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Android-Based Car Tire Pressure Monitoring System

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Abstract

Incorrect tire pressure measurements can cause rapid damage to vehicle tires. The measurement process has been done manually. Therefore, a system is needed that can monitor tire pressure on the car directly without having to measure the air pressure on the tire manually. The purpose of this research is to design and implement an android-based car tire pressure monitoring system This data was obtained through Field Research and Library Research. The method used in this research is to use the PIECES (Performance, Information/Data, Economic, Control/Security, Efficiency, and Service) methods. The results of his analysis research are used as a basis for improving the working system of tire pressure monitoring using handphone android to measure tire pressure by testing air pressure on car tires. The results of the research on the vehicle tire pressure measurement system can help the community, both for the middle class and for the rich, so this research is important to implement.

Keywords: Monitoring; PIECES, Tire Pressure;

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Introduction

Tires are an important component of land vehicles that function to maintain the stability of the vehicle speed caused by irregularities of the road surface to increase acceleration and facilitate the movement of vehicles. Tires become a very vital component for vehicles, especially in four-wheeled vehicles, where this part is one of the main factors that often cause accidents on the road.

Tires are designed to hold air, as part of their structure. Tires that are designed to withstand air pressure have a predetermined pressure, so riders need a tire measuring device to manually check how much air pressure is in the tire usage. Non-standard tire pressure can affect tire life The existence of tires sometimes goes unnoticed by the owner when driving (Hacker, 2019). Many people feel lazy to check tire pressure intensively before driving, even though it must be done especially when the person will travel far in his vehicle. The hassle of checking the tire when going to travel using a tire pressure measuring instrument manually is the driver's laziness in taking tire pressure measurements Improper air pressure can cause rapid damage and wear to the vehicle tire, so it can trigger accidents, (Pearlman et al., 2000).

The exact tire pressure standard for each vehicle has been set by each tire manufacturer. The size of tire pressure is usually set in Pounds per Square Inch (Psi). The problem of human negligence to carry out periodic checks cannot be separated from the availability of tire pressure monitoring devices that are not widely known and used by the public. Tire air pressure must always be considered and checked periodically to stay at good pressure so that the tire can function optimally. The exact tire pressure standard for each vehicle has been set by each tire manufacturer. The size of tire pressure is usually set in Pounds per Square Inch (Psi). The problem of human negligence to carry out periodic checks cannot be separated from the availability of tire pressure monitoring devices that are not widely known and used by the public.

From the Computer Systems Study Program, Faculty of Computer Science, Narotama University of East Java Computer Systems Study Program, Faculty of Computer Science, Narotama University of East Java (Wuryaningrat et al., 2018) in his journal Tire Air Pressure Detection on Motor Vehicles for Safety Riding". The study discussed the reading of air pressure on tires, vehicles are able to display to motorists the condition of two-wheeled vehicle tires, so that in the future air pressure gauges on four-wheeled vehicle tires can overcome the risk of accidents and can save the life of vehicle tires(Elfasakhany, 2019). By using the sensor as an air pressure reader, then the results of the tire air pressure

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measurement will be sent through Bloetooth to the microconroller, which will then be processed and displayed on the LCD display (Silalahi et al., 2019).

Method

The method used to analyze this system is by using the PIECES (Performance, Information/data, Economic, Control/Security, Efficiency, and Service) methods, the reason researchers use the PIECES method in this study is because by analyzing the weaknesses, needs and feasibility of the system, this analysis activity starts from understanding and identifying the problems of the system that is running, It is agreed to make a decision if the current system is problematic or not(Li et al., 2020). it works well and the results of its analysis are used as a basis for improving the system. The analysis method also serves as a determinant of the goals that must be obtained in order to meet the needs of the user, as for the comparison analysis of the old system and the new system can be seen in the following table.

Table 1. Comparison analysis of old systems and new systems.

No	PIECES	Old System	New System
1	Performance	The current system is still less effective because it can monitor tire pressure using manual tools to monitor tire pressure.	The current system is effective because it can monitor tire pressure using Bluetooth communication that connects Android phones. to monitor tire pressure
2	Information	In the current system is still not optimal because it uses on the Liquid Crystal Display (LCD) screen. to display tire pressure results	On the current system using Bluetooth that connects Android phones. to monitor tire pressure
3	Economy	When viewed from the current system is still less economical because it is still using cable media and to monitor tire pressure.	When viewed from the current system is more economical because it is still utilizing Using Bluetooth that connects Android phones. to monitor tire pressure
4	Control	The current running system is less than optimal because it has not utilized Bluetooth technology.and Android Mobile monitors tire pressure	the current running system k optimal because it utilizes Bluetooth technology.and Android Mobile monitors tire pressure
5	Efficiency	When viewed in terms of efficiency, the current running system is still less efficient because the system has not optomal process long enough. For example, in the collection of tire pressure data	When viewed in terms of efficiency, the current running system is efficient because the system uses Bluetooth technology.and Mobile Android monitors tire pressure.
6	Services	When viewed in terms of service, the current system still uses cable media in reading tire pressure.	when viewed in terms of service, the system has used technology

Results and Discussion

Result

The monitoring to be developed focuses on car tire pressure. The learning design will be implemented with the aim of devices and sensors that take wind pressure data on tires connected to smartphones or android phones that aim to make four-wheelers can monitor tire pressure with smartphone devices made by drivers can know, monitor and maintain the stability of air pressure on the tire to drive safely and comfortably. features that will be created in the development of android-based tire pressure monitoring(Nguyen et al., 2020);(Patil et al., 2018).

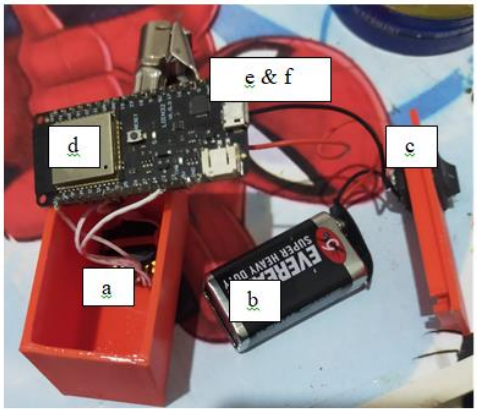

Figure 1. Hardware Design Results

In figure 1 shows a picture of an android-based tire pressure monitoring system tool, as for the explanation as follows:

1. MPX 5700 AP Pressure Sensor: Mpx 5700 AP pressure sensor is a function to measure air pressure on the tire, used for Microprocessors or Microcontroleller Mpx5700 sensor pin configuration consists of 6 pins and used only 3 pins, namely pin 1 as the output voltage, pin 2 as ground while pin 3 as input from supohkunjhynm2qply voltage of 5 volts, while the other 3 pins NC (not connects).
2. Battery: An energy source that can convert the chemical energy it stores into electrical energy that emits a voltage of 9 Volts.
3. Switch: A switch is a device used to disconnect a power grid, or to connect it.
4. IC regulator 2596 mini: An IC regulator is an electronic component used to regulate voltage in an electronic circuit. Named as IC or Integrated Circuit because this voltage regulator is composed of tens to hundreds of transistors, capacitors, diodes and resistors which integrate into each other so as to form regulatory IC components. This voltage regulator is widely found in various types of adapters that are useful for providing DC voltage for laptops, mobile phones, notebooks, and so on. In addition, in some electronic devices whose power supply or power supply is integrated with the series such as Televisions, DVD players, Desktop PCs. The function of a voltage regulator is to maintain or regulate the voltage at a certain level (according to the value on the regulator IC) automatically. This can be interpreted that the DC output voltage in the voltage regulator will be stable and not affected by the change in input voltage, this study raises ic regulator 2596 mini will issue an output of 5V.
5. Mikrokontroller ESP32: ESP32 microcontroller whose function as the main control or controller on the circuit and send data to android phones via Bluetooth.

Figure 2. Results of Installation of Tools on Car Tires

In figure 2 shows an image of the installation of an android-based tire pressure monitoring system on the tire by installing a tool on the car tire tire pentil tire tire and connecting with the android handpone with an application that has been made using the Inventor app. After assembling and installing tools on the Toyota Dyna 130 tank car using Birghstone Might Rib N750 16 14PR car tires, we need to test whether it is in accordance with the planned and also tested with some engineering conditions that may occur to develop this system. Tire pressure testing when the tank water is empty by measuring the front and rear tires with a time of 45 (forty-five) minutes with fixed test results produces the same approval.

Table 2. System Test Results on empty water tanks

Test Cast Ban	Measurement Time	Initial Pressure Psi	Measurement Time	Final pressure Psi	Result
Front	08:00 WITA	61.30 Psi	08:45 WITA	61:30 Psi	The same pressure
Back	16:30 WITA	80.52 Psi	17:15 WITA	80:52 Psi	The same pressure

Table 2 shows that the test item measures tire pressure when the water tank in the car is filled. Each type of vehicle has different tire pressures according to its shape, size, weight and function. Therefore, in addition to maintaining the performance of the vehicle to remain maximal, measuring tire pressure is an important ritual that should not be ignored because it has a great effect on the safety and comfort of driving.

Table 3. System Test Results on paved roads

Test Cast Ban	Time	Initial Pressure	Time	Final pressure	Result
Front	09:40 WITA	61.30 Psi	10:25 WITA	61:47 Psi	experienced Tire pressure increase of 0.12 Psi
Back	10:30 WITA	80.52 Psi	11:15 WITA	80:82 Psi	experienced an increase in tire pressure of 0.22 Psi

Table 3 shows that the test item measures the pressure of the front tire running on the asphalt. Tire pressure that is too high or excessive can interfere with driving comfort because hard tire conditions are very sensitive to the condition of the road passed both on paved roads and damaged roads. In addition to potentially causing damage to some parts of the vehicle due to vibrations that are too loud. In addition, it can also accelerate the occurrence of wear on the tire, especially in the middle.

Table 4. System Testing Results on the road berbeton

Test Cast Ban	Time	Initial Pressure	Time	Final pressure	Result
Front	13:30 WITA	61.35 Psi	13:55 WITA	61:59 Psi	experienced Tire pressure increase of 0.24 Psi
Back	14:00 WITA	80.60 Psi	14:45 WITA	80:92 Psi	experienced an increase in tire pressure of 0.32 Psi

Table 4 shows that the test item measures tire pressure on concrete roads.

Discussion

The problem of air pressure on car tires is often considered trivial, in fact if the pressure of the car tire does not fit, less or excess will have an impact and once felt on the performance of the car on the track, this will certainly affect comfort as well as safety in driving. In this tool there are several advantages found in the results of the analysis, namely in addition to facilitating tire pressure measurements, tools using microtrollers in which there is Bluetooth, and how the tool works easily by using android handpone to display tire pressure, there are also some shortcomings obtained in this study, namely handpone can only connect Bluetooth with one tool(Masoudi et al., 2019). The ideal tire pressure is the wind pressure on the tires recommended by the car manufacturer, usually this ideal tire pressure is written / listed on the car dashboard and car manual. In the description of the tire pressure, actually also stated information about the tire there is also the type of tire used and its size(Caban et al., 2019).

Conclusions and Suggestions

Conclusions

Based on the design results and research results of "Android-Based Tire Pressure Monitoring System" then the authors concluded. This tool is designed to use the ESP32 Microcontroller as the main device and is equipped with several other tools, namely Batteries, Switches, IC regulator 2596 mini, Bluetooth, and Android handpone, in terms of software this tool uses arduino IDE and APP Inventor.

Suggestion

In the manufacture of this tool there are several obstacles faced, then for the next opportunity so that the work of this tool is more maximal and perfect then the next research on monitoring tire pressure with android, handpone can connect Bluetooth with the tool installed on 4 (four) car tires.

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