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Automatic Tyre Pressure Inflation System with Voice Recognition

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Abstract: Under inflation is one of the leading causes of tyre failure. If tyre pressure is too low, too much of the tyre's surface area touches the road, which increases friction and can cause the tyres to overheat, which can lead to premature wear, tread separation and blowouts. As we are aware that maintenance of correct tyre pressure is extremely important for the enhancement of tyre life. Due to drop in the pressure the tyre goes underinflated stage, it reduces fuel economy, quickest tyre wear, not proper rolling and discomfort ride etc. The system solves out all these problems. We develop an automatic tyre pressure inflation with voice recognition system, which will properly inflate the tyre all the times. To develop the system, this recognizes and sends the signal as voice command to indicate air pressure in respective tyre when its pressure goes below the desired/required pressure (under inflated condition). Underinflated tyres overheat more quickly than properly inflated tyres, which cause damage to tyres. To reduce this problem we are designing this system. Greater to overcome this problem, we are designing this automatic tyre pressure inflation system with voice recognition.

I. INTRODUCTION

According to a study, approximately 80% of the vehicles on the road are driven with one or more tyre under inflated. Tyre loses air during normal driving (especially after hitting pot holes or curbs) and seasonal changes in temperature. The vehicle can also lose one or two psi (pounds per square inch) each month in winter and even more in the summer and you can't feel if they are properly inflated just by looking at them. This is a system which is installed on the vehicle that enables the operator to sense the pressure and delivers the voice recognition to drivers. In case of under pressure the tyre pressure is maintained inflate the tyre to the required level if there is a drop in the tyre pressure and there has to be identified the height of wheel by sonar sensor and it triggers the program to give an voice recognition in the system.

Tyre pressure plays an important role in the safety and fuel consumption considerations of automobiles. Vehicles moving with low tyre pressure will consume more fuel. Leakage of air from tyre, if not detected, can cause serious problems during running of vehicle. The proposed designed keeping these vital considerations in view. Most vehicle owners are unaware of the fact that their tyres are not at the exact pressures because it is difficult to determine the tyre pressure visually; so we have design the project to make the system. Improper tyre pressure is a safety issue that is often overlooked or ignored. A drop in tyre pressure by just a few pounds per square inch (Psi) can result in the reduction of fuel mileage, tyre life, safety, and vehicle performance. To address this problem, the system which needs for actively maintaining tyre pressure was designed. This report documents the design process for an on board tyre pressure management system consisting of sonar sensor, microcontroller, voice module, output amplifier, wheel. The system takes periodic tyre pressure readings and makes adjustments according to the desired pressure setting. This comes with several pre-defined tyre pressure settings and allows the user to enter their own pressure setting if needed. Pressure settings, current pressure and notifications are all displayed on a located in the dash board. This system will take the maintenance out of upholding tyre pressure and increase tyre life, fuel efficiency and vehicle safety and performance.

II. OBJECTIVE

The main objectives for the system

- A. To develop an inflating system that will decrease tyre wear.
- B. To improve fuel economy, performance and safety of a passenger vehicle through dynamically- adjustable tyre pressures.
- C. Maintains the required tyre pressure: The function of the system is to maintain and identifies the pressure in all the tyres of the system according to varying load and driving conditions.

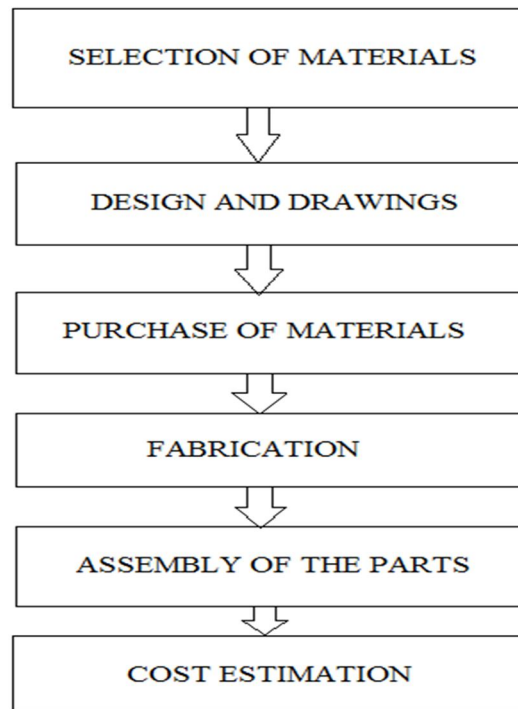
III. PLAN OF WORK

A. Selection of Materials

Before starting any project, the planning is essential. It is the process of thinking before doing and determining the future course of action to be done, while planning a project each and every steps should be analysed carefully with all related things. The proper selection of the material for a particular job.

To choose the optimum combination of properties in a material at the lowest possible cost without compromising the quality. Selection of material based on stiffness, cost, availability and suitability of materials.

B. Design And Drawings



The design factor should be carefully considered. Detail drawings are necessary for designing and also fabricating the project. Development and modification of the system should be in the simplest form.

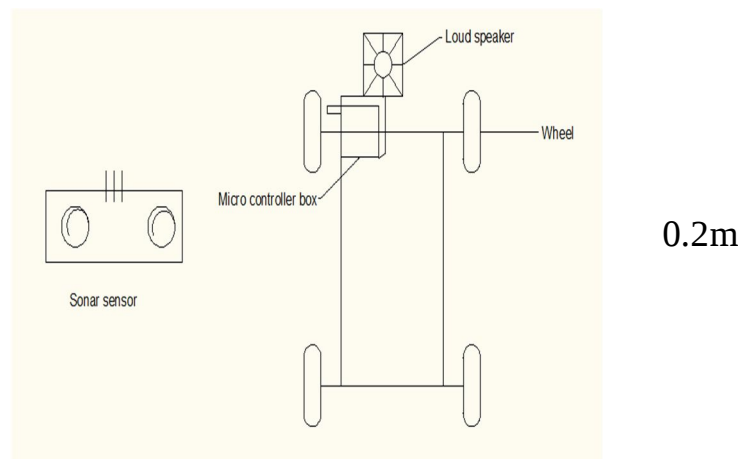


Fig 3.2: Design diagram

C. Purchase of Materials

It is difficult to manufacture all the components required for fabrication in the machine shop itself. The decision about particular component whether to be purchased or manufactured is decided after making a study of relative merits and demerits of direct purchase and self-manufacture.

Sonar sensor
Output amplifier
Microcontroller
Wheel
Tyre

D. Fabrication

Next step of the project is to select the best method of manufacture, so that the wastage of materials, man power, machine power and time can be reduced to a greater extent. By comparing various methods, the best method of manufacturing is to be

selected. The purpose of necessity of operation and machine tools used to do the jobs are considered while selecting the best method of manufacture.

Dimensional stability,

Strength,

Toughness,

Heat resistance,

Corrosion resistance,

Fatigue and creep resistance,

Electrical and thermal conductivity etc.

E. Assembly of the Parts

The fabricated and purchased components are assembled together to complete the fabrication process.

F. Cost Estimation

Cost estimation can be calculated by considering the material cost, labour cost, transportation charges etc.

Material cost

Labour cost

Transportation cost

In most of the cases, the cost of raw material accounts about 50 % of the finished cost. Obviously, the cost of the material is a major factor which influences the choice of the material or process. We must note that the use of cheaper material will not always reduce the final cost of the component or product. Use of cheaper material may be associated with higher processing cost due to large number of operations to be performed and also more scrap. We can easily see that this sometimes makes the overall cost more than that of expensive raw material in combination with low processing cost due to lesser number of operations and lesser scrap. The type of material affects the detailed aspect of design and hence the choice of material as well as the process is selected at the early design state *e.g.* whether the material is to be joined by spot welding, screws or rivets, must be decided at the design state.

IV. WORKING PRINCIPLE

First of all the sonar sensor is fixed in the frame which is nearer to the wheel. The function of sonar sensor is to calculate and measure the distance. Here the ground acts as a barrier, whereas from the frame to the ground a distance is calculated. The reference distance tends to be consistent until the pressure drop occurs in the tube which is present in the tyre. The indication won't be created for the precise variation. More than 5% to 7% under inflation occurs means the triggering tends to get takes place. Hence overall view for using sonar sensor is to identify and monitor the pressure variance in the tube. Which further follows to the triggering process. The triggering signal transferred or sensed in the microcontroller. Whereas from the microcontroller the signal is transferred to the voice module.in this module convert the output amplifier is in belief .its purpose is to amplify the output signal obtained here is audio signal.t e audio signal is experienced by the humans through the speaker which is used. Overall view of this setup is to sense the pressure drop in the tube by analysing the distance, after sensing which further followed to the microcontroller to the speaker in the form of audio signal.

Our project consist of the control unit, sonar sensor and tyre model. We are using sonar sensor to measure the distance and ground acts as a barrier. The level of pressure already programmed in control unit. Pressure level is decreased the sensor gives signal to the control unit. Microcontroller the signal is transferred to the voice module.in this convert the output amplifier. Finally got an audio signal.

V. PROGRAM FOR THE CIRCUIT

```
#include <LiquidCrystal.h>;
```

```
LiquidCrystal lcd(1,2,4,5,6,7);
```

```
const int trigPin=9;
```



```
const int echoPin=10;

int Led= 13;

long duration;
int distance;

void setup() {
  lcd.begin (16,2);
  pinMode (Led, OUTPUT);
  pinMode (trigPin, OUTPUT);
  pinMode (echoPin, INPUT);
  Serial.begin (9600);
}

void loop() {

  digitalWrite (trigPin,LOW);
  delayMicroseconds (2);

  digitalWrite (trigPin, HIGH);
  delayMicroseconds (10);
  digitalWrite (trigPin, LOW);

  duration = pulseIn (echoPin, HIGH);
  distance = duration/58 ;

  Serial.print ("Distance: ");
  Serial.print (distance);
  Serial.println (" cm");
  delay (120);

  lcd.setCursor(0,0); // Sets the location at which subsequent text written to the LCD will be displayed
  lcd.print("Distance: "); // Prints string "Distance" on the LCD
  lcd.print(distance); // Prints the distance value from the sensor
  lcd.print(" cm");
}
```

VI. ADVANTAGES

- A. The main advantage is that you don't require to check tyre pressure daily, it save the time of air filling.
- B. This will reduce the tyre wear because of uniform pressure in the tyre.
- C. The cost of the system is optimized, but increases safety, comfort and efficiency.
- D. Avoids accidents and fatality.
- E. Increase the life span of tyre.

VII. APPLICATION

- A. It can be used in military vehicles.
- B. It can be used in emergency vehicles like ambulance, police vehicles.
- C. It can be used in very costly vehicles where maintenance of standard is important.

VIII. CONCLUSION

The use of vehicles a mode of transport is notably growing by day and the ultimate goal of the engineering discipline would be to ensure satisfactory service provision. proper and efficient tyre pressure maintenance is one of the answers to such end over and as such this design project contribute an idea that can be implemented and be of great savings to motorists.



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