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Implementation of Tire Pressure Controlling System for Vehicles

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Abstract

Today safety of the human life is major concern. Nowadays about 75% of the causalities has been observed due to the accidents during transport of the vehicle. These are especially due to the flaw in the tire pressure. Tire break avoiding is very important for safe driving in superhighway. So we need a controlling system not monitoring system to maintain the tire pressure as inflation pressure recommended by the tire company.

Keywords: TPCS, RF module, microcontroller Atmega8, pressure sensor.

Introduction

The main aim of our project is to control the tire pressure, when it exceeds or falls behind the specified inflation pressure of the tire and also to warn the driver during such drastic conditions. Here, the proposed work Wireless Tire Pressure Controlling System (TPCS) for Vehicles using ZigBee/RF detects if there is a variation in the inflation pressure of the tire recommended company, with the help of pressure and temperature sensors, and then those information are sent to the central Controlling Systems. The central Controlling System warns the driver and also maintains the tire pressure by opening or closing the air valves in the tire automatically, as well as activating the air compressor if the pressure is low. The safety of driving improves as TPCS automatically detects the tire pressure and temperature in real time and controls the tire pressure which prevents bursting of tire thereby avoiding the possibility of an accident.

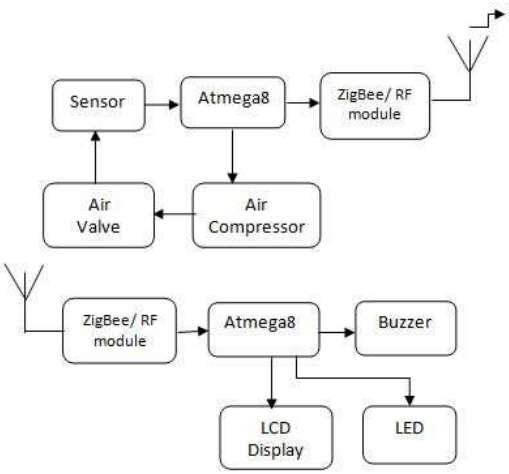
Methodology

The project aims at developing a TPCS, which displays the tire pressure onto a LCD wirelessly using ZigBee/RF module. The proposed system provides the facility of dynamically changing the tire pressure limit setting. TPCS alerts the driver by horning alarm if the tire pressure is high or low and also maintains the tire pressure using air compressor and valve.

TPCS is a new standard for improved vehicle safety. This system is an important and growing safety feature in newer vehicles. The proposed system utilizes advanced integration techniques to provide a TPCS solution that provides real-time tire pressure controlling and alerts the driver to improperly inflated tires.

The controlling device system of the whole systems is a MCU ATMeg8. The project can be divided into two sub systems; one present in the tire which helps in sending current tire pressure through ZigBee/RF module based wireless communication. The other system is present in the car dashboard, which receives the current pressure and continuously controls it. Also, it displays the pressure onto a LCD display. This system is capable of alerting in case of improper inflated tires. When the pressure is low, then the air compressor is activated to maintain the correct pressure in the tire. If the pressure is high then the air valve is opened to reduce the air pressure. The provision of dynamic pressure setting is available in the car system.

Block Diagram



Block Diagram Explanation

A. *Microcontroller*

ATmega8 is a low-power CMOS 8-bit microcontroller based on the AVR RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega8 achieves throughputs approaching 1 MIPS per MHz, allowing the system designed to optimize power consumption versus processing speed.

The Arduino Uno is a microcontroller board based on the ATmega8. The controlling device system of the whole systems is a MCU ATMeg8. The project can be divided into two sub systems; one present in the tire which helps in sending current tire pressure through ZigBee/ RF module based wireless communication. The other system is present in the car dashboard, which receives the current pressure and continuously controls it.

B. *RF Module*

This RF module comprises of an RF Transmitter and an RF Receiver. The transmitter/receiver pair operates at a frequency of 434 MHz An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin 4. The transmission occurs at the rate of 1Kbps - 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter. The RF module is often used along with a pair of encoder/decoder. The encoder HT12E is used for encoding parallel data for transmission feed while reception is decoded by a decoder HT12D.

433MHz module, use a 173mm antenna length of wire.

C. *Pressure sensor*

The SPD100G Pressure sensor has sense the pressure range is 5 to 100psi or 6.5bar.

The two types of sensor is gauge and absolute. The output voltages of both types are proportional to the pressure that is measured. This sensor is comfortable for atmega8. SPD100G sensor maximum output voltage is 240mV. So we are using amplifier circuit is converted to 5v.

Span

The typical full-scale span is 140 mV and the typical temperature coefficient of the span equals -22 %FS/100 C.

Linearity

The linearity is defined as the maximum deviation from the best fitted Straight line.

D. *LCD Display*

The LCD display is used to display the pressure value, and operation states details.

E. *Alarm Indicator*

This system is capable of buzzer alerting in case of improper inflated tires. Tire pressure control system alerts the driver by horning alarm if the tire pressure is high or low and also maintains the tire pressure.

Pressure Calculation

Arduino Atmega8 micro controller to read the sensor value

Sensor value = analogRead(sensor Pin);

$$\text{Pressure} = \frac{\text{Vin} * \text{Vref} * 27}{1023 * 5.0} \text{ PSI}$$

Vin – input voltage.

Vref - Reference voltage.

Software Development Tool

The software for the Atmega8 is developed using Arduino compiler. The development tools can be easily downloaded from the website www.arduino.cc for Atmega8.

Wireless Communication

The wireless communication in the system is the transmitter and receiver side. The transmitter to send the data in RF Module while all the receiver remains in receive mode. When the Rf signal is receive then the corresponding signals are converted in to digital data, and the data is displayed using LCD Display.

Conclusion

Tire Pressure Controlling Systems (TPCS) are a new standard for improved vehicle safety. These systems are an important and growing safety feature in newer vehicles. The proposed system utilizes advanced integration techniques to provide a TPCS solution that provides real-time tire pressure controlling and alerts the driver to improperly inflated tires. Tire pressure controlling system (TPCS) is implemented in the vehicles to control the variations in tire pressure. The safety of driving improves as TPCS automatically detects the tire pressure, temperature in real-time and warns the drivers, and activate the compressor to maintain the pressure, which prevents bursting of tire thereby avoiding the possibility of an accident. We are aiming at reducing 75%of accidents to less than 10%.

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