INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

A PATH FOR HORIZING YOUR INNOVATIVE WORK

SPECIAL ISSUE FOR
NATIONAL LEVEL CONFERENCE
"Technology Enabling Modernization of Rural India (TMRI- 2018)"

DATA ACQUISITION OF VARIOUS PARAMETERS OF E- VEHICLE USING TELEMETRY

GARVIT JAIN[1], CHAYAN KUMAR PATODI[2], PROF. TAPAN JAIN[3]

1.IV[th] year EC Student, Acropolis Institute of Technology & Research, Indore.

2.IV[th] year EC Student, Acropolis Institute of Technology & Research, Indore

3.Associate Professor, Acropolis Institute of Technology and Research, Indore.

Accepted Date: 19/03/2018; Published Date: 01/04/2018

Abstract: Telemetry is basically an automated communication process which helps to collect measurements and other data at remote or inaccessible locations and is transmitted to receiving equipment for management and monitoring. The word is derived from Greek roots: tele means remote, and metron means measure. Systems that need external instructions and data to operate require telecommand, which is the counterpart of telemetry. In the transportation industry, telemetry provides useful information about an automobile or driver's performance by collecting data from sensors that are within the vehicle. This is undertaken for various reasons such as staff compliance monitoring, insurance rating to predictive maintenance. The goal of this project is to design a system to aid the maintenance of automobiles by remotely monitoring the trends in the data captured by various sensors onboard the vehicle.

Keywords: ARM, Automobiles, Data Acquisition, Telemetry, Vehicle Diagnosis

Corresponding Author: GARVIT JAIN

PAPER-QR CODE

Access Online On:

www.ijpret.com

How to Cite This Article:

Garvit Jain, IJPRET, 2018; Volume 6 (8): 217-223

INTRODUCTION

Telemetry is the art of continuous recording and transmission of data from remote locations to a system for monitoring and analysis. [1] It, in general, is collecting information in the form of measurements or statistical data and forwarding it. This term can be used in reference to many different types of systems, such as wireless systems using radio.[2]

Most data acquisition systems available in the global market are based in a concentrated philosophy, which in more simplified terms means that they usually consist of one central processing unit or a hub installed in the vehicle, in which the analog signals are directly measured, analyzed and transferred. [3] The other fact is that the commercially available products are usually dedicated to either data acquisition or telemetry and but not both. The main idea behind the proposed system is to develop a decentralized telemetry system, in which the physical quantities are locally measured and converted to digital signals using a distributed sensors network. The device that is used for the data acquisition is a double layered PCB which has an ARM processor, interfaced with other sensors, to acquire the data and store it on various platforms. This device can be used for various purposes. The device could be attached to almost any automobile at any point in time. It has a lot of benefits too, personally and professionally, such as to enhance the life of automobiles and components used therein, to or event road accident caused by part malfunction, performance optimization by regular monitoring, database for all the failures, so as to learn how to rectify mistakes in the future by creating appropriate safety measures, to know the whereabouts of the vehicle, if lost in a remote location, to avoid the fraudulent claims of Insurance.

The data may be transferred using various ways, such as using radio, GSM, satellite or cable, depending on the required.

Telemetry can help us know which features the customers use most, detection of bugs and an indirect feedback on the customers. In a general sense, telemetry works through sensors which measure physical or electrical data. This is converted to electrical voltages that are combined with timing diagrams. They form a data stream that is transmitted

The primary benefit of telemetry is the ability of a person to monitor the condition of an object while physically away. Just because telemetry provides insights into how well the product is working, it's a valuable tool for ongoing performance monitoring and management.

II. COMPONENTS

The processor used plays a very crucial part in the development of the product. The STM 32F103 is a 32-bit ARM Cortex-M processor.

It has Adaptive real-time accelerator (ART Accelerator™) allowing zero wait state execution from Flash memory, frequency up to 168 MHz, memory protection unit, 210 DMIPS/1.25 DMIPS/MHz (Dhrystone 2.1), and DSP instructions. It is a 100 pin processor with 7 timers and up to 9 communication interfaces. Apart from the processor, the Quectel MC60 and MPU6050 have a greater purpose to serve. Without those sensors, we could not acquire the data from the device. The device tellsits precise latitudes and the longitudes, as the MC60 has key benefits of a multi navigation constellation (GPS /GLONASS/QZSS). It also interfaces with the other sensors on the board and displays everything on the display, stores it in a memory card and also on the server. MPU6050 tells us about the orientation of the vehicle in which the device is installed. The temperature sensor and the Hall Effect sensor, tell us about the temperature and the voltage of the automobile respectively.

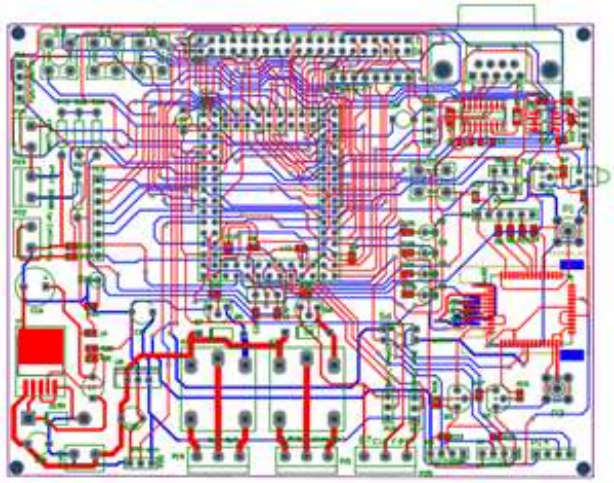

Figure 1: PCB Design of module

III. SOFTWARES

The Software's like ALTIUM: PCB Design Software, which is the best **PCB design** software and high-powered tool for PCB designers. The self adjusting feature makes it one of the easiest ways to design a PCB. Apart from Altium, CooCox has been a useful tool. They are committed to providing free and open ARM Cortex M development tools to users, including CoIDE--an Internet-based and component-oriented IDE for Cortex M3, Cortex M4, Cortex M0+ and Cortex M0, which has integrated the CDT editor and GCC compiler. CoIDE is a free software development environment based on Eclipse and GCC tool chain, which has been customized and simplified to give users an easy access to ARM® Cortex®-M microcontrollers.Keil Compiler is the compilation toolchain for the Arm architecture, available in all editions of MDK. It brings together the modern LLVM compiler infrastructure and the highly optimized Arm C libraries to produce performance and power optimized embedded software for the Arm architecture.

Efficient code generation, better diagnostics, and faster feature development make SLLVM the natural choice for the next generation of Arm Compiler.

IV. DATA ACQUISITION AND TELEMETRY SYSTEM

The presented data acquisition and telemetry system consist of two subsystems:

- The data acquisition and management subsystem.
- The data telemetry, the storage and optical representation subsystem of the data.

In the data acquisition and management subsystem the measured quantities (voltages, temperature, pressure, location, speed etc.) are stored in a data card and all sensors are connected to the microprocessor through USART, CAN communication and transferred over a network and saved to a central database through GPRS/GSM module connected to the processor. This system is interfaced with various AD sensors I/O devices so that continues data monitoring can be done, a display is interfaced with the processor so that the data can be displayed to the driver and GUI should be developed to alter the setting.

The data can be categorized further in three ways according to the likes of the vehicle driver:

- Data or Information such as the vehicle speed that must be known to the driver.
- Data such as the motor controller temperature that the driver doesn't needs to be concern about, but he must be aware of them and the measures to take if their limits are exceeded.
- Data that is of no use to the driver and which does not concern the driver and is therefore not shown on the driver display unit and is only transmitted to the computer for sophisticated analysis.

V. DATA STORAGE

Similar to the concept of a Black box, another important component of the telemetry system is the on-board data storage, so that further analysis could be done with more sophisticated software, summarize much of what happened during the day, e.g. run time, average speed etc., and make comparisons against previous race days and correlate those differences to specific events.

Figure 2: Fabricated PCB

Figure 3: Road side connected vehicle technology

VI. FUTURE SCOPE

1. Modern trends in the sensor technology set by the automobile industry
2. Decreasing cost of sensors and electronic accessories
3. Increased connectivity and higher data speeds.
4. Reducing server costs
5. Powerful computers and data analysis tools
6. Increasing market for the Electrical Cars and Self-Driving Cars.
7. Increasing facilities/luxuries in the automobiles by the companies.
8. Customization of the automobile.
9. Increasing concern for the safety because of the self-driving automobiles.
10. Dedicated Short-Range Communications (DSRC) system. A very important technology in a non- line- of- sight communication in the future of next generation advanced driver assist automobiles.
11. Road side connected vehicle technology:

- Vehicle-to-Vehicle (V2V):

The wireless exchange of data between vehicles that avoid fatalities and offer the significant safety improvements.

- Vehicle to Infrastructure (V2I):

It's a communication model which allows trading of signals between vehicles and buildings or a highway system which may include lane markers, traffic lights or cameras, for critical safety and constructed specially to avoid motor vehicle accidents and also for a wide range of other benefits.

12. Advantage of Node Mobility can be obtained for example., Store-Carry-and-Forward (DTN) Store a message, carry it until an appropriate communication opportunity arises and then forward it to a new node , which may even be used in cabs or public transits.

13. The Fair information Practice Principles includes :

- Choice
- Information Protection/Privacy
- Information review and suitable correction
- Accountability
- Transparency

VII. CONCLUSION

The above presented telemetric system deals with the measurement of electric features and necessary quantities that completes the functioning of ahybrid car or a purely electric car and transmission of that measured value through some medium such as GPRS. It should be

mentioned that, as data is transmitted using the standard communication network, the vehicle can transmit from everywhere, as far as the cellular network is present. The developed system is quite flexible and holds the capability for bidirectional operation, as it can be easily upgraded and adapted for similar usage in the near future.On a professional level, Corporates are already changing fleet management capacities with the help of IoT with features which go far beyond basic tracking by GPS.

VIII. REFERENCES

1. Edward Kulperge, "The Future of Connected Vehicles and the IoT", https: // iot.telefonica.com/blog/the-future-of-connected- vehicles- and-the-iot (2017)
2. Stackify, "What Is Telemetry? How Telemetry Works, Benefits of Telemetry, Challenges" (2017).
3. E. Mitronikas, A. Safacas, I. Tsoumas , "Development of a telemetry system for electric vehicles" EET-2007 European Ele-Drive Conference (2007).
4. Prajapati, Karan & Sagar, Rachit & Patel, Ravi, "Hybrid Vehicle: A Study on Technology", International Journal of Engineering Research & Technology, ISSN: 2278-0181. 3. 1076-1082 (2014).
5. Michael D. Hudson, Hillsboro, Kelly M. McArthur, "System and methods of performing real-time on-board automotive telemetry analysis and reporting"
6. Hulten, Geoff, "Intelligent Telemetry", 171-182. 10.1007/978-1-4842-3432-7_15, (2018)
7. Ray A. Sackett, "Telemetry system for tire pressure and temperature sensing".
8. Vishal Malhan, Gourango Biswas, Narayan Singh Rana, Gautham Ramamurthy,Balaji Mahadev, "Wireless telemetry auto for torque measurement system."
9. Kamil Sternal, Adam Cholewa, Wojciech Skarka, Mirosław Targosz, "Electric Vehicle for the Students' Shell Eco-Marathon Competition. Design of the Car and Telemetry System".
10. Hande N. Kilickir, Akif Demircali, Selim Koroglu, SelamiKesler, Mustafa Tumbek, ArdaKilic, "RF Telemetry Design for Electric Vehicle",6th International Conference on Advanced Technology & Sciences (ICAT'Riga) (2017).