Study and Literature Survey for Wireless Data Acquisition for Automobile Dashboard

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***Abstract*: The collection of the real time data before moving the vehicle i.e immediately after Starting the vehicle to drive the driver can see the status or the health of the various parts of the vehicle which is determined or analyzed by the data collected at the moment and simultaneously transmitting the data over the wireless network. The data acquisition System (DAQ) is used to collect the data like speed, engine temperature, Brake status, fuel sensor, tyre pressure, acceleration, GPS position, wiper movement, and time etc. This data can be used to see that whether the vehicle is safe for the ride or should go for the service. The data collected by DAQ is used by the service person to come to know the problems in the vehicle which reduces the time taken to analyze the problem as it points at the problem associated area. If required the data can be collected using a SD card for analyzing purpose. The main purpose of this paper is to avoid accidents rather than alerting police after the accident .In system data is collected by using different sensors and wireless communication. the DAQ system is implemented over FPGA SoC.**

***Index Terms:* Data acquisition System (DAQ), Sensors, FPGA SoC**

I. INTRODUCTION

The major problem in many countries is to control vehicle accidents. Due to some factors like speed driving, drunk driving, riding without sufficient sleep, etcall cause to increase the number of accidents.The numbers of death and disability are very high because of late assistance by public to the person who met with the accident. Due to this maximum automobile manufacturers are developing safety devices to protect riders from accidents. However, a perfect safety device for vehicles is difficult to implement and it will cost more. On roads, drivers usually a maintain distance from one vehicle to another. On the other hand ,due to lots of interruption, like longtime driving, sudden application of brake by the car which is ahead, even though the driver is in a conscious mind he cannot respond immediately to control vehicle. Sometimes crash may occur due to bad weather. Like if rain has started and wipers are not working then it can lead to poor visibility of the road due to which accidents can occur.so if we have devised a system which can tell the status before starting the drive so that we can overcome this situation.

Data acquisition is the system used to acquire data from various sensors and bring the collective data to store and manipulate the data as per the requirement. Data acquisition are used to measure differenttypes of system. Usually the output from the sensor will be analog. Before they can be transferred into any computer system they need to be in a digital format [1].The main objective of the proposed work is to develop a prototype of data acquisition system for vehicle to diagnosis or to scan the major /minor parts of the vehicle's health status before getting on to the road which can be installed into any vehicle. Theproposed prototype can be designed with minimum number of circuits using various sensors.This can contribute to avoid the accidents which can happen in future. The collection of the real time data after the scan in the vehicle will help to know the problem if any by simultaneously transmitting the data over the wireless network.

II. LITERATURE REVIEW

In [3] developed an Advanced SMART Automobile Safety Information System. By using MEMS accelerometer and GPS tracking system we can get the information of accidental occurrence through GSM module. MEMS is a Micro electro mechanical sensor which is a high sensitive sensor and capable of detecting the tilt. The device is capable of performing all the tilt functions like forward, reverse, left and right directions. The system consists of cooperative components of an accelerometer, microcontroller unit, GPS device, GSM module, Ultrasonic sensor and CO/temperature sensor. Whenever the CO gas or temperature level exceeds the threshold limit then the motor of the vehicle will be stopped. Ultrasonic sensor in the module is used to detect any obstacle in the surroundings of the vehicle and intimates the microcontroller and the controller calculates the distance between the vehicles and if the distance reaches predetermined set point, then the vehicle stops automatically.

The project includes advanced occupant restraints (seat belt pretensions, load limiters, advanced frontal air bags, side air bags and head curtains), active head restraints, anti-lock braking systems, brake assist, traction control systems, electronic stability control systems, event data recorders, night vision systems, adaptive cruise control, blind spot detection

and backup warning systems. The readily-accessible web pages provide useful information to the vehicle-buying public and will assist individuals to make informed choices for safety features that may only be available in certain makes and models and/or as optional equipment [4].

In [5] Experiments employ various kinds of protocols and typically use infrared, microwave or millimeter wave media. The situation is ready for standardization. The deployment strategy is another issue. To be feasible, deployment should begin with multiple rather than single services that would work even at a low penetration rate of the communication equipment. In addition, non-technological, legal and institutional issues remained unsolved. Although inter-vehicle communications involve many issues, such applications should be promoted because they will lead to safer and more efficient automobile traffic

In [6] design and implement of data acquisition system (DAQ) by using serial RS-232 and SPI communication protocols on FPGA platform. The developed DAQ system should be able to acquire both analog signals as well as digital signals. The SPI interface deals with the ADC and amplifier communication with FPGA and the RS-232 interface deals with the communication between PC and FPGA. The SPI and RS-232 communication protocol have been developed using VHDL programming language and implemented in Sparten3A/3AN board. The IDE tool Xilinx ISE 12.3i is used in out paper

In [7] the process variables like Temperature, Humidity are sensed and their continuous reading is transferred to a remote PC via wireless. The project was initially computed and monitored on LabVIEW software and then hardware circuit is prepared. The minimum response time between sensing and controlling is very small (few milliseconds). Minimum response time for ON and OFF the control relay was found in micro seconds. The parameter range can be controlled by the programmer controller. A greenhouse environment parameters monitoring system based onwireless communication technology has been developed, which realizes the measurement, summary and control of temperature, humidity and the other parameters.

Advancements in electronics provide a vital new option for implementation of low-frequency smart sensors that can perform signal processing close to the sensors and transmit the data wirelessly. These smart sensors can improve the efficiency of an automatic classification system and reduce the cost of actual infrasound microphones. The design of a digital wireless data acquisition system using a QF4512 programmable signal converter from Quick filter Technologies, a MSP430 microcontroller from Texas Instruments and a F2M03GLA Bluetooth module from Free2move for infrasonic records is presented in this paper. The digital wireless data acquisition system has passed extensive laboratory and field tests (e.g. with man-made explosions)[8].

In [9] the design of vehicles of public transport as much as private, it is important to know the real load properties which are put under the vehicle. The obtained data of each sensor is prepared, processed, stored and transmitted in time intervals towards a receiver, which is in charge to send them to Internet server for its storage, visualization and analysis for any user connected to the network who have accessibility to the collected information and can make the pertinent procedures and actions

Data acquisition (DAQ) system with custom back-plane and custom readout boards has been developed for a Compton camera prototype. The DAQ system consists of two layers. The first layer has units for parallel high-speed analog-to-digital conversion and online data pre-processing. The second layer has a central board to form a general event trigger and to build the data structure for the event. This modularity and the use of field programmable gate arrays make the whole DAQ system highly flexible and adaptable to modified experimental setups. The design specifications, the general architecture of the Trigger and DAQ system and the implemented readout protocols are presented in [10]

In this paper, embedded controller for DAQ using FPGA SoC (System On Chip) technique. SoC is the effective method to implement DAQ which is implemented over FPGA which consists of processor, memory, I/O peripheral and several interfaces

III. METHODOLOGY

Stage 1: Real time Data collection

In first case the data is coming to the input port of the controller from various sensors which will continuously collect the data. When the data does not differ from the reference data then the vehicle is ready for getting onto the road. The sensor data is coming to the input port of the controller will be saved to the memory device connected to the system while transmitter connected to the output port of the controller will simultaneously transmit the data to the wireless network.

Stage 2: Report Generation

In this case, at receiving end the collected data from various sensors will received and compared and the data will be displayed on the screen.so that the driver can check the status of major/minor parts of the vehicle and decide whether to go for service of or can go for the drive.

Stage 3: Wireless communication

The prototype can be designed to get the actual output. The data can be collected using the different sensors connected.

IV. HARDWARE COMPONENTS AND DESIGN

A) Block diagram

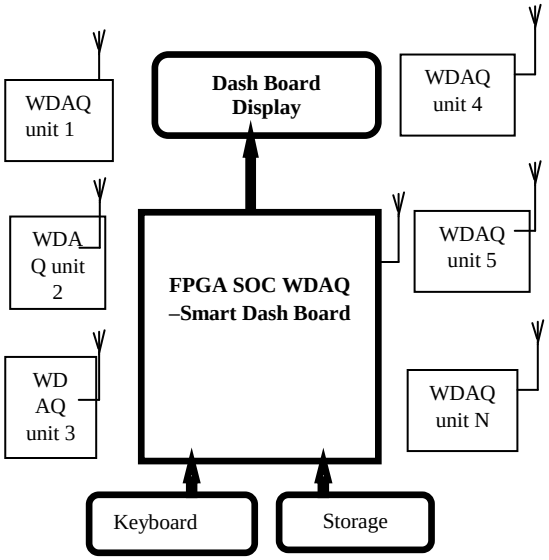

Fig.1.Block Diagram of Automobile Data acquisition

B) Block Diagram Description

A field-programmable gate array (FPGA) is an integrated circuit that can be programmed in the field after manufacture. FPGAs are similar in principle to, but have vastly wider potential application than, programmable read-only memory chips. FPGAs are used by engineers in the design of specialized ICs that can later be produced hard-wired in large quantities for distribution to computer manufacturers and end users. Ultimately, FPGAs might allow computer users to tailor microprocessors to meet their own individual needs, FPGAs present a compelling alternative for digital system implementation due to their less time to market and low volume cost. Normally FPGAs comprise of: • Programmable logic blocks which implement logic functions. • Programmable routing that connects these logic functions. • I/O blocks that are connected to logic blocks through routing interconnect and that make off-chip connections.

Various types of sensors are used like

a) Temperature Sensor: Engine temperature is important in engine control unit, if this value goes to abnormal, some unwanted gases exhaust from vehicles due to improper combustion. In this project, in order to obtain the vehicle engine temperature, we have used LM35 temperature sensor. This temperature sensor continuously reads the engine temperature and fed to the microcontroller.
b) Alcohol Sensor: In this, MQ-2 gas sensor is used for alcohol detection. It is high sensitive to alcohol, simple drive circuit, stable and long life. If driver has drunk, then alcohol sensor sends signal to microcontroller.
c) LPG Sensor: In this, MQ-6 gas sensor is used for LPG detection. It is high sensitive to LPG. If the level of LPG is more, MQ-6 LPG gas sensor sends signal to microcontroller.
d) Accelerometer sensor: The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration.
e) Impact sensor: In this, piezoelectric type of sensor is used as impact sensor. When piezoelectric device (PZT) detects a mechanical impact, it emits signal which is given microcontroller. It is used to detect mechanical shock or vibration in its vicinity.
f) Door status sensor: In this, limit switch is used for door status. A limit switch is electromechanically device that consists of actuator mechanically linked to set of contact with actuator, device operates the contacts make or break electrical connection.
g) Pressure sensors: A pressure transducer, one of the most common is the strain-gage base transducer. The strain will produce an electrical resistance change proportional to the pressure.
h) Wheel speed sensor: A wheel speed sensor or vehicle speed sensor (VSS) is a type of tachometer. It is a sender device used for reading the speed of a vehicle's wheel rotation. It usually consists of a toothed ring and pickup
i) Rain sensors: A rain sensor or *rain switch* is a switching device activated by rainfall
j) Torque Sensor: A torque sensor or torque transducer or tachometer is a device for measuring and recording the torque on a rotating system, such as transmission, rotor, a bicycle crank or Cap Torque Tester ,an engine, crankshaft, gearbox,. Static torque is relatively easy to measure. Dynamic torque, on the other hand, is not easy to measure, since it generally requires transfer of some effect (electric or magnetic) from the shaft being measured to a static system [2].
k) Parking sensors:They are proximity sensors for road vehicles designed to alert the driver to obstacles while parking.

V. CONCLUSION

We develop a FPGA Based Smart DAQ for Automobile NO WIRE Dash-Board that will completely eliminating complex wiring and its issue and hazards, Implementing wireless data acquisition and control for all sensors, related to accessories and system in vehicle. Improve the safety to vehicle and

passengers and improve the travel comfort level. This proposed Wireless DAQ will also takes care of Reliability, Reduces cost, wiring problems, controlling Speed, and avoids physical wire damages by rodents etc.

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