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IMPLEMENTATION OF VEHICLE MONITORING SYSTEM BASED ON SENSOR NETWORK

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ABSTRACT

This system consists of sensors array, Global positioning system (GPS) of mobile phone, LPC2148, Bluetooth modem. Sensors are hardware devices that produce measurable response to a change in a physical condition in vehicle. The analog signal send by the sensors is digitized by an analog to digital converter& send to LPC2148 for further processing. Carbon dioxide, pressure in tire, fuel leakage collision detection and short circuit sensors senses and communicate the data with microcontroller. Bluetooth modem is used for transmitting the data to LPC2148 to android mobile. GPS modem of the mobile itself is used to send the location information. The main objective of this system is to continuously monitor the vehicle condition provided by the different sensor via Bluetooth modem. Hence particular plan of action should be taken to monitor the vehicle condition using android mobile.

Keywords—*LPC2148, Global positioning system (GPS), Bluetooth, sensor networks.*

INTRODUCTION

Mobile devices (in particular smart phones and tablets) can be used to monitor quality of life parameters. Today mobile devices use embedded sensors such as accelerometers, compasses, GPSs, microphones, and cameras without considering, for example, the air quality or the pollutants of the environment. This paper presents the possibility to use the smart phones capabilities to gather data of vehicle condition by using sensors. The Bluetooth was chosen as a transmission tool since it is embedded in all smart phones and it can work in the absence of the Wi-Fi connection. Smart phones are the programmable tools to have different kinds of applications that allow communicating with other devices and also gathering, analyzing and verifying data**.** This paper helps to monitor the carbon monoxide releasing from vehicle's tile pipe, monitor the pressure in tire, monitor the leakage of fuel, can monitor the short circuit in vehicle and by using the sprinkler it can automatically sprinks water on fire.

Colliding information module is used to give the information to the authorized person when the vehicle got the accident. So this paper is used for monitoring of vehicle condition based on wireless android mobile device.

Most of the monitoring systems are based on sensors that report via wired modem, router, or short-range wireless access points. In this paper, we propose a system. Integrates a LPC2148,

several sensors, general positioning systems (GPSs) module and Bluetooth module .The unit can be placed on any moving device such as a public transportation vehicle. When the vehicle is moving LPC2148 generates a frame which consist of the acquired level from the sensors array and the physical location that is reported from the attached GPS module.

ARM architecture

A RISC based computer design approach means ARM processors require significantly fewer transistors than typical processors in average computers. This approach reduces cost, heat and power use. These are desirable traits for light, portable, battery-powered devices including smart phones, laptops, tablet and notepad computers, and other embedded systems. A simpler design facilitates more efficient multi-core CPUs and higher core counts at lower cost, providing higher processing power and improved energy efficiency for servers and super computers.

LPC2148is the widely used IC from ARM-7 family. It is manufactured by Philips and it is pre-loaded with many inbuilt peripherals making it more efficient and a reliable option. 8 to 40 kB of on-chip static RAM and 32 to 512 kB of on-chip flash program memory.128 bit wide interface/accelerator enables high speed 60 MHz operation.
In-System/In-Application Programming (ISP/IAP) via on-chip boot-loader software. Single flash sector or full chip erase in 400 ms and programming of 256 bytes in 1ms.Embedded ICE RT and Embedded Trace interfaces offer real-time debugging with the on-chip Real Monitor software and high speed tracing of instruction execution.USB 2.0 Full Speed compliant Device Controller with 2 kB of endpoint RAM. In addition, the LPC2146/8 provides 8 kB of on-chip RAM accessible to USB by DMA. One or two 10-bit A/D converters provide a total of 6/14analog inputs, with conversion times as low as 2.44 us per channel. Single 10-bit D/A converter provide variable analog output. Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog. Low power real-time clock with independent power and dedicated 32 kHz clock input. Multiple serial interfaces including two UARTs (16C550), two Fast I2C-bus (400 kbit/s), SPI and SSP with buffering and variable data length capabilities. Vectored interrupt controller with configurable priorities and vector addresses. Up to 45 of 5 V tolerant fast general purpose I/O pins in a tiny LQFP64 package. Up to nine edge or level sensitive external interrupt pins available. Power saving modes include idle and Power-down. Individual enable/disable of peripheral functions as well as peripheral clock scaling for additional power optimization.

Wireless sensor node

A wireless sensor network (WSN) is an infrastructure consisting of computing ,sensing and communication elements which allows the administrator to monitor & control of the

specified parameters in the network Typical application of WSN includes data collection, monitoring, surveillance & medical telemedicine.

Sensors

Sensors are hardware devices that produce measurable response to a change in a physical condition of the parameters. The analog signal send by the sensors is digitized by an analog to digital converter & send to controller for further processing. There are different types of sensors from which we can select the suitable & appropriate sensor depending on the application.

Sensor 1 (MQ2 sensor):- The sensor senses the carbon dioxide and communicates the data with microcontroller.
Sensor 2 (BMP085 sensor):- sensors sense the pressure and communicate the data with microcontroller.
Sensor 3 (MQ7sensor):- The sensor senses the fuel and communicates the data with microcontroller.
Sensor 4 (Fire sensor):- The sensor senses the fire and communicates the data with microcontroller.
Sensor 5 (Accident detection sensor):- The sensor senses the accident and communicates the data with microcontroller.

GPS Receiver Module

With the high sensitivity, good tracking performance, and high position and speed accuracy in the world, the QUECTEL L80 GPS is selected as the GPS receiver module which providing the best solution.

ARP9600

APR9600 is a low-cost high performance sound record/replay IC incorporating flash analogue storage technique. Recorded sound is retained even after power supply is removed from the module. The replayed sound exhibits high quality with a low noise level. Sampling rate for a 60second recording period is 4.2 kHz that gives a sound record/replay bandwidth of 20Hz to 2.1 kHz. However, by changing an oscillation resistor, a sampling rate as high as 8.0 kHz can be achieved. This shortens the total length of sound recording to 32 seconds.

Total sound recording time can be varied from 32 seconds to 60 seconds by changing the value of a single resistor. The IC can operate in one of two modes: serial mode and parallel mode. In serial access mode, sound can be recorded in 256 sections. In parallel access mode, sound can be recorded in 2, 4 or 8 sections. The IC can be controlled simply using push button

keys. It is also possible to control the IC using external digital circuitry such as micro-controllers and computers.

The APR9600 has a 28 pin DIP package. Supply voltage is between 4.5V to 6.5V. During recording and replaying, current consumption is 25 mA. In idle mode, the current drops to 1 □A. The APR9600 experimental board is an assembled PCB board consisting of an APR9600 IC, an electret microphone, support components and necessary switches to allow users to explore all functions of the APR9600 chip. The oscillation resistor is chosen so that the total recording period is 60 seconds with a sampling rate of 4.2 kHz. The board measures 80mm by 55mm.

Bluetooth Module HC-05

In the proposed system, we are using Bluetooth modem for transmitting the data to lpc2148 to mobile. These small size Bluetooth TTL transceiver modules are designed for serial communication (SPP - serial port profile). It allows target device to send or receive TTL data via Bluetooth technology without connecting a serial cable to your computer. The modules with the HC-06 firmware are the modules which are factory set to be Master or Slave modules. Master and slave mode cannot be switched from the factory setting. HC-06 is a commercial grade product.

HARDWARE DESIGN

Vehicle Monitoring Based on Sensor Networks

WSN is a modern information technology with the integration of sensor technology, data transmission network, storage, automatic control technology, processing and analysis technology Compared with traditional monitoring techniques, WSN is featured by its low-cost, simple to deploy, without onsite maintenance, low power consumption, etc., and it can achieve a variety of regional low-cost unmanned continuous monitoring.

Advances in WSN technology as well as the development of tiny sensor devices enable us to monitor the information.WSN have become significant tools for analyzing natural phenomena. Over the past 10 years, a great deal of research effort has been devoted to the development in monitoring based on tiny WSN system.

Therefore, based on technologies of micro-sensors, GPS, Bluetooth, to meet the need of vehicle maintenance monitoring, this paper developed a monitoring system for vehicles like pressure in tire, leakage of fuel, if any fire occurred in vehicle then sprinkler will sprinkles the water and monitor of carbon dioxide realized from the tile pipe of vehicle and give information to the mobile.

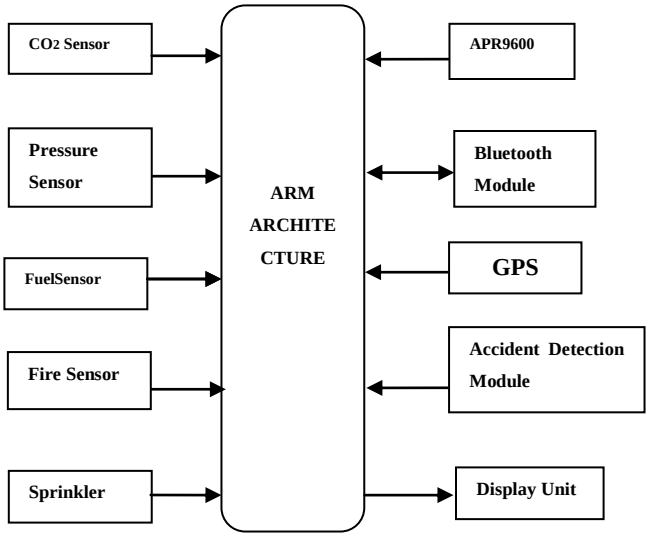

Fig 1: Block diagram of hardware design

The development of monitoring equipment is the core task of the whole system. The equipment can be deployed in vehicle. It can collect CO_2, pressure, fire, fuel and other air information through sensors and get the current position (longitude, latitude and elevation) and timing information through Global Positioning System (GPS).

HARDWARE INFRASTRUCTURE

Maintenance monitoring equipments based on WSN are mobile devices used by humans. The equipment is composed of the sensors array, GPS receiver module, central processing unit, LCD display module and Bluetooth wireless transmission module, as shown in Figure 2

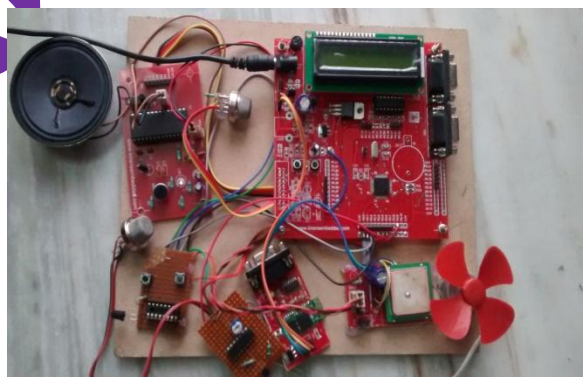

Fig2: Circuit board of vehicle monitoring equipment

FLOW CHART

Firmware process includes two main parts, collecting and wireless transmission. First, the sensors array of CO_2, pressure, fire and fuel are used to collect data; GPS receiver module is adopted to collect GPS position and time information; Afterwards, for the collected data, through Bluetooth wireless transmission module, continuous wireless transmission is conducted as shown in Figure 4. Specific procedures are as below:

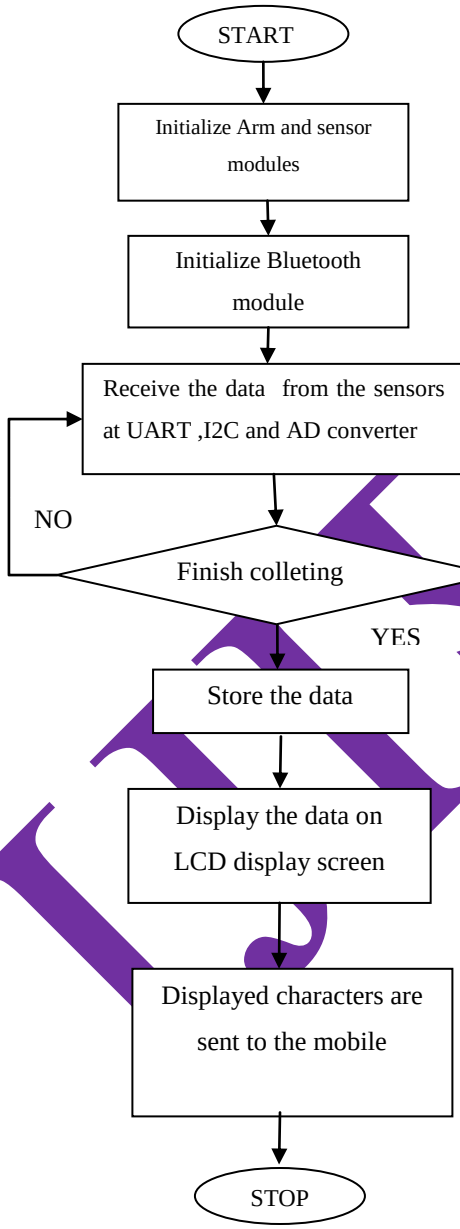

Fig3: Process flow

1) Power the equipment on, then is to initialize the entire monitoring system, including the circuit initialization of sensors array, ARM and all modules. Display the control signal in a fixed time and monitor the operational status of each module real-timely.
2) After the initialization Bluetooth wireless transmission module, ARM achieves the connection to mobile network and then the point to point communication will be established.
3) Wait for the data of sensors and GPS receiver module, including $CO_{2,\ pressure}$, fire, fuel, GPS positioning and timing from converters of UART, I2C and A/D.
4) If data collection is completed, ARM will automatically store the collected data, otherwise go to Step three.
5) ARM displays the collected data and power supply information on the LCD display module real-timely.
6) When the transmission time interval is reached, pack the stored data. Bluetooth wireless transmission module to connect to wireless communication network and the data will be sent wirelessly to the mobile.

RESULT

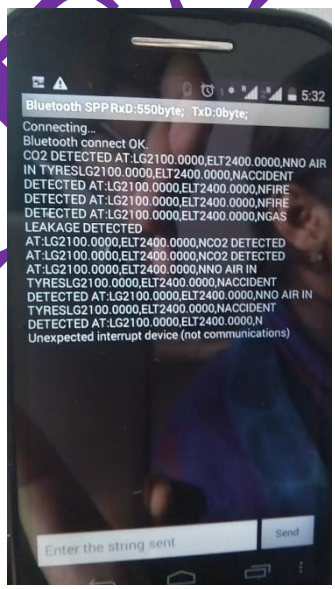

Fig 3: Information received in mobile through Bluetooth

CONCLUSION

Sending information using Bluetooth module:

To send the information here we are using the Bluetooth module. A Bluetooth module with standard communication interfaces like RS-232 (Serial Port), USB etc., so that it can be easily interfaced with ARM board. Here we can send the information to any android mobile which is having the Bluetooth SSP application in the android mobile that we want to send the message by using Bluetooth module. The power supply circuit is also built in the module that can be activated by using a suitable adaptor.

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