WIRELESS ADVANCE TIRE PRESSURE MONITORING SYSTEM

Dheeraj Kumar[1], Manish Chamoli[2], Ms. Rasveen[3]

[1, 2]Student, [3]Assistant Professor

Dept. of Electronics & Communication Engineering

Dronacharya Group of Institutions, Greater Noida, India

Abstract— This project is to design a system which monitors the vehicle tire pressure and thus provide air pressure data to the driver through LCD display. The proposed project will improve safety and vehicle performance. In the project pressure sensor is used which adds intelligence in car and reduce number of accidents.Our project will display the current pressure data of tires with high/low pressure warning. Also if the air pressure is constantly decreasing in tires it gives an indication of tire puncture. Due to presence of piezoelectric sensor,this project do not require an additional source of battery for power supply.Hence, it will provides safety to the driver & vehicles and also increase the life of tires.

Index Terms—Pressure Sensor, Arduino, LCD Display, Monitoring, Transmitter & Receiver, Piezoelectric.

I. INTRODUCTION

According to Ministry of Road Transport and Highways India, 35-40% of accident have been due to tire bursts in the past 5 Years. The main reason of Tire burst is Under-inflated tires. Under-inflated tires also increases problems such as decreased tire life, blowouts and handling. Air pressure should always be at appropriate value which minimize wear and tear of tires. Also at high or low pressure stopping distance will increased drastically which may lead to an accident. High pressure may burst out the tire while driving at high speed which may lead to an accident. Our project will display the current pressure data of tires with high/low pressure warning. Also if the air pressure is constantly decreasing in tires it gives an indication of tire puncture. Hence, it will provides safety to the driver & vehicles and also increase the life of tires.

II. OBJECTIVE/AIM

The aim of this project is to design and develop a tire pressure monitoring system which monitors the vehicle tire pressure and thus provide air pressure and temperature data to the driver through LCD display.

III. NEED FOR SUCH A SYSTEM

Naturally, tires loses air pressure because of change in seasonal temperature and leakage. If such type of system is present in vehicles then driver is attentive about the Under-inflated tires and the problems which increased by Under-inflated tires, such as

- Decreased tire life
- Blowout
- Increased Fuel Consumption
- Reduced Vehicle Safety

IV. RESOURCE REQUIRED

- ARDUINO UNO

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains 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.

- PRESSURE SENSOR

The BMP180 is precision sensor from Bosch is the best low-cost sensing solution for measuring barometric pressure and temperature. Because pressure changes with altitude you can also use it as an altimeter. The BMP180 is fully calibrated and can be used directly because it does not require any external power supply. The sensor is soldered onto a PCB with a 3.3V regulator, I2C level shifter and pull-up resistors on the I2C pins.
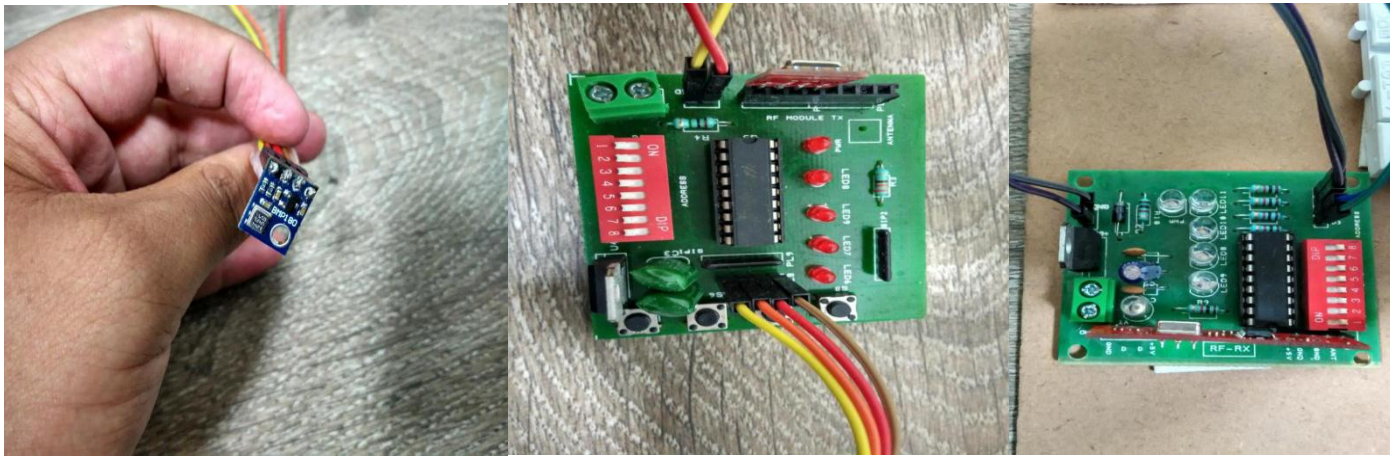
PRESSURE SENSOR   TRANSMITTER   RECIEVER

- **RF TRANSMITTER & RECEIVER**
    In this project, we use RF transmitter & receiver for transmitting & receiving the temperature and pressure data. The Transmitter module implements inside the tire and the operational voltage rate of transmitting module is varies from 2-12V.
RF receiver ranges depends on the power supply of the transmitter, the maximum ranges is up to 500 ft.It is light weigh and short in size, the operational voltage is 5V.

- **LCD PANEL WITH DRIVER**
    In this project, we use a 16*2 LCD to monitor the temperature and pressure of tire. This LCD panel can display 16 characters per line and 2 such lines are present. This display has 5*7 pixel matrix for each character. This LCD panel consists two registers, Data and Command. The operation of command register is to store the command instructions which were given to LCD and data register is to store the data and displayed on the LCD.
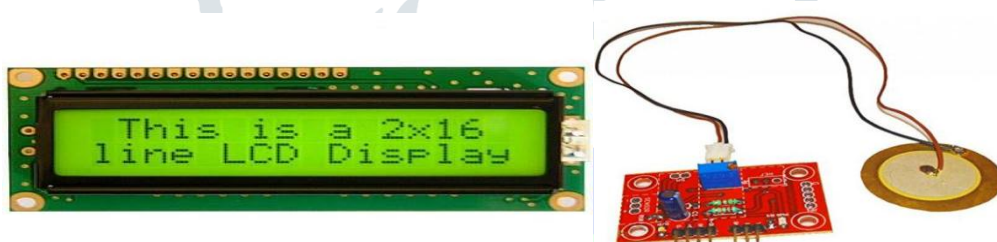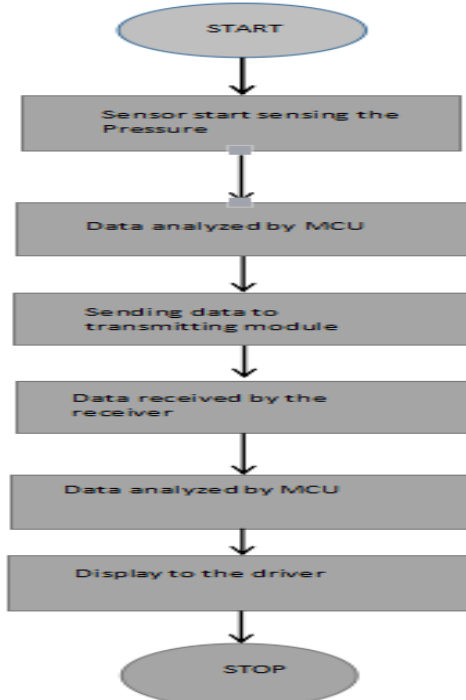

LCD PANEL   PIEZO SENSOR

- **PIEZOELECTIC SENSOR**
    A piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in temperature, pressure, or force by converting them to an electrical form(Voltage/Charge). The piezo word is from Greek which means 'press' or 'squeeze'.

V. WORKING FLOW CHART

VI. ARDUINO PROGRAMMING

```
SFE_BMP180_tommorow

#include <SFE_BMP180.h>
#include <Wire.h>
#include <LiquidCrystal.h>
LiquidCrystal lcd(8, 9, 10, 11, 12, 13);//RS,EN,D4,D5,D6,D7

SFE_BMP180 pressure;

#define ALTITUDE 1655.0
#define LCD_2LINE 0x08
#define LCD_1LINE 0x00

void setup()
{
  Serial.begin(9600);
  Serial.println("REBOOT");

  if (pressure.begin())
    Serial.println("BMP180 init success");
  else
  {

    Serial.println("BMP180 init fail\n\n");
    while(1);
  }
}

void loop()
```

```
SFE_BMP180_tommorow

void loop()
{
  char status;
  double T,P,p0,a;

  status = pressure.startTemperature();
  if (status != 0)
  {
    // Wait for the measurement to complete:
    delay(status);


    status = pressure.getTemperature(T);
    if (status != 0)
    {
      // Print out the measurement:
      Serial.print("Temperature:");
      Serial.print(T,2);
      Serial.print(" deg C, ");
      Serial.print((9.0/5.0)*T+32.0,2);
      Serial.println(" deg F");

      status = pressure.startPressure(3);
      if (status != 0)
      {
        // Wait for the measurement to complete:
        delay(status);
```

```
SFE_BMP180_tommorow

        // Wait for the measurement to complete:
        delay(status);

        status = pressure.getPressure(P,T);
        if (status != 0)
        {
          // Print out the measurement:
          Serial.print("Pressure:");
          Serial.print(P,2);
          Serial.print(" mb, ");
          Serial.print(P*0.0145038,2);
          Serial.print("psi");

          lcd.print("Pressure:");
          lcd.print(P*0.0145038,2);
          lcd.println("psi");


        }
        else Serial.println("error retrieving pressure measurement\n");
      }
      else Serial.println("error starting pressure measurement\n");
    }
    else Serial.println("error retrieving temperature measurement\n");
  }
  else Serial.println("error starting temperature measurement\n");

  delay(300);
```

VII. MARKET POTENTIAL

As this system uses a RF module and a piezoelectric sensor, it makes it cost efficient, which increase the chances of the consumer actually buying it. The major competitive advantage in this project is also the market potential, that is cost efficiency. When a consumer goes to the market to buy a particular product then, other than the quality another important factor that plays a vital role is that "how much it costs?". Our product being very much less in cost than the other similar products available in the market can become the consumers preference. Being able to tell the amount of pressure, current pressure and flat/leak notifications in the tire it also helps to reduce the amount of fuel consumption, which is another leading factor while buying TPMS. This system takes cares of all important aspects, which results in an increase in life expectancy of the tire, fuel efficiency, which leads to proper vehicle security and improved performance.

VIII. INNOTIVE & USEFULLNESS

Innovative:

Our project has made itself innovative one, due to our additional features which makes it cost efficient and secure. The additional features are as follow.

1. The transmitting unit that is installed inside the tires. Therefore making the system immune to the environment and to theft.
2. Due to presence of piezoelectric sensor,this project do not require an additional source of battery for power supply.
3. A RF receiver and transmitter Module makes the system updated and cost efficient.

Usefulness :

1. Designed for human welfare.
2. Upgraded mileage.
3. Reduction in green house gas emission.
4. Reduction in rate of tire's wear and tear.
5. Improves vehicle safety.

IX. CONCLUSION

This project apply combination of techniques to implement a solution to measures time-to-time tire pressure and also provide air pressure data to the driver through LCD display. This system should be required necessary in the vehicles. The system ensures measured tire pressure which is important for preventing the problems which was due to Under-inflated tires, such as Decreased tire life, Blowout, Increased Fuel Consumption, Reduced Vehicle Safety. If we use Nitrogen gas, the durability of tires can also be increased .
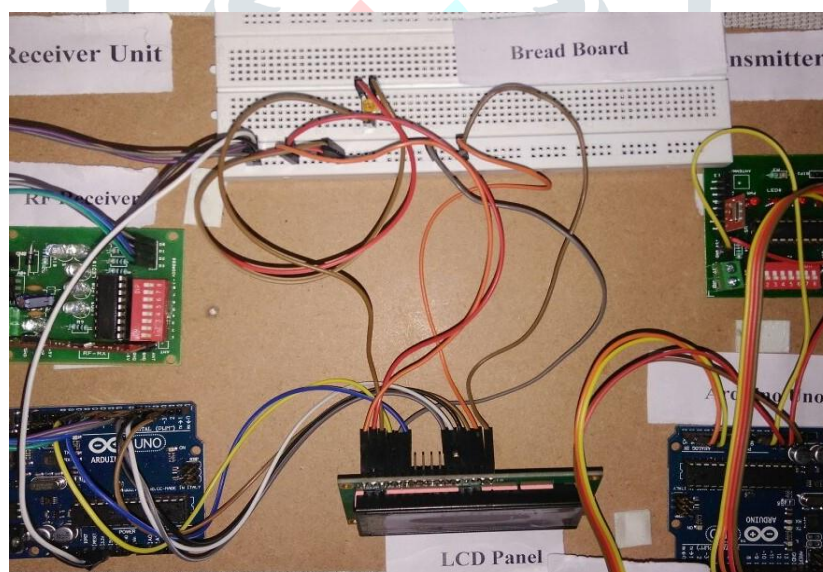
X. ACKNOWLEDGEMENT

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