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TIRE PRESSURE MONITORING SYSTEM USING WIRELESS COMMUNICATION

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ABSTRACT

Tire pressure monitoring system is an electronic system that monitors the air pressure and temperature of an automobile tire in real time and alerts the driver by a horning alarm and display the real time pressure as well as temperature on a LCD. A drop in tire pressure results in decreased mileage, tire life, safety and vehicle performance. This paper presents a Tire pressure monitoring system that results in Improved Mileage, long tire life, reduce number of accidents, proper handling of vehicle etc.).The whole programming is controlled by a microcontroller that is loaded with an intelligent embedded c program. The main advantage to introduce such a system is to reduce the number of accidents and a lot of inconvenience during driving and to increase the durability of tires, fuel Mileage and to provide proper vehicle handling. The pressure and temperature are displayed on the physical interface i.e. LCD Screen with the help of a Radio Frequency Identification (RFID)

KEYWORDS: *Microcontroller, RFID, LCD, Wireless Network, Pressure sensor, Transmitter, Receiver.*

I. INTRODUCTION

Tire pressure Monitoring System is a newer way to measure the tire pressure in real time. When the pressure goes low it alerts the driver by a horning alarm. This projects consists of two sections i.e. Transmitting section and the Receiving section. The transmitting unit is present inside the tire and the receiving unit is present near the steering or the meter display. The Transmitting section measures the real time air pressure with the help of a sensor BMP085 and transmits the current value of the temperature and pressure to the receiving section and displays the current value of the pressure on the LCD screen wirelessly using RFID. RF communication works by creating electromagnetic waves at a source and being able to pick up those electromagnetic waves at a particular destination.The whole concept is based on the programming of a microcontroller that is loaded with a intelligent embedded C program to perform the specified task**.**

II. LITERATURE REVIEWS

According to Mike Dale[1] TPMS are designed to solve the problem of under inflated tires but current monitoring equipments might not up to speed. Walter H. Waddell measures tire rolling resistance as a function of inflation pressure and Estimate fuel losses due to varying tire re-inflation time period. Increases in tire operating temperatures significantly increases monthly air loss rates [3]. Stephan van Zyl, Sam van Goethem, Stratis Kanarachos, Martin Rexeis, Stefan Hausberger, Richard Smokers have performed a study on "Tyre Pressure Monitoring (TPMS) as a means to reduce Light-Commercial Vehicles (LCVs) and Heavy-Duty Vehicles (HDVs) fuel consumption and CO2 emissions"[4].

III. NEED FOR SUCH A SYSTEM

All tires naturally lose air pressure due to leakage and seasonal temperature changes. Some of the failure because of improper tire pressure are

- Tire Failure
- Shorter Tire Life
- Higher Fuel Consumption
- Minimised Vehicle safety

At present Era people are very busy and they can run continuously for achieving their day to day goal. If such a system is present in their vehicles than they can manage their day to day goals easily because if they were aware about the tire pressure of the vehicle they can drive without facing any trouble and inconvenience and which save their precious time. In order to reduce the above inconvenience during driving Tire Pressure Monitoring System are necessary and also in the upcoming years this system became an essential part of all the vehicles.

IV. OBJECTIVE

The main objective of such a system is to add intelligence to car and reduce number of accidents and lot of inconvenience during driving .i.e. reduce accidents due to improper inflated tires, increase tire life and safety of the vehicle, durability of tires, reduce vehicle's fuel consumption.

V. BENEFITS

All the system which are developed are designed for human welfare to achieve more benefits in order to make human life easier. There are number of benefits which makes such a system important. Some of them are

- Improved Vehicle Safety
- Decreased Rate of tire tread wear
- Improved mileage
- Reduce green house Gases emission

VI. COMPONENTS REQUIRED

The main components of this system are

- IC ATMEGA168
- PRESSURE SENSOR
- LCD
- RF Transmitter & Receiver

VII. COMPONENT DESCRIPTION

7.1- ATmega 168:-

The ATmega 168 combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit. The Atmel ATmega168 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega168 achieves throughputs approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed.

7.2- Pressure Sensor:-

The BMP085 is a high precision digital pressure sensor for various applications. The BMP085 is used because of its robustness, high accuracy and linearity as well as long term stability and faster conversion time. The BMP085 is fully calibrated and can be used directly because it does not require any external power supply.

7.3- LCD:-

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.

7.4-RF Transmitter:-

RF transmitting module is used to transmit the pressure and temperature data to the receiving unit. This module lies inside the tire. It operates in the voltage rate of 2-12V.

Figure 1: RF Transmitter

7.5- RF Receiver:-

This is used to receive the pressure and temperature data that is being sent by the transmitter. It ranges upto 500ft depending upon the power supply of the transmitter. It is extremely small in size and light in weight. The receiver is operated at 5V.

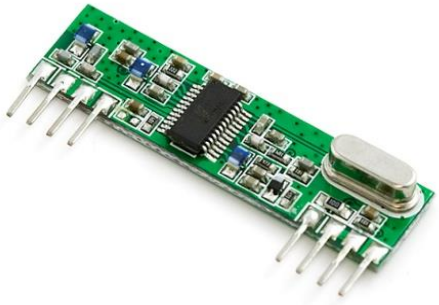
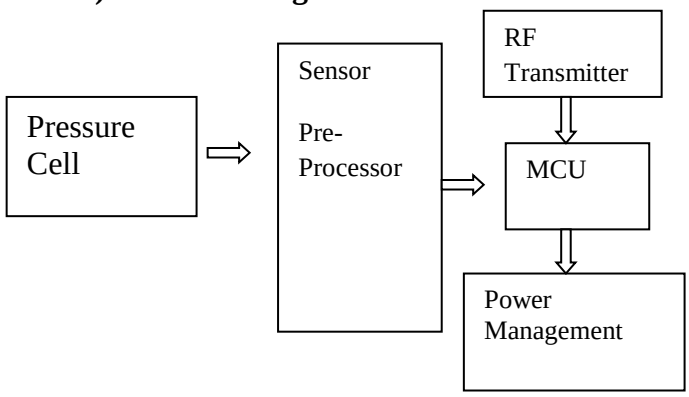


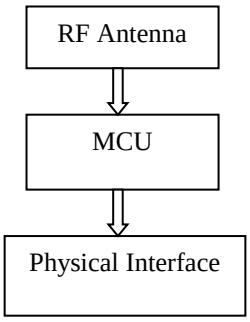
Figure 2 : RF Receiver

VIII. BLOCK DIAGRAM

a) Transmitting Unit



b) Receiving Unit:



IX. WORKING

The working of this system is quite simple to understand. Let us consider a simple flow chart in order to understand the working.

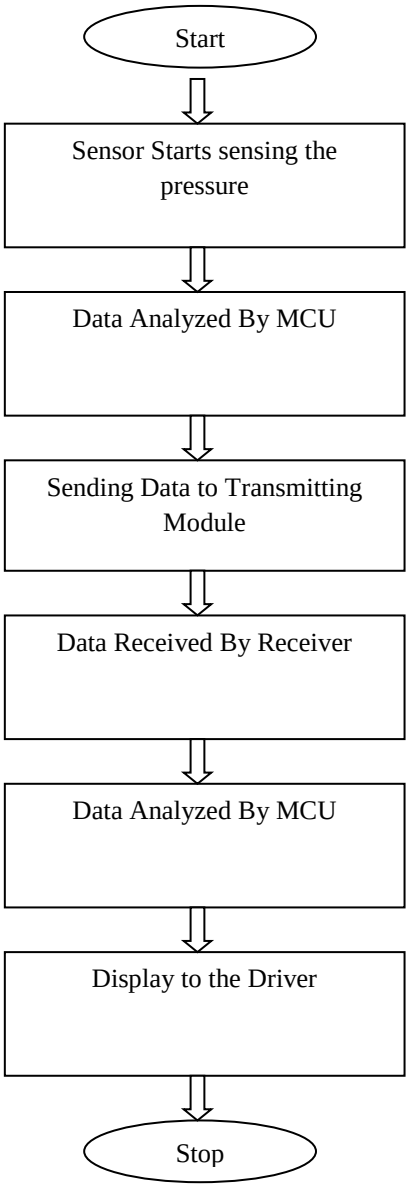


Figure 3 : Flowchart

When the sensor starts sensing of pressure it transmit the value of pressure along with temperature to the RF transmitting module and the microcontroller analyze these values and transmit these data with the help of RF Transmitter to the RF Receiver and the current pressure and temperature data are displayed on the LCD screen. In this we use 7805 voltage regulator IC to maintain the voltage level automatically. RF communication works by creating electromagnetic waves at a source and being able to pick up those electromagnetic waves at a particular destination. These electromagnetic waves travel through the air at near the speed of light. The wavelength of an electromagnetic signal is inversely proportional to the frequency; the higher the frequency, the shorter the wavelength. The RF communication system then utilizes this phenomenon by wiggling electrons in a specific pattern to represent information. The receiver can make this same information available at a remote location i.e. communicating with no wires.

X. SIMULATED CIRCUIT DIAGRAM

a) Transmitting Section

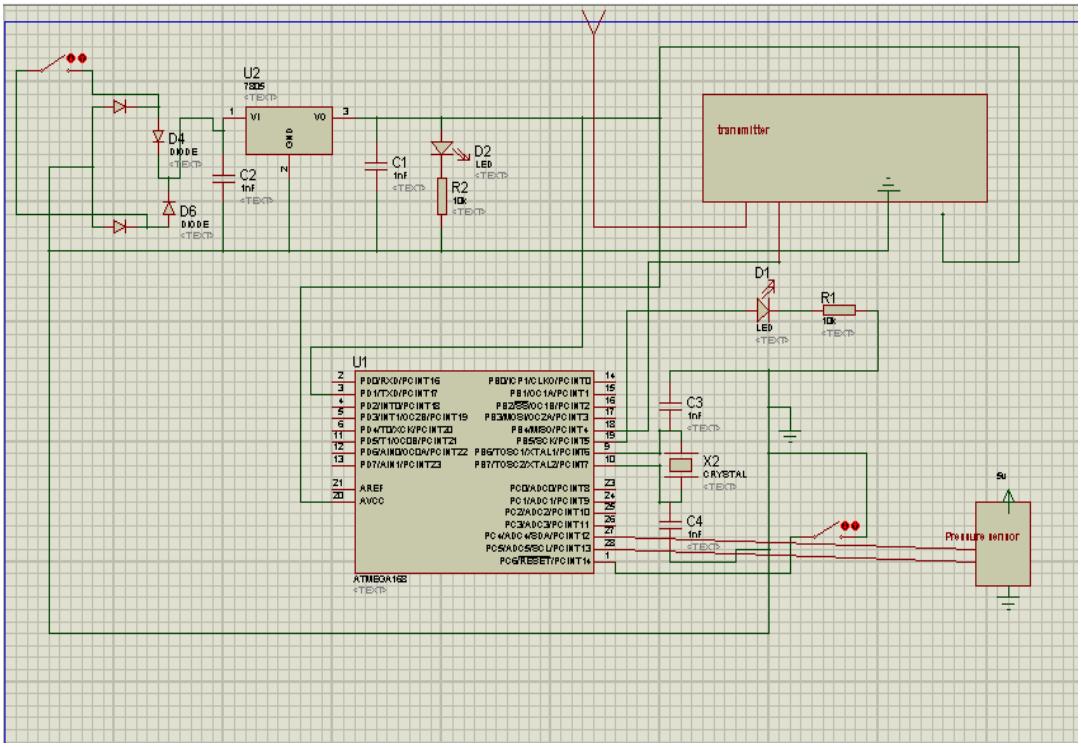


Figure 4: Simulated Circuit Diagram Of Transmitting Section

b) Receiving Section

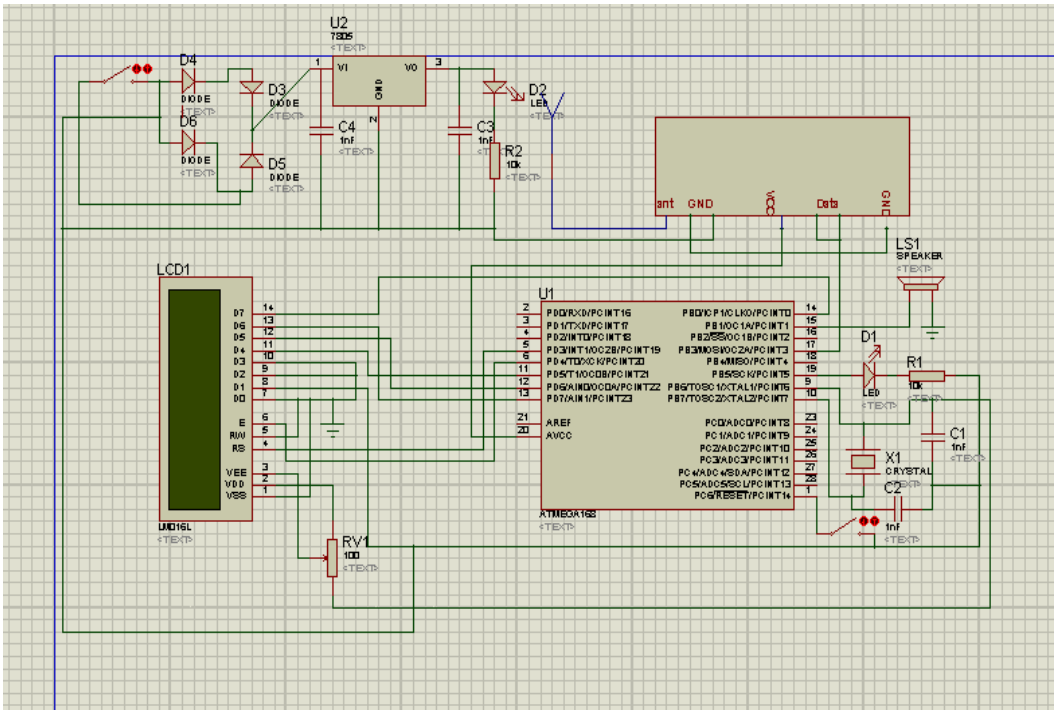


Figure 5: Simulated Circuit Diagram Of Receiving Section

XI. RESULTS

The calibrated pressure and temperature data measurements are being observed and displayed on the LCD Screen. As the pressure varies and reaches below the lower limit it alerts the driver by a horning alarm.

Figure 6: Value of Pressure & Temperature on LCD Screen

XII. CONCLUSION

This system utilizes integration techniques to provide a solution to measures real-time tire pressure and also alerts the driver about improperly inflated tires. This system is an essential feature in all the vehicles. The system ensures calibrated tire pressure which is important for tire life, reduce number of accidents, proper handling of vehicle and vehicle's fuel consumption. The durability of tires can also be increased if we use Nitrogen gas. The tires that are filled with nitrogen gas can lasts up to Six Months.

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