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Designing Motorcycle Safety System Using Fingerprint Sensor, SMS Gateway, and GPS Tracker Based on ATMega328

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Abstract. A motorcycle security system has been designed using an ATMega328 microcontroller by applying fingerprint, SMS and GPS. The system consists of a GPS Module and a SIM Module. The system is designed to find the position of a stolen motorcycle via a Google Maps and create a security system on a motorcycle that uses a fingerprint sensor as a substitute for the key to turn on and turn off the motorcycle engine. ATMega328 is used as a processor, with additional GPS, GSM SIM 8000I, relay and buzzer. When a theft occurs, the system will send an SMS contained Google Maps link to the owner of the motorcycle. The results of the system design are expected to minimize the crime rate in motor vehicle theft cases.

Keyword: ATMega328, fingerprint sensor, SMS gateway, GPS tracker, SIM module.

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1 Introduction

Advances in technology and the development of human civilization from time to time, the need for human interests is increasing. This has a negative impact because it will increase the likelihood of crime. The more technology develops, the more criminal acts, including theft. Motor vehicle theft, known as curanmor, occupies the top place for criminal acts. This case seriously disturbed security and public order, and has occurred in every region for a long time [1]. The manufacturer only provides basic safeguards such as locking the handlebar and innovation of the ignition only. The work system of security like this cannot be relied on by motorcycle owners [2]. Therefore, a safety system must be made in motorized vehicles to avoid things that are not desirable [3].

Motor vehicle theft perpetrators have various experiences and modes. The mode often used by motorcycle thieves is to use the T key to break into the ignition of a motorcycle [4]. Several ways to secure yourself from the crime of robbery that is often done include preparing a

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cellphone to make emergency calls to the police station [5]. SMS Gateway is a type of two-way sms service, which combines the sending of information from a computer device on a network owned by a cellular operator [6]. Fingerprint or fingerprint sensor is a technology development that has high enough security where it can only be accessed by people whose fingerprints have been inputted into the fingerprint [7].

In cases of theft that often occur, motorized vehicles are taken away by thieves, therefore a tracking system is needed. This study uses a GPS (Global Positioning System) system which is used to determine the position of the coordinate points and determine the distance of vehicle movement when parked [8]. A vehicle tracking system is a series of systems installed on a vehicle that can be tracked by modern vehicle owners, generally using a GPS device to determine the location of the vehicle. GPS is a satellite-based navigation system that can show location and time information in all weather conditions anywhere on the earth's surface as long as it has coverage [9].

A system is a collection or group or any physical component that is interconnected with one another and works together in harmony to achieve certain goals. A security system is a system used to provide a sense of freedom from danger, not to feel afraid, anxious, or anxious about the valuables that are left behind. The security system can identify the possibility of theft or other crimes that have an impact on losses [10]. In fleet management, this system is very helpful in avoiding stealing vehicle use or using lanes / routes that are permitted by the fleet owner [11].

Microcontroller is a tool that performs limited local functions. The microcontroller has the potential to be the brain used to make decisions in the event of a condition such as car theft. The microcontroller is equipped with a theft sensor device that detects theft, then the microcontroller can receive the information and then send a message about the location of the car [12]. ATMega328 is an output microcontroller from atmel which has a RISC (Reduce Instruction Set Computer) architecture. The ATMega328 microcontroller has a Harvard architecture, which separates memory for program code and memory for data so that it can maximize work [13]. The microcontroller used is Arduino, Arduino is an open source electronic circuit board or electronic kit in which there is the main component of a microcontroller chip with the AVR (Automatic Voltage Regulator) type from the Atmel company. Precise Point Positioning is a method used to obtain the position points generated from the system GPS data processing is done in real time [14-17]. GPS is a system for determining the location on the earth's surface with the help of satellite signal synchronization. GPS Tracker or often referred to as GPS Tracking is AVL technology. (Automated Vehicle Locater) which allows the user to track the position of the vehicle. GPS Tracking utilizes a combination of GSM and GPS technology to determine the coordinates of an object and then translate it into a digital map [18-20].

2 Methods

2.1 Block Diagram

Figure 1 is a block diagram of a motorcycle security system based on ATMega328.

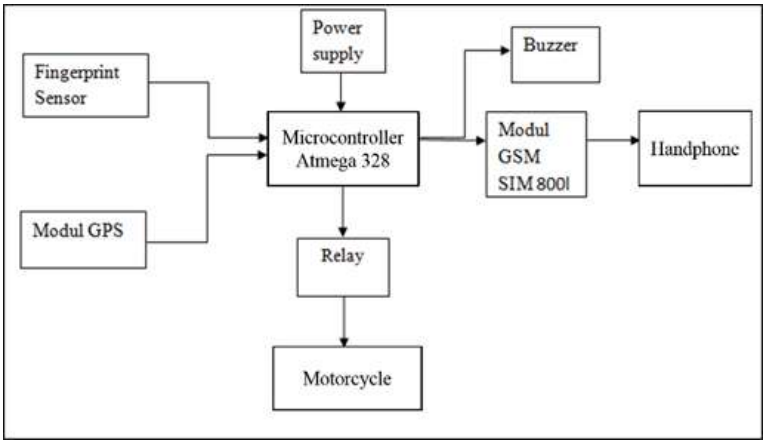

Figure 1. Block Diagram of The System

The Fingerprint Sensor functions to turn on and turn off two-wheeled vehicles where the owner has scanned a finger on the fingerprint sensor. The microcontroller functions as a system control that will send commands to the GSM SIM800I module. GSM SIM800I functions as an SMS sender to your handphone. If there is a fingerprint scan error 3 times, an alarm (buzzer) will sound. In case of theft, the GPS module will work with the help of a microcontroller which will then send a notification to the vehicle owner's cellphone. The owner can find out the whereabouts of the vehicle and can turn off the vehicle automatically via cellphone.

2.2 Flowchart

Figure 2 is a flowchart of a motorcycle security system based on ATMega328.

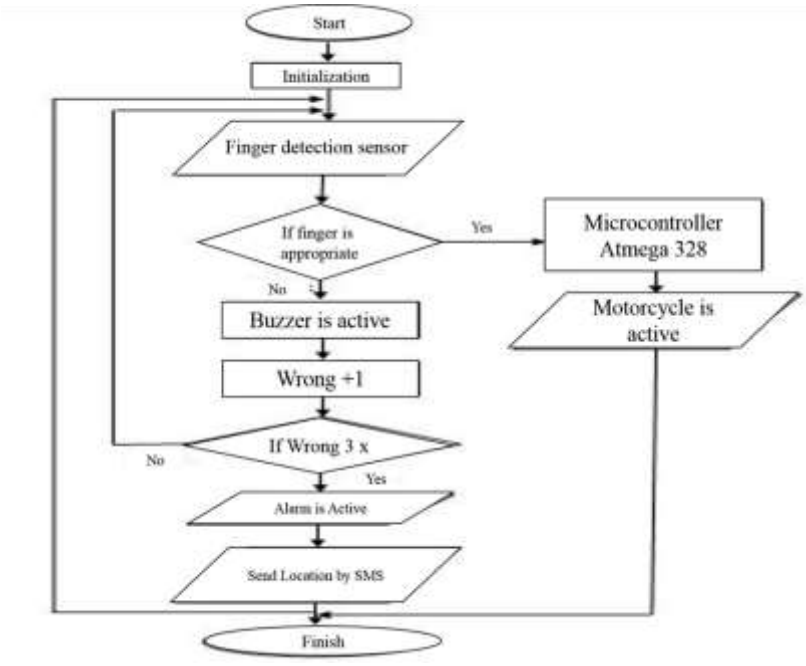

Figure 2. Flow Chart of Motorcycle Safety System

3 Result and Discussion

3.1 Testing Relay Starter

Tests are carried out to find out whether the starter circuit can work properly. The test results can be seen in Table 1. 12V DC voltage source is connected to the NO relay and the starter is connected to COM and Ground. Testing is done by providing a 5V DC input voltage from the microcontroller for testing the starter relay circuit. When the relay is active, the starter starts and the current from the voltage source will flow through NO and COM. However, when the relay is inactive, the starter dies.

Table 1. The Results of Testing the Starter Relay Circuit

Voltage Relay	Condition At Starter	Starter Conditions
Active	11.95	Live
Not active	00.00	Not Live

3.2 Testing of Ignition Cable Relays

Tests are carried out to determine whether the ignition cable relay circuit can work properly. The test results can be seen in Table 2. 12V DC voltage source is connected to the NC relay and the ignition cable is connected to COM and Ground. Testing is done by providing a 5V DC voltage input from the microcontroller. When the relay is in active condition, the ignition cable is disconnected and the vehicle engine will shut down. However, when the relay is inactive, the ignition cable is connected to the current from the voltage source and flows through the NC and COM.

Table 2. The Results of Testing Ignition Wires

Relay Condition	Voltage on the cable Ignition Key (Volt)	Ignition Key Cable Condition
Active	00.00	Disconnected
Not Active	11.94	Connected

3.3 GSM Shield SIM 800 Module Testing

The test was conducted to find out whether the GSM Shield SIM 800 Module circuit can work properly. The test is carried out by providing a 5V DC input voltage and then connected to a microcontroller that has been given the program. The results of the test can be seen in Figure 3.

Figure 3. Testing GSM SIM 800 Module on the SMS User Display

4 Conclusion

A motorcycle security system using a fingerprint sensor, SMS gateway, and GPS tracker based on ATMega328 which is designed to work well. The system is in accordance with the planned concept. Can locate motorbikes with GPS tracking and send a motorbike location link to the vehicle owner's cellphone. Using a relay as a button that is controlled to start and stop the vehicle engine.

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