ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 3, March 2017

Review of Wireless Tyre Pressure Monitoring System for Vehicle Using Wireless Communication

Sharda Mule, K. S. Ingle

Student, Dept. of Electronics and Communication, Deogiri institute of Engineering and Management studies Aurangabad, Maharashtra, India

Assistant Professor, Dept. of Electronics and Communication, Deogiri institute of Engineering and Management studies Aurangabad, Maharashtra, India

ABSTRACT: The tyre pressure monitoring system for vehicles using wireless communication is a long tyre life. The tyre pressure and temperature are high or low then alert the driver alarm by using buzzer and display the real time pressure as well as temperature on LCD display. This paper present the review of tyre pressure monitoring system is improved in the reduce of number of accident ,avoid tyre break, avoid the damage of vehicle and also the damage of human body. All this operation is controlled by microcontroller with help of buzzer in real time. The main advantage of this paper is to increase the tyre long life. The tyre pressure and temperature are displayed on the LCD with help of buzzer.

KEYWORDS: Microcontroller, LCD, Buzzer, Wireless Network, Pressure Sensor, Temperature Sensor, Transmitter ,Receiver.

I. INTRODUCTION

Tyre pressure monitoring system (TPMS) is implemented in the vehicles to monitor the variations in tyre pressure. The safety of driving improves as TPMS automatically detects the tyre pressure, temperature in real-time and warns the drivers to take measures that prevents bursting of tyre there by avoiding the possibility of an accident. It is one of main reasons of the sudden traffic accidents. Statistics shows the number of the traffic accidents happened owing to tyre break is about 70% of the whole. key measure of avoiding tyre-break is to keep the tyre pressure near to its standard value and discover tyre pressure release in time. Thus, tyre pressure monitoring system (TPMS) has been drawing attention of many researchers and engineers. Tyre bursting is important concern for the drivers since it is very difficult to prevent. Research shows that tyre burst is mainly caused by abnormal tyre pressure and higher tyre temperature. Thus traffic accidents can be prevented if the tyre pressure is regularly monitored during driving. It is also observed that if the tyre bursts at extremely high speed, the death rate is nearly 100%. Therefore the abnormal tyre pressure affects the quality and the safety of automobile driving.

II. LITERATURE SURVEY

As we take literature survey of such system, then we find number of systems and technology which are detecting some particular task in this topic separately for only one purpose in it. An such systems and technology are not much more affordable and comfortable to use and to perform practically. In now a days people need more applications in only one systems. And so following are some survey paper name which implement some particular task separately in them. 'Wireless tyre pressure monitoring system for vehicle using wireless communication' in this paper they were detecting automatic pressure and temperature of two tyre in real time [6].In this research paper we examine the wireless communication based tyre pressure monitoring system with respective information will be based on wireless communication and how to make more efficient and perfect[3]. We have to detect the pressure and temperature will

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 3, March 2017

automatically detect in real time,but don't detect in running condition[1].As explained in the above paper they were implemented the project only for automatic pressure detection purpose[4]. So as compaired with this system our technology is really a new one and advanced.

'An Efficient Approach for Automatic Number System Using detect the tyre pressure and temperature using wireless communication'.All the functions of the developed TPMS are tested for high pressure as well as low pressure situation. The system has good measurement accuracy and it can properly warn abnormal states well within in time and rightly[1]. It is also observed that if the tyre bursts at extremely high speed, the death rate is nearly 100%. Therefore the abnormal tyre pressure affects the quality and the safety of automobile driving[5]. Research studies show that if the tyre pressure is maintained near to its standard value and pressure changes are discovered within time the possibility of tyre-break can be avoided. Thus, many researchers and engineers are working on tire pressure monitoring system (TPMS).

III. SYSTEM DEVELOPMENT

A. BLOCK DIAGRAM

There are two kinds of common TPMS. One is Wheel-Speed Based TPMS (abbreviation: WSB TPMS, or called indirect-type TPMS). This system monitors wheel speed signals through the wheel speed sensor of (Antilock Braking System) ABS system. Tyre diameter becomes large or small when certain tyre pressure is too high or low, while wheel speed also correspondingly changes., and then it will give an alarm if tyre pressure is too high or insufficient. Such system cannot judge the situation of more than two tyres being lack of gas at the same time or speed exceeding 100 km/h, with complex system calibration. Failure tyre positioning is not precise enough, and pressure values cannot be reflected visually and accurately. The other is Pressure-Sensor Based TPMS (abbreviation: PSB TPMS, or called direct-type TPMS). This system uses pressure sensor and temperature sensor in the tyre to directly measure tyre pressure to display and monitor it. System will automatically turn on alarm when tyre pressure is too low or there is leakage. Driver can intuitively understand every tyre pressure condition through direct-type TPMS. In contrast, direct-type TPMS is superior to indirect-type TPMS in function and performance, so this system used the direct-type TPMS. It mainly consisted of wireless tyre pressure monitoring modules attached in tyre. wireless tyre-pressure monitoring modules real-timely measured tyre pressure, temperature and the measured signals were transmitted after modulated into high frequency signals. Central receiving module received the signals and displayed the received tyre pressure, temperature data on the screen for driver to refer to. If tyre pressure and temperature abnormalities occur, then central receiving module will give relevant alarm signal to remind driver to take necessary measures. System block diagram is shown in Figure 1.

The system proposed here is Direct-TPMS. A direct TPMS mainly composed of two parts i.e. the transmitter module also called as pressure monitoring module and the receiver module. Pressure monitor module contains pressure sensor, temperature sensor, microcontroller unit and radio frequency transceiver chip. The receiver module include microcontroller unit, RF transceiver chip, LCD display and the buzzer circuit.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 3, March 2017

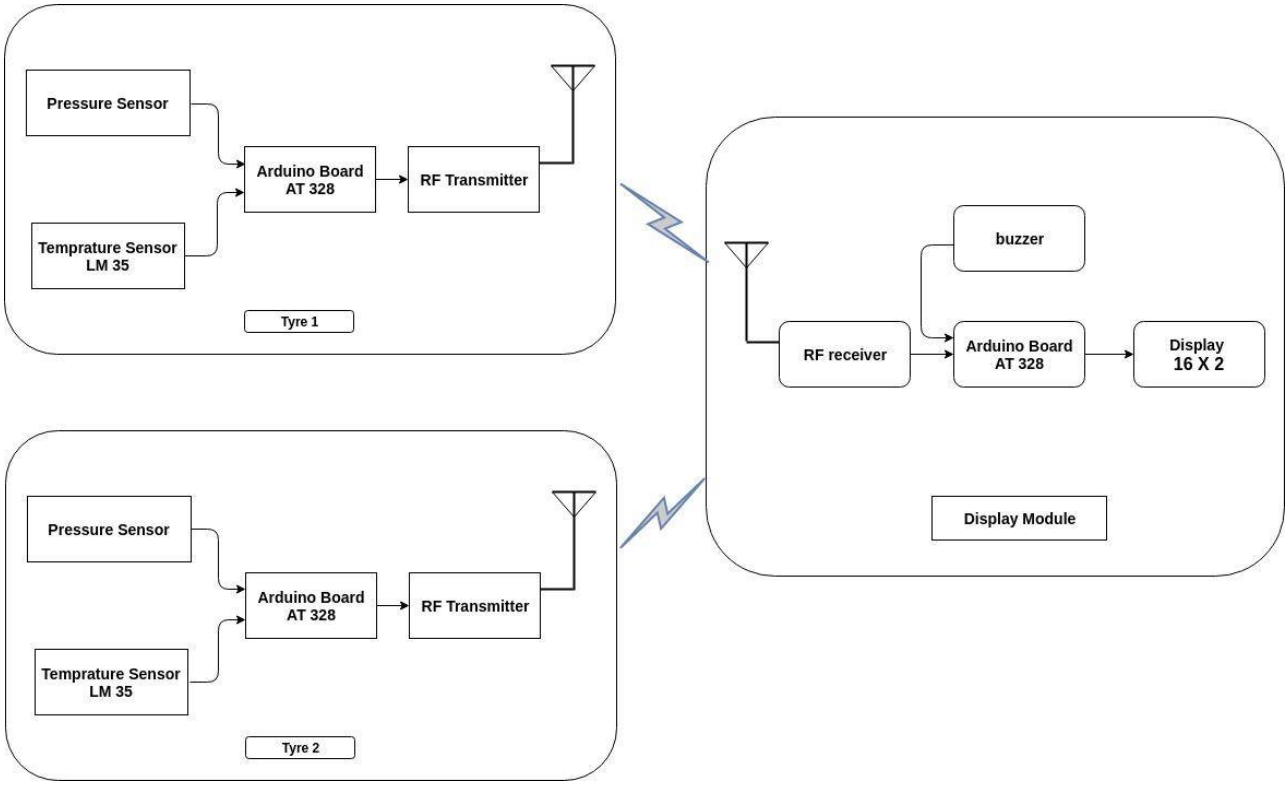

Figure 1:Block diagram of tyre pressure monitoring system.

B. COMPONENT REQUIRED

THE MAIN COMPONENTS OF THIS SYSTEM ARE

- **ATMEGA328**
- **SENSOR**
- **RF TRANSMITTER & RECEIVER**
- **LCD**

C. COMPONENT DESCRIPTION

A. AT MEGA 328(ARDUINO BOARD)

The Arduino Uno contains a microcontroller board based on the ATmega328. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It consists of everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno different from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega328 programmed as a USB-to-serial converter."Uno" means "One" in Italian and is named to mark upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the advanced in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison of previous versions, see the index of Arduino boards. The Arduino is open-source, which means hardware has sufficient price and development software is free for advanced Arduino users, prowl the web; there are lots of resources. An important feature of the Arduino is that you can create a control program on the host PC, download it to the Arduino and it will gives output automatically.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 3, March 2017

Remove the USB cable connection to the PC, and the program will still run from the top each time you push the reset button. When you reconnect the battery, the last program you stored will run. T his means that you connect the board to the host PC to develop and debug your program, but once that is done, you no longer need the PC to run the program.

Technical Specifications

- **Microcontroller ATmega328**
- **Operating Voltage 5V**
- **Supply Voltage (recommended) 7-12V**
- **Maximum supply voltage 20V**
- **Digital I/O Pins 14 (of which 6 provide PWM output)**
- **Analog Input Pins 6**
- **DC Current per I/O Pin 40 mA**
- **DC Current for 3.3V Pin 50 mA**
- **Flash Memory 32 KB (ATmega328) of which 0.5 KB used by boot loader**
- **SRAM 2 KB (ATmega328)**
- **EEPROM1 KB (ATmega328)**
- **Clock Speed16 MHz**

B. SENSOR

The tyre pressure monitoring module or transmitter module is composed of MLX90603pressure sensor, LM 35 temperature sensor and the ATMega16 microcontroller. The pressure sensor MLX90603 is responsible for monitoring tyre pressure and temperature is measured by LM 35. The ATMega16 chip is used as the controller for tyre pressure monitoring module. It receives the signal from pressure sensor and transmits the data to the host receiver through wireless RF communication. While designing the tyre pressure monitoring module small size and low power consumption are the major issues. Fig shows the transmitter and receiver modules in TPMS. The MLX90603 is a System in a Package (SIP) pressure sensor, combining an analog pressure sensor and a low-power sensor interface with micro-controller in a plastic SO16package.Its primary use is in wireless TPMS applications, using any RF transmitter, the system can be made compliant with existing Remote Key less Entry (RKE) systems .Power consumption during stand by is less than 1uA,power during periodic sensing is reduced with the low-power microcontroller.

C. RF TRANSCEIVER

In the system, the major issue is how effectively the wireless radio frequency signal is transmitting because the RF transmission consumes most of the power. Thus, when choosing a wireless radio frequency chip, power consumption is important issue along with the transmission bandwidth. In this design the IC 434MHz is used as radio frequency transceiver. It is a low-cost 2.4 GHz transceiver designed for very low-power wireless applications. The circuit can be useful for the frequency range of 2400 to 2483.5 MHz i.e. ISM frequency band with the help of an onboard antenna. The big and important advantage of using this frequency is that it does not require license from government and this frequency is freely available. This chip is mainly selected because the main operating parameters and the transmit/receive FIFO register of 434MHz can be controlled via an wireless communication interface. It can transmit and receive the data in range of 30 meters without requiring any external antenna. In a typical system, the 434MHz will be used together with a microcontroller and a few additional passive components. Besides, it integrates a low-power PLL RF transmitter and voltage controlled oscillator, can modulate and transmit digital signals.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 3, March 2017

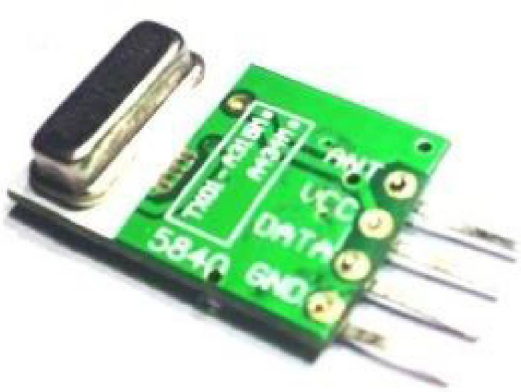

FIGURE 2: RF TRANSMITTER

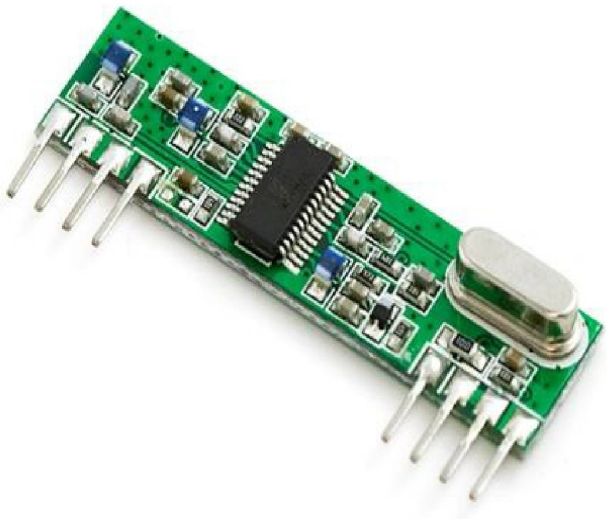

FIGURE 3: RF RECEIVER

D. LCD DISPLAY

LCD is an electronic display module. In this system we use a 16*2 LCD Screen in order to monitor the tire pressure. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. The data register stores the data to be displayed on the LCD. A buzzer circuit can be interfaced with the receiver or master module together with the LCD display in order to alert the driver regarding the ups and downs in the pressure of the tyre. The LCD display indicates the real time values of the tyre pressure. Whenever the pressure value exceeds the predetermined values in any one of the tyres, the buzzer circuit gets activated. Accordingly the driver can take the corrective action.

D. MICROCONTROLLER AND WIRELESS COMMUNICATION

In this design of tire pressure monitoring system wireless communication is used to communicate between the microcontroller unit and radio frequency transceiver module. Data is changed between transmitter and receiver sections by using wireless communication. This communication is mainly used because it allows serial communication between two or more devices at a high speed up to 10 Mbps. It is easy to implement as it is only 4 wired bus. In wireless is also called as 4 wired protocol. The MOSI (Master Out Slave In) and MISO (Master In Slave Out) lines transfer the data to and between the microcontroller unit and RF transceiver module. SCK (Serial Clock) line provides clock for synchronization between transmitter and receiver because data transfer is depending on clock. The last line CS (Chip Select) is used for selecting the slave device.

III. CONCLUSION AND FUTURE WORK

This system utilizes integration techniques to provide a solution to measures real-time tyre pressure, temperature and also alerts the driver about improperly inflated tyres. This system is an essential feature in all the vehicles. The system ensures calibrated tyre pressure which is important for tyre life, reduce number of accidents, proper handling of vehicle.

REFERENCES

1. Y. Shiming, T. Jianbin, Hong Q., C. Chengrong, “Wireless Communication Based Tire Pressure Monitoring System,” 1-4244-1312-5/07.
2. I. H. Ho, J. M. Chung, H. C. Chen, H. W. Chiu, “A Battery-less Tire Pressure Monitoring System,” 978-1-4244-2517-4/09.
3. H. Wang, S. Yu , Y. Haung, Y. Pu, “Wireless Communication of Tire Pressure Intelligent Monitoring System Based on SensorNetworks

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 3, March 2017

Technology,", International Conference on Intelligent Control and Automation 2006.
L. Yueming , H. Binghua, S. Jianchun, Y. Yuan, "Design and Implementation of TPMS Based on Wireless Sensor Network,", International\
4. Conference on Intelligent System Design and Engineering Application, 2010.
5. F. Leens, "An introduction to I2C and SPI Protocol," IEEE Instrumentation and Measurement Magazine, 2009.
6. L. Liu, X. Zhou, "Design of Intelligent Tire Safety Pre-alarm System Based on ARM9" International Conference on Informatics,2010.
7. M. Shao, W. Guo, "Tire Pressure Monitoring System," 978-1-4244- 9439-2/11
8. J. Zhang, Q. Liu, Y. Zhong, "A Tire Pressure Monitoring System Based on Wireless Sensor Networks Technology," International Conference on Multi media and Information Technology, 2008
9. B. Fleming, "Tire Pressure-Monitoring Systems Rollout," IEEE Vehicular Technology Magazine, 2009.
10. M. Kowaleski, "Monitoring and Managing Tire Pressure," IEEE Potentials, 0278-6648/04.
11. Z. X. Wang, Y. Xu, G. J. Wang, "Design and Implementation of Tire Monitoring System Based on Zigbee", 978-1-4244-09.
12. Q. Zhang, B. Liu, "Design of Tire Pressure Monitoring System Based on Resonance Frequency Method," IEEE/ASME International Conference on Advanced Intelligent Mechatronics, 2009

BIOGRAPHY

Sharda T. Mule is a student of Master of Engineering in Electronics and Telecommunication Department, Deogiri institute of Engineering and Management studies, Aurangabad. Babasaheb Ambedker Marathwada University. She Recevied Bachelor of Engineering(BE) in 2013,Aurangabad,Maharashtra,India.