A smart dashboard -vehicle monitoring system

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Abstract- Drivers very often disregard the condition of tires and the value of the prevailing pressure in them. Changes in the value of air pressure in a tire have a significant impact on driving comfort, fuel efficiency and road safety. We have designed a TPMS system using Raspberry Pi to measure bike's tire pressure. Normally bikes don't have any tire pressure sensors fitted in. We are using Raspberry Pi to read the sensor values and display on Smart LCD display fitted on the smart dashboard. It also displays personal information of owner of the bike, such as his or hers' DL, RC, Insurance and other documents which are related to their bike. Along with it, we have also implemented an authentication of valid owner in case of theft by making use of smart hidden camera.Keywords: TPMS, Raspberry Pi, Smart display, Authentication, Smart hidden camera.

I. INTRODUCTION

Embedded System

An embedded system is a programmed controlling and operating system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. Embedded systems control many devices in common use today.

An embedded system has three components −

- It has hardware.
- It has application software. It has Real Time Operating system (RTOS) that supervises the application software and provide mechanism to let the processor run a process as per scheduling by following a plan to control the latencies. RTOS defines the way the system works. It sets the rules during the execution of application program. A small scale embedded system may not have RTOS.

Tire-Pressure Monitoring System

A tire-pressure monitoring system (TPMS) is an electronic system designed to monitor the air pressure inside the pneumatic tires on various types of vehicles. TPMS reports real-time tire- pressure information to the driver of the vehicle, either via a gauge, a pictogram display, or a simple low-pressure warning light.

Smart Display

At times of some sudden emergencies that leads to circumstances like forgetting of the documents such as Driving License (DL), Registration Certificate (RC) and insurance of the vehicle, this idea of smartly displaying all of the above mentioned details by the help of LCD screen or dashboard would be of a great help.

System Authentication

The system of authentication is done through implementing camera app. In case of any stolen aspects the system returns the picture of a thief or unauthorized user to the authorized user through GPS. This enhances the security of the vehicle.

Problem Statement

To design a smart dashboard that displays the details of vehicle, tire pressure and alerts the authorized owner in case of any theft.

Objectives

- To alert the user with periodic analysis of tire pressure which helps him to know problem in advance which may occur due to improper tire pressure.
- To help user with proper authentication with finger print sensor.
- To store user personal data within the display system which helps him carry his vehicle related details wherever he carries his vehicle.
- To provide improved safety.

II. LITERATURE SURVEY

In this section, we present a review of the existing and related works on Tire Pressure Monitoring System (TPMS) and User Authentication System proposed in the literature.

In paper "Implementation of Tire Pressure Monitoring System with wireless communication", the author has implemented a system for a car. It says tire replacement or maintenance will not affect the systems working. Warning is generated whenever tire pressure crosses the max or min safe pressure level, or when it changes abruptly [1].

In paper "Method and apparatus for Tire Pressure Monitoring and for shared keyless entry control", the author says that in many TPMS systems, each time a tire is replaced, the user has to go through a signup process in which the user moves a portable magnet near each tire in a particular sequence so that the receiver can learn the new tire ID code [2].

In paper "Tire Pressure Monitoring System", the author has implemented a wireless tire pressure monitoring system that warns a driver of a vehicle of low pressure in one or more of its tires so that the driver may take corrective action before a tire blowout occurs [3].

In paper "Remote Tire Pressure Monitoring System", the author has proposed a system which monitors a vehicle's tire pressures and displays real-time pressure values on a dashboard display while the vehicle is on the road [4].

In paper "Tire Pressure Monitoring System", the author says that Remote energy transmits a first RF signal when activated by the controller. A remote unit in the tire receives the first RF signal, and when the pressure in the tire is greater than a predetermined pressure, the remote transmits a second RF signal [5].

Existing System:

The TPMS were classified as two types, Wheel-Speed Based -

WSB (often referred to as "indirect") and Pressure-Sensor Based - PSB (often referred to as "direct"). Wheel-Speed Based TPMS infer tire pressures using the vehicle's ABS hardware, specifically the wheel speed sensors, to measure tire-to-tire differences in rotational velocities. Pressure-Sensor Based TPMS directly measure tire pressures with pressure sensors mounted either in each tire or on each wheel.

TPMS Evaluation Method

Two vehicles equipped with Wheel-Speed Based TPMS were studied. For all of these vehicles, the vehicle manufacturer installed the TPMS as original equipment. For each vehicle equipped with a WSB TPMS, the goals of the testing were to determine:

1. The accuracy of the TPMS.
2. The repeatability of the TPMS.
3. When the TPMS issues a warning to the driver.
4. How the TPMS issues a warning to the driver.
5. How to reset/train the TPMS when tires are replaced or rotated.

WSB TPMS cannot treat the tires independently. Therefore, to determine the sensing capabilities of each system, each vehicle was tested with multiple combinations of tires being deflated.

Six Pressure-Sensor Based TPMS were studied. One was manufacturer-installed as original equipment, while the other five were installed on test vehicles by the VRTC. In addition to the goals listed above (for WSB systems), PSB TPMS were also examined with the following additional goals in mind:

1. How the TPMS handles temperature effects.
2. What the TPMS does when the system fails.

Proposed System:

Our aim is to analyse tire pressure of the bike in real time and display in a controlled environment such as an LCD screen mounted in the bike dashboard. Our goal is not only to produce tire pressure but along with that some data related to driver as well. We are also looking to protect the data by using fingerprint module so that only dedicated user can access personal details.

III. PROPOSED METHODOLOGY

We have used a pressure sensor on the tire wall tube. Hence sensor can get the reading of the current pressure of the tire. The data of the pressure sensor will be sent to RF transmitter. The whole assembly along with power source is supposed to be fitted on the rim of the wheel. Once the data has been received from the transmitter our raspberry pi module will start processing and converting in to actual PSI, and will be sent to the display screen. For display screen we are using 5 or 7 inch touch display. And the data from raspberry pi will be sent to the display along with the diver details.

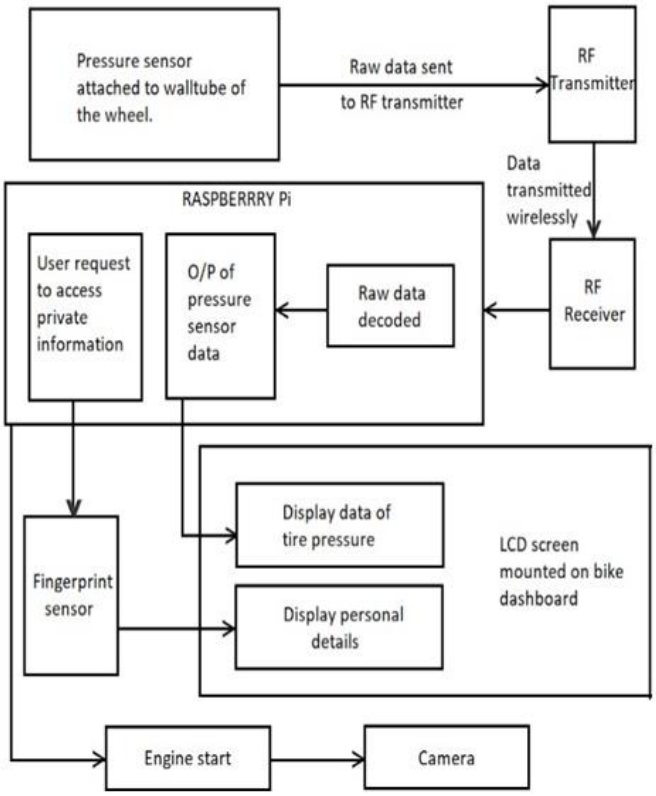

Fig.1: Block Diagram for proposed methodology.

SYSTEM REQUIREMENTS

Software Requirements

- Operating System: Raspbian OS
- Programming IDE: Python IDE
- Programming Language: Python
- Additional addons used: LCD-show Adafruit

Hardware Requirements

- Raspberry Pi
- Pi camera module()
- LCD 5 inch Screen with XPt2046 Touch
- Controller
- General RF Transmitter and receiver
- Pressure sensor BMP280 / NPP301A
- Jumper cables
- 3Ve CR2032 coin battery
- 16 GB + memory card

IV. RESULTS

Figure 2 shows the currently obtained reading after sensing pressure**.** This value is 3.53hectopascal=0.0511983214psi.

Fig.2: Values obtained**.**

V. CONCLUSION AND FUTURE SCOPE

A Smart Dashboard will stand its applications and creative characteristics in wide spectrum. Another feature that is display of the pressure in a very innovative way along with two more important features like authentication and display of owner information are very useful. This system also provides safety to the driver, reduces fuel consumption and helps the user with longer lasting tires. It also help drivers to maintain their vehicles in an eco friendly way.

In the future enhancements, the caller details on the dashboard can be displayed to the person who is driving the vehicle (if he/she uses Bluetooth), so that the user could see the caller name directly on the dashboard.

VI. REFERENCES

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