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Identification E-SIM for Motorcycle Security Using Atmega 8 Microcontroller

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Abstract

Motorcycle theft is getting more disturbing, so it encourages the author to make security devices on motorbikes. This study has created a security system that can secure motorcycles using an e-SIM based on the Atmega-8 Microcontroller. Where the e-SIM has a chip, the chip itself has 7 bytes. In this case, the authors take advantage of the 7-byte chip in the e-SIM. The e-SIM will replace the motorcycle ignition key. Not only that, but the e-SIM will also give orders to the motor starter to start the motorcycle. Thus, only the owner of the e-SIM who already has a sim can give the motorcycle ON and OFF orders. The research method used is direct observation of the selected object, namely the author's home environment, and conducting literature studies related to the Atmega-8 microcontroller. This study aims to create a security system for motorcycle vehicles to avoid theft and the use of motorcycles for children without driving licenses.

Keywords: Atmega 8, Chip, e-SIM, Mikrokontroler

Abstrak

Pencurian sepeda motor semakin meresahkan sehingga mendorong penulis membuat perangkat keamanan pada sepeda motor. Dalam penelitian ini, telah dibuat sistem pengaman yang dapat mengamankan sepeda motor mengunakan e-SIM berbasis Mikrokontroller Atmega-8. Dimana didalam e-SIM memiliki chip, chip itu sendiri memiliki 7 byte. Dalam hal ini penulis memanfaatkan chip 7 byte yang ada didalam e-SIM. e-SIM akan menggantikan kunci kontak sepeda motor, tidak hanya itu e-SIM juga memberi perintah kepada stater motor untuk menyalakan sepeda motor. Dengan demikian hanya e-SIM pemiliknya saja yang telah memiliki sim yang bisa memberi perintah ON dan OFF sepeda motor. Metode penelitian yang digunakan adalah observasi langsung terhadap objek yang terpilih yaitu dilingkungan rumah penulis serta melakukan studi pustaka yang berkaitan dengan mikrokontroler Atmega -8. Tujuan penelitian ini adalah Untuk membuat sistem keamanan pada kendaraan sepeda motor agar terhindar dari pencurian dan pemakaian sepeda motor pada anak-anak yang belum memiliki surat izin mengemudi.

Kata kunci: Atmega 8, Chip, e-SIM, Mikrokontroler

INTRODUCTION

Currently, people feel that the current security is not conducive, there are many robberies and muggings of motorbikes, and it results in material and non-material losses for certain classes of society that are considered significant. Therefore, a security system is needed to reduce the theft of motorcycles and underage motorcycle riders or motorcycle riders who do not have a SIM.

Almost every day, motorcycle theft occurs. Solve this problem, and a dual security system is needed on a motorcycle. The security system using RFID technology can only be accessed using one e-KTP. RFID technology is installed on motorcycles to provide additional security to avoid theft (Afandi, 2021).

The security system used on motorcycles is currently not safe enough because it still has weaknesses that criminals can exploit to steal motorcycles. The problem is solved using an E-KTP with RFID (Radio Frequency Identification) technology. RFID is a process of identifying an object automatically with radio frequency. An RFID system has two essential components: the card (Tag) and the reader (reader). In designing this tool, RFID is

used to turn on the cut-off engine system on the motorcycle (Awaludin, 2020).

Cases of motor vehicle accidents caused by minors are increasing. The solution to the problem In this study, an electronic-based security system (e-Lock) has been realized, which can limit access to these motorized vehicles. The system is equipped with an RFID reader module that can read the ID card of the motorized vehicle owner to activate the ignition (Fitriana, Kholifah, Aprianto, & Hartono, 2021).

The security technology used by motorcycles is still manual or analog. The solution to the problem of motorcycle security technology can be replaced by using digital technology to increase security and reduce cases of theft. The use of E-KTP for activation of this motorcycle uses Arduino UNO as a control system and RFID for card scanning tools. (Negara, Najib, & Hapsari, 2017)

The GAP analysis is that the author uses the 7-byte chip in the e-SIM. The e-SIM will replace the motorcycle ignition key. Not only that, but the e-SIM also gives orders to the motor starter to turn on the motorcycle. Previous researchers used an RFID card for motorcycle security, and there were additional tools in the design.

This study aims to overcome the problem of motorcycle theft in the community and prevent motorcyclists who do not have a driver's license and are underage from not riding a motorcycle.

RESEARCH METHODS

In collecting data and information, the author uses several research methods, including:

1. Observation Method

The author makes direct observations of the selected object, namely in the author's home environment, where the author observes the behavior of the community in terms of maintaining the safety of the motorbike in the community where the author lives.

2. Literature Study

The author conducted a literature study to support all the collection of information needed. Information collection is done by looking for references related to the tools that the author will make. These references are obtained from books, journals, articles, and the internet.

A. Block Diagram

The motorcycle safety system has several parts for ON and OFF motorcycles. For more details, see the block diagram in Figure 1 below.

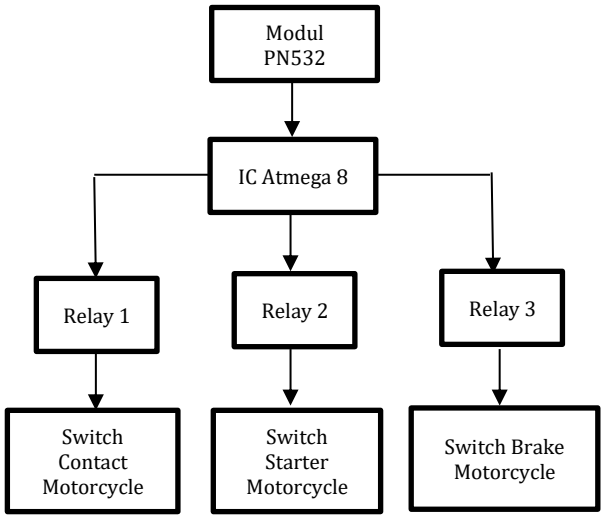

Figure 1. Block Diagram Tool

The explanation in Figure 1 is as follows:

1. Input

This input component is the input component that will be processed. This input component consists of the following:

a. E-SIM (Electronics SIM). It is a type of SIM identity using smart card technology or what is known as an RFID-based smartcard(Faizin, Arrizal; Khairunnisa, Nurul; Nurdiana, n.d.). RFID is an identification method or technology based on radio waves (radio frequency). This technology can identify various objects simultaneously without the need for direct contact. Simultaneous means that the various objects are identified not one by one, as is done in the identification of the barcode system (Djamal, 2014).
b. The PN532 will scan the value of the motorcycle owner's 7-byte e-SIM chip.
c. From the results of the PN532 scan, if the chip value matches what has been programmed, then the PN532 will give an order to the Atmega-8 IC. If the chip values differ, PN532 does not give orders to the Atmega-8 IC. Furthermore, IC Atmega-8 commands relay 1, relay 2, and relay 3.
d. Relay 1 will activate the contact switch with a delay of 1 second, and then relay two and relay three are active after relay 1. Then relay two starter switch and relay three brake switch are active simultaneously with a delay of 0.5 seconds, then relay two and relay three are deactivated again—motorcycle ON.
e. And vice versa to OFF the motorcycle. PN532 will scan the value of the 7-byte e-SIM chip. If the value matches, then it is ordered to the Atmega-

8 IC. Atmega-8 gives the command to turn off the relay one switch contact. Motorcycle OFF.

2. Process

The process is the main component that functions as a manager of data received by input which will then produce output. In this process, the author uses Atmega-8.

3. Output

Output is the output of all processes that are executed. The resulting outputs are:

a. The Contact Switch functions to turn on the motorcycle's electrical path automatically after Atmega-8 has successfully processed the e-SIM chip

a. The Brake Switch protects the motor, so the user activates the brakes when starting.
b. The Starter Switch functions to turn on the motorcycle starter automatically after the Atmega-8 has successfully processed the e-SIM chip.
c. The LED serves as a working indicator of the tool.
d. The switch serves to restart the device.
e. Buzzer serves to give a signal when the tool is working.

B. Schematic of Tool Circuit

In this section, the author makes a system design wiring diagram that will be made according to Tools. The following is the wiring diagram in Figure 2

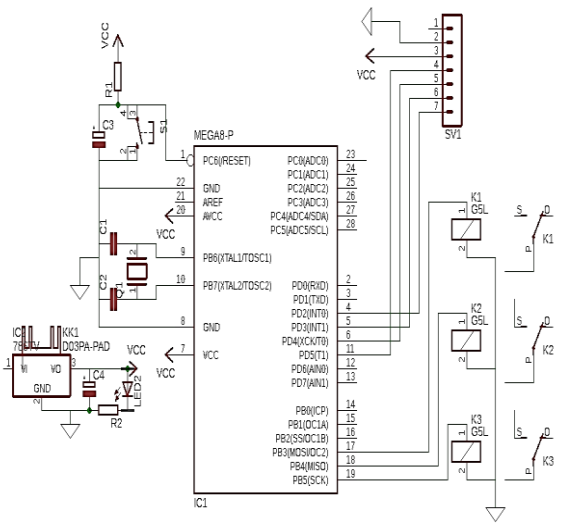

Figure 2. Schematic of Tool Circuit

Explanation of Figure 2 is on how the tool works and below about the components used in making this tool, including *Power Supply*

1. The power Supply is a component that functions as a source of electric current for other components in the circuit (Rhs, Masri, Roynal, & Alam, 2022) in the direction of the diode to produce a voltage of 5 Volt DC. The power Supply is a component that functions as a source of electric current for other components in the circuit (Viktorovich, Petrovich, & Aleksandrovich, 2021) in the direction of the diode to produce a voltage of 5 Volt DC.
2. Two capacitors and 30 ceramics. Capacitors are passive components often used in systems that function as filters and store electrical energy (Arifianto, 2011).
3. Cristaloid 16.000B3D.
4. PN532. The PN532 is the most popular NFC (Near Field Communication) integrated circuit today, with the full range of NFC system components commonly found in modern NFC-enabled gadgets. (Syawaluddin, 2019). Field Communication, also known as NFC, is a short-range, high-frequency wireless communication technology that has emerged from the convergence of contactless identification, such as RFID, and network technologies, such as Bluetooth and Wi-Fi. (Andarsyah & K Saputra, 2020).
5. Atmega 8. The microcontroller is a microcomputer with three main components: central processing unit (CPU: Central Processing Unit), memory, and system I/O (Input/output) to be connected to external devices. (Son, 2018). The ATMega 8 microcontroller is a low-power CMOS microcontroller with an 8-bit RISC AVR. Instructions are packed in 16-bit code and executed with only one clock cycle—good I/O structure with few extra components outside(Dedi, 2013).
6. Relay. A relay is an electronic switch that can open or close a circuit using control from another electronic circuit (Gunawan, Akbar, & Ilham, 2020)
7. LED. LED (Light Emitting Diode) is an indicator light in an electronic device that usually has a function to indicate the status of the electronic device. (Lubis, Gultom, & Annisa, 2019)
8. Buzzer. The buzzer is an electronic that converts electrical vibrations into sound vibrations (Budiharto, 2018).

C. How the tool work

A battery (accumulator, accumulator) is a device that can store energy (usually electrical energy) in chemical energy. Batteries are also known as accumulators(Abidin, 2014). The voltage source is from ACCU 12 Volt DC because this tool requires 5 Volt DC voltage to supply the components in this tool. A voltage-reducing circuit is made using LM-

7805 filtered by voltage with Elco, which is then used to power Atmega-8. Pin AVCC and GND on the Atmega-8 will be used as power connected to the PN532 module, which adds two ceramic and one crystalloid capacitor and connects the pins on the Atmega-8 to the PN532 module according to the circuit diagram so that it can identify the chip on the e-SIM.

The PB3 pin on the Atmega-8 is connected to relay one, the motor contact. The PB4 pin on the Atmega-8 is connected to a relay that functions as a motor starter which works together with the PB5 pin connected to the brake switch as safety, and this safety works according to the code that has been embedded in the Atmega-8. When the chip on the e-SIM is correctly detected, the LED and Buzzer will give a light signal and make a sound

D. Flowchart Diagram

In Figure 3, the following is a program flowchart from the tool that the author made:

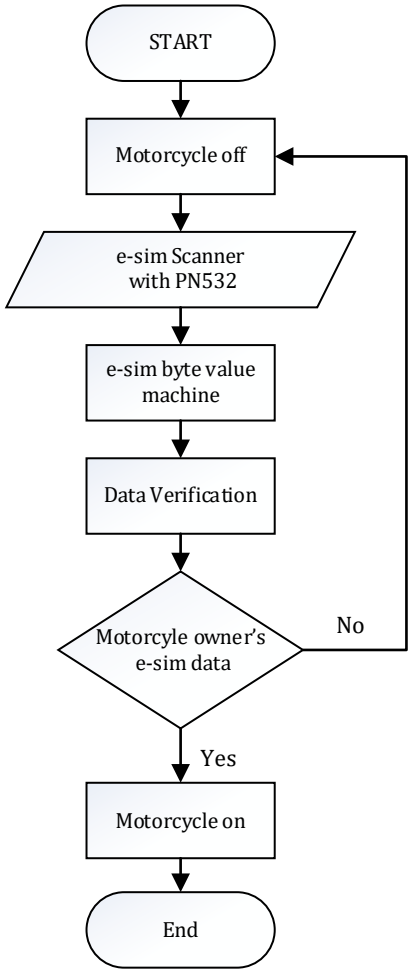

Figure 3 Flowchart Diagram try tool work

Figure 3 explains that the motor will start and run if the e-SIM scanner can match the correct data already stored in the system, then he is the rightful owner. Moreover, if the e-sim scanner does not match the data stored in the system, he is not the rightful owner and cannot start the motor.

RESULTS AND DISCUSSIONS

In this section, the author will carry out several test schemes, namely those consisting of input trials, output trials, and the results of all experiments or conclusions from these experiments.

A. Input experiment result

Table 1 describes the input components used along with the results of the test conditions

Table 1. Input experiment result

No	Input	Condition
1.	PN532	On-chip 7-*byte* e-SIM
2.	IC Atmega-8	On If e-SIM compatible
3.	IC Atmega-8	Inactive If the e-SIM does not match
4.	Brake Switch and Starter	Turn on the Power supply
5.	Regulator IC Input Power Supply	On 12 Volt
6.	Ignition Key	On

In table 1 as follows, In installing the connection, the author only injects cables into the contacts, brake switches, and starter switches and installs a 2-pin socket for the power supply and six pins for connection from the relay to the contacts, brake switch, and starter switch. Installation of the first by pulling the cable to the voltage source from the input contact for the board's minimum power supply and combined in COM relay one.

B. Output test result

Table 2 describes the output components used and the results of the test conditions

Table 2. Output test result

No	Output	Condition
1.	Contact Relay	On
2.	Sweat Brake Relay	On
3.	Relay To starter	On

Explanation in table 2 as follows, pulled the cable to NO (Normally Close) relay one and connected to the contact output, where two wires connected to the

brake switch. One brake switch input cable is connected to COM relay 2. The other cable is the output of the brake switch itself, which is connected to NO (Normally Close) relay 2, connecting the starter switch cable. There are two wires connected to the starter switch. One is the starter switch input cable connected to COM relay 3. The other cable is the output of the starter switch itself, which is connected to NO (Normally Close) relay 3.

C. **overall trial results**

Table 3 describes the overall results of the tool by testing the input and output components.

Table 3. Overall trial results

No	Input	Condition
1.	PN532	On e-SIM
2.	PN532	Inactive e-SIM is not compatible
3.	IC Atmega-8	On If e-SIM compatible
4.	Power supply Input IC Regulator	On 12 Volt
5.	Ignition Key	On
6.	Contact Relay	On
7.	Sweat Brake Relay	On
8.	Relay To starter	On

Explanation in table 3 as follows:

A testing method is used by measuring and observing each component used in the Motorcycle Security System Design using an e-SIM based on the Atmega-8 microcontroller and indications that the motorcycle is ON and OFF.

In testing the tool, the equipment used is the Digital/Analog AVO Meter. After the wiring diagram assembles the tool, the next step is testing each circuit block. This test is intended to test the performance of each block of the tool as a whole. The test is carried out by providing input voltage to the circuit, analyzing the output voltage, reviewing the design, and improving performance. If the output voltage is appropriate, the test for each block is stopped, and that part of the block is declared to have adequately functioned and continues with testing the next block. However, if the output voltage has not reached the desired condition, then repairs are carried out.

CONCLUSIONS AND SUGGESTIONS

Conclusions

With this tool, there is no need to use the ignition key to turn on the motorbike, and this tool can identify only valid motorbike owners who already have an ID card registered in the tool system can use it, to be able to overcome theft and misuse of motorized vehicles by minors.

Suggestions

Because this motorbike safety is only for turning ON and OFF motorbikes, it is hoped that in future development, e-SIM can be used to open seats/JOK and lock motorcycle handlebars. It is hoped that the e-SIM will not only be used to turn ON and OFF motorbikes, but e-SIM can turn ON and OFF on cars.

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