique is proposed different from the OBD systems already in place. As mentioned above, a scan-tool, technologist and service centers are not required for this program.
- This is in keeping with the server-client architecture. The vehicle's various parts are connected with several ECUs, and sensors for monitoring will be attached to these ECUs.
- All ECUs are connected to the server and ECU values are collected. Any parameter value can be viewed on a mobile phone in real time.
- The driver thus knows the vehicle's state and results. With optimum maximum and minimum values of each parameter, the proposed device should be preloaded. The indicator displays the device anomalous sign.

4. Block Diagram

The block scheme of the system, System hardware is made up of an Ethernet gateway vehicle diagnostic system. As Figure 1 shows, the devices can send acquisition information and control commands to the gateway, connected to the sensors and actuators, to monitor the field environment in realtime.

5. HARDWARE AND SOFTWARECOMPONENTS

Hardwarerequirements

LM35 Sensors:

The LM35 is an integrated circuit sensor that can be used in the electric output temperature (in degrees Celsius) measurement process. In comparison with a thermostat, the LM35 temperature sensor measures temperature better. The circuit of the sensor is screened and not oxidized, etc. The LM35 produces higher than thermocouples output voltage and cannot need an improved output voltage. The voltage is commensurate with the temperature of Celsius. The LM35 size factor is 0.1 V / C and it is supplied with just 60 micro amps and has a low auto heating capacity. The Auto-heating sensor induces an improvement in still air of less than 0.1C.

Brake Pedal Sensors

- Non-contact travel measurement.
- Optional redundancy.
- 5V supply (optional12V).
- Analog or PWM Output.

Voltage Sensors:

Many transducers can convert different conditions to different electrical quantities. Photocells adapt a varying resistance to the amount of light that falls on them versatile sensors that adjust the resistance as they bow force sensitivity (FSRs) that modify the resistance depending on a changeable pressure exerted on the region on the sensor. To read these changeable resistors, place them in a circuit and pass a current through them to see the resulting change in voltage. On this circuit there are some variations. The most simple is the divider of tension. The voltage of both resistors at the input of the microcontroller is proportional to the resistor ratio. If the input voltage is similar, that is half the overall voltage. The value of the fixed resistor will generally complement the range of the variable resistor. You might select a ten-kilometer fixed resistor if you have a variable resistor of 10-20kilo-ohms.

MEMS Pressure Sensors:

The MEMS Pressure Sensor is an absolute, ultra-compact piezo pressure sensor. This consists of a monolithic sensing device and an IC interface that takes data from the sensing element and provides the outside world with a digital signal.

MEMS Accelerometer Sensors:

The module is comprised of a thin, 3D MEMS accelerometer with incredibly low noise from

analog devices – the ADXL335. A full sensor area of ±3 g is available. The sensor works on a power range of between 1.8V and 3.6VDC (optimal 3.3V) and usually only takes up 350μA of current, which is due to its gravity in inclination-sensing applications and also dynamic acceleration resulting from the movement, shock, or vibrating. A 3.3V onboard control system however makes it a great way to interface with 5V microcontrollers like the Arduino.

Level Sensor

- Sensors emit a pulse of ultra-sonic sound of 40 kHz that travels through the air until it hits an object.
- When pulse of sound hits an object it gets reflected back.
- It measures the time taken to strike an object.
- Transmitting Transducer usedMAX3232
- Receiving transducer usedLM324
- Distance Measurement:
- 5v signal is sent to trig pin for 10microseconds.
- When module receives this signal, it will emit 8pulses at frequency 40 kHz.
- Waits and listens at receiving transducer
- If object is within the range then 8 pulses will be reflected back.
- Once sound signal is received in echo, it is converted back to electrical signal and measured.

Liquid Crystal Display:

Liquid crystal display in the embedded system is very important. The user has a high degree of flexibility, because the required data can be displayed there. Yet others struggle because of the lack of appropriate LCD interfaces. Many people think that LCD interface is a complex task, but I believe LCD interface is very simple task. This section is meant to support the enthusiast design understanding LCD with. The technique of copying and pasting may fail if an embedded system engineer wants the use of LCD interfaces in real world projects.

Arduino Uno:

Arduino Uno is an 8-bit ATmega328P microcontroller microcontroller board. Together with ATmega328P there are many modules for microcontroller support, such as a crystal oscillator, serial communication, voltage regulation, etc. There are 14 digital input / output pins (6 can be used as PWM output), 6 analog ingoing pins, USB connection, a power barrel jack, an ICSP header and a reset button on Arduino Uno. Arduino is a device and hardware-friendly open source electronics network. Inputs can be interpreted on the Arducino boards – sensor illumination, button finger or notification for a Tweet – and converted into production – triggering an engine, clicking on an LED and publishing online stuff. Through submitting instructions on the board to the microcontroller, you will say the board what you can do. You use the programming language Arduino (based on wiring) and the processing-based software Arduino (IDE).

LDR Sensor:

An LDR is a part with a (variable) resistance that varies by the light intensity. It can be seen in the process of light detection. The most apparent use for an LDR is when a light is automatically set up at a certain amount of illumination. A street light or garden light may demonstrate this.

ESP8266:

ESP8266 is a cheap Wi-Fi module belonging to the families of ESP that you can use in everywhere in the world to manage electronics projects. It has a built-in microcontroller and a 1 MB flash to link to a wireless Internet network. The Wi-Fi module is connected to a TCP / IP protocol stack. The maximum voltage is 3.3v, so that 5v cannot be provided as the module is brushed.

Basically, the ESP8266 WIFI module is a robust WIFI system, featuring a TCP / IP built-in

protocol stack that can be linked directly to the Microcontroller for Wi-Fi connectivity. This module can be used as a stand-alone tool for any microcontroller, like a peak Arduino. You can simply upload the program to this Wi-Fi module and use it to sent data to a web server or received HTTP requests for this module to connect it to any Wi-Fi internet network express if Systems' high efficiency ESCP (Smart Connectivity Platform) wireless SOC offers unprecedented Wi-Fi features for makers of network applications in certain systems, at the lowest cost and best flexibility. ESP8266 host the program and Arduino's official applications render code building too simple to get wet with the learning method for an average citizen who has no prior technological know-how it comes with built-in functions and commands which play a crucial role in debugging, editing and environmental code compilation. So simple to assemble so that only a average citizen with no prior experience will get the learning cycle to wet their feet. This can conveniently be made usable for MAC Windows, Ubuntu and on the Java platform, with built-in functions and commands which are essential to scripting, editing and environmental application compilation. This is the only application processor that can boot from an external flash directly on the device. This has developed a cache to optimize device efficiency and reduce memory needs for these applications.

SOFTWARE REQUIREMENTS

IOT Technology: Depending on what the user wants to do, an IoT application requires some basic components:

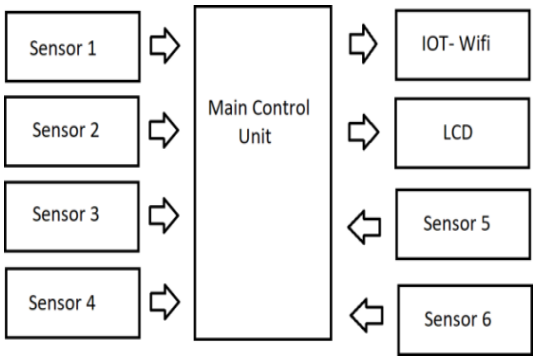
- Data-building devices or something control.
- Hardware (e.g. Arduino Sketch) behavior defining software; and cloud application for data storation or equipment remote monitoring.
- Usually, you need to program Arduino boards to enter code via Arduino Sketch. The Arduino IoT Cloud produces a Sketch as you set up a new object easily and automatically: this is one of their benefit.

Arduino IDE:
Arduino IDE is open source software used primarily in the Arduino module for writing and compiling code. It is the official Arduino software which makes code compilation too easy to make learning processes wet even for a person without technical knowledge. It comes with built-in functions and commands which play a crucial role in debugging, editing and environmental code compilation. So simple to assemble so that only a average citizen with no prior experience will get the learning cycle to wet their feet. This can conveniently be made usable for MAC Windows, Ubuntu, and on the Java platform, with built-in functions and commands which are essential to scripting, editing and environmental application compilation.

Embedded C:
Embedded C is probably the most common language for Embedded Systems programming. Some common languages such as Assembly, BASIC, C++ etc. are used commonly for designing Embedded systems but Embedded C is still common because of its performance, less time for implementation and portability.

6. Flowcharts

Fig 1: Block diagram of the system hardware



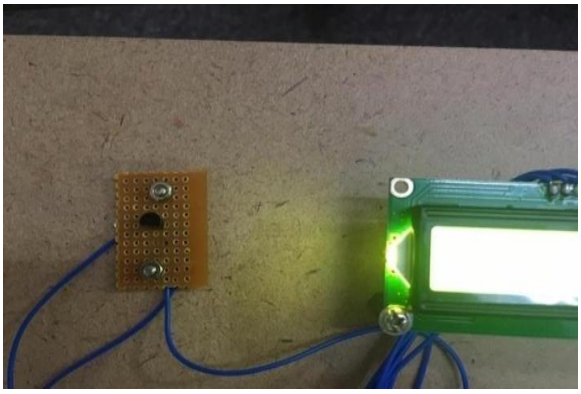


Fig 2. Flowchart

Reading and showing the value of temperature

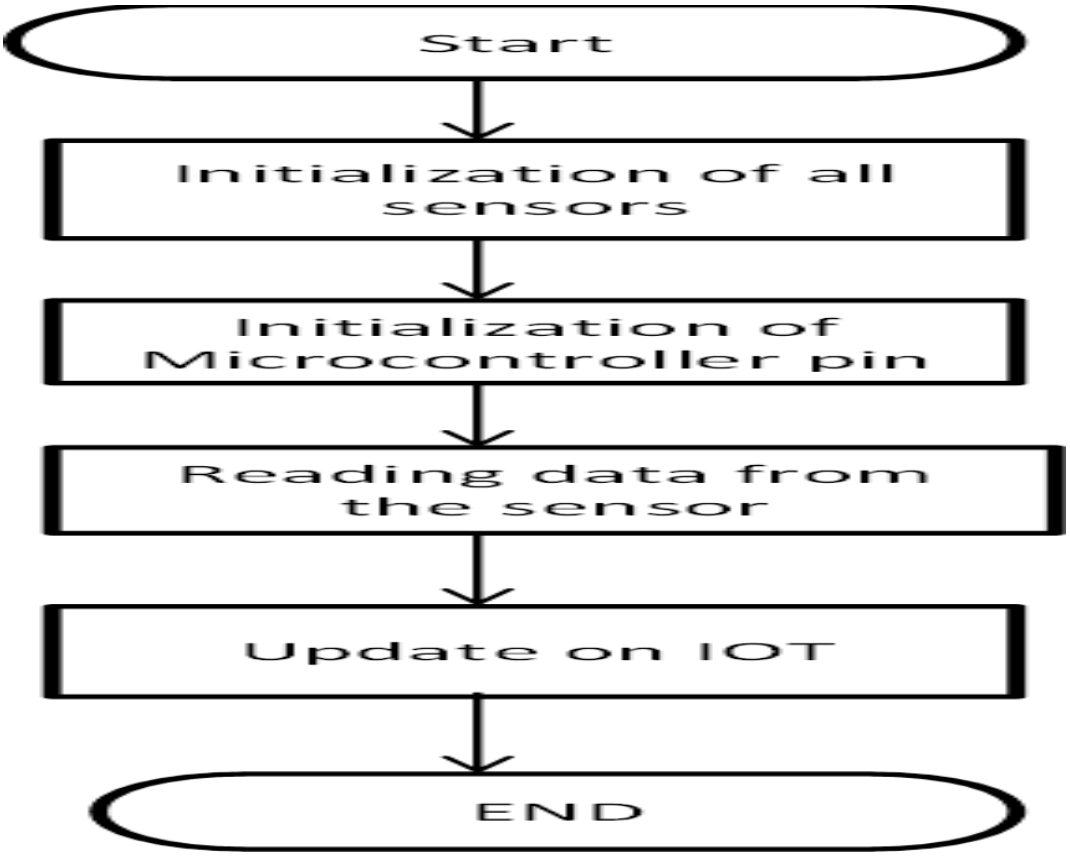


Fig 3: Working of Temperature sensor

Level sensor and distance sensor
Fig 4: Level Sensor and Distance Sensor

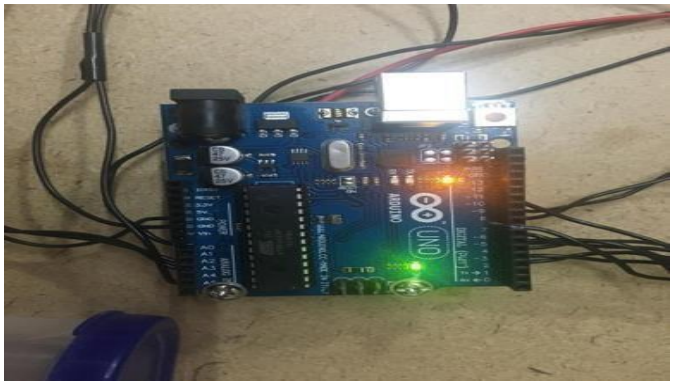


Fig 5: a communication of controller and esp8266

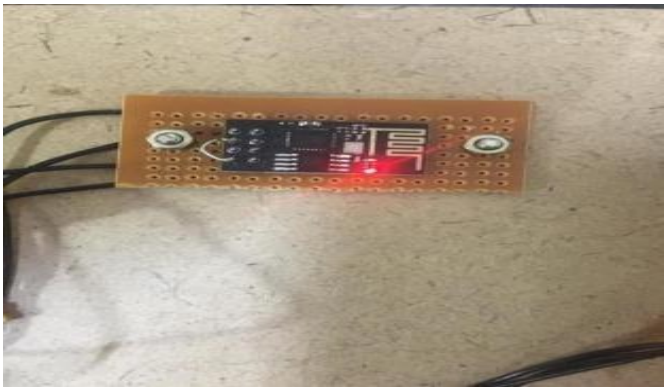


Fig 5: b Working of ESP8266

7. Results

- LM35 sensor is connected to controller and the LCD display.
- Information is collected and transferred by using Wi-Fi model.
- Continuously reading data from the engine and displaying in LCD display in Celsius.
- The level sensor and distance sensor are made from ultrasonic sensor.
- As the ultrasonic sensor is connected to the controller and read the data.
- It is used as a level sensor were to see the level of a petrol or diesel or oil tank of a vehicle. Continuously read the data and information is send to a cloud using esp8266 Wi-Fi module.
- It is also used as a distance sensor to avoid damage of vehicle and object.
- Successfully implemented the esp8266 Wi-Fimodule and working.

- Collecting the information from the sensors and uploading to the cloud, it is controlled by an controller.

Connection between controller and Wi-Fi module

- Made connection of controller and sensors.
- Arduino Uno is a microcontroller us to control the operation of all sensors and modules of a project.

8. Applications Andadvantages

Applications

- To detect problem in vehicle
- Daily vehicle diagnosis can be done
- Getting problem statement without human effort
- Current powertrain diagnostic data
- Driving analysis

Advantages

- Low cost
- Use in real time applications
- User friendly
- Minimum delay in fault identification
- Live data update to the cloud

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