Prototype Smart Security on Doors using RFID with Telegram Monitor NodeMCU Based

Mardianus
STMIK Widya Cipta Dharma,
Samarinda, 75123, Indonesia
mardianuscao@gmail.com
* Corresponding author

Andi Yusika Rangan
STMIK Widya Cipta Dharma,
Samarinda, 75123, Indonesia
andi@wicida.ac.id

Salmon
STMIK Widya Cipta Dharma,
Samarinda, 75123, Indonesia
salmon@wicida.ac.id

Abstract- The application of prototype smart security tools on doors using RFID with a NodeMCU-based telegram monitor in the process of opening the door aims to provide security and comfort and make work easier to make it faster, more effective and efficient. Where it can be used by lecturers and assistant lecturers who have been registered as staff and admin of the Computer Laboratory and the results of the track record will be monitored by the Head of the STMIK Computer Laboratory, Widya Cipta Dharma. This prototype was built using the C programming language with the Arduino IDE (Integrated Development Environment) application, and the system in the form of WEB using the PHP Native programming language using the Sublime Text 3 application and using the Mysql database and using the Telegram application as a medium for receiving notifications in the form of messages to be received by head of the Computer Laboratory. Based on the data analysis carried out above, it is concluded that the application of Smart Security on doors using RFID with a NodeMCU-based Telegram monitor is much faster, effective, efficient and safe and easy to use.

Keywords- Smart Security, Nodemcu, RFID, Solenoid, Telegram.

I. Introduction

The security system of a room is an important thing especially when the room is used to store valuables. A smart security system with various facilities, will provide security and comfort for home owners and those who will live in it, because it can facilitate work to be faster, more effective and efficient (Ellison, 2018). UPT. STMIK Widya Cipta Dharma's computer laboratory is a work unit that provides academic services. The laboratory has a function as a place for the teaching process. This research will discuss about the Smart Security Prototype at the Door Using RFID with NodeMCU-Based Telegram Monitor.

Some of the benefits of designing this RFID control system are that this tool can create technology that can be used at UPT. The Widya Cipta Dharma STMIK Laboratory is to maintain security in the room and limit people who enter the room so that data loss or damage to the computer unit in the laboratory is caused by irresponsible people.

One of the technologies that can be used to solve this problem is the automatic door unlock system. In this case, the technology to open and close the door to the room automatically uses a solenoid and with the help of an RFID sensor as a medium to verify users. Therefore, we need a tool that can control room doors and sensors systematically using NodeMCU as the minimum system to support the performance of a running system.

II. Literature review

A. NodeMCU

According to the official website nodemcu.com (2014) "An open-source software and development kit that helps you to Prototype yout IOT product within a few lua script lines" (an open source firmware and development set that helps you to Prototype your IoT product. in a few lines of the Lua script). NodeMCU consists of hardware in the form of System On Chip ESP8266 from ESP8266 made by Ekspresif System, as well as the firmware used, which uses the Lua scripting programming language. The term NodeMCU by default actually refers to the firmware used instead of the development kit hardware. NodeMCU is analogous to the ESP8266 ardiuno board. NodeMCU has packaged the ESP8266 into a compact board with various features like a microcontroller plus capabilities for wifi as well as a USB to Serial communication chip.

B. RFID

According to Nugroho (2015), RFID is one of the Auto-ID technologies. RFID uses a tag or chip media and sends data via frequency to identify a computer product, so that the data recorded is instantaneous data or data. RFID technology relies on wireless data transmission via electromagnetic fields. This pit ranti consists of two parts. The first tool is the RFID reader, which functions to read the code from the RFID tag (label) and compare what is in the reader memory. While the second part is the RFID tag which functions to store codes as a substitute for one's identity. In general, passive RFID is used in this implementation process.

C. Solenoid Door Lock

Dimas Sanjaya P (2020), Solenoid is a specially designed electromagnetic. A solenoid usually consists of a dimple of the nucleusmovable iron is called armature. Inexpensive solenoids are used primarily limited to on-off applications such as latching, locking, and triggering. Another type of electromagnetic actuator is a linear solenoid, which is an electromagnetic device that converts electrical energy into motion energy. The energy of motion produced is in the form of driving force or attracting mechanical output. Inside the solenoid there is a coiled wire (coil coil) in the iron core. When an electric current passes through the coil, a magnetic field occurs which results in a linear motion that pushes or pulls a piston / cylinder made of iron called a plunger. Linear solenoids have the same basic principles as electromechanical relays and can also be activated and controlled using a transistor or MOSFET.

D. LED (Light Emitting Diode)

According to Syam (2013), Light Emitting Diode (light-emitting diode), better known by its short form, LED, produces light when current flows through it. Initially, LEDs were only made in red, but now orange, yellow, green, blue and white are also available in the market. There are also infrared LEDs, which produce infrared light instead of visible light. A typical LED has a dome-shaped packaging made of plastic, with a protruding edge (rim) at the bottom of the dome, there are two domed terminal legs at the bottom of the dome. Usually, although this is not always the case, the cathode pins are shorter than the anode pins. The rim is made flat on the side adjacent to the cathode leg.

E. Buzzer

According to Andi Dinata (2018), Buzzer is an electronic device that uses a monotone voice. This sound is generated by mechanical vibrations caused by an electric current. The received electric current is used for the oscillation process which causes vibrations between the two planes. These vibrations cause sound to be emitted through the resonant tube so that a tone is heard. Because of the monotone sound, there is only one 'beep' sound emitted by the buzzer. Buzzers are widely used, for example in alarm clocks, distance markers when the car is parked, there are also refrigerators that sound when the temperature changes because we open the door for too long.

F. Relay 1 Channel 5 Volt

According to Muh.Yusrifar Haris, Aryo Abdi Putra (2017), a relay is an electrically operated switch. Many relays use an electromagnet to operate the switch mechanically, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit with separate low power signals, or where several circuits must be controlled by a single signal. The first relays were used on long-distance telegraph circuits as amplifiers. They repeat the incoming signal from one circuit and retransmit on the other circuit.

Relays were used extensively in early telephone and computer exchanges to perform logical operations. Relay is a switch controlled by the flow of electric current. In the relay there are two main parts, namely the coil and the switch circuit

G. PHP (Hypertext Preprocessor)

According to Raharjo, Heryanto, Rosdiana (2014), PHP is a scripting programming language designed to build web applications. When called from the web browser, the program written by PHP will be parsed on the web server by the PHP interpreter and translated into an HTML document, which will then be displayed back to the web browser. Since PHP processing is done in a web server environment, PHP is said to be a server side language. Therefore, as stated earlier, the PHP code will not be involved when the user selects the "view source" command on the web server they are using.
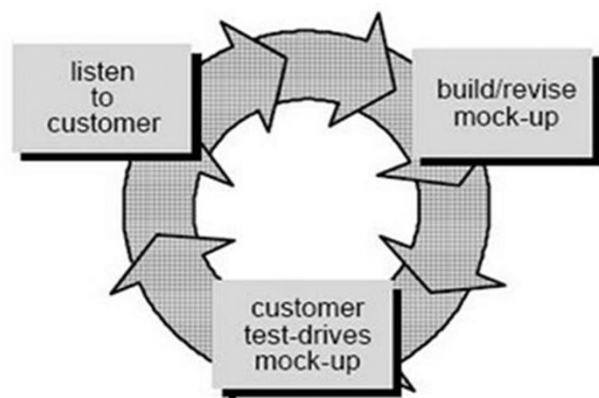
H. CSS (Cassanding Style Sheet)

According to Saputra (2013), CSS or which stands for Cascading Style Sheet, is a web programming language used to control and build various components on the web so that the appearance of the web will be tidier, structured, and uniform.

I. Sublime Text

According to Ardhana (2012), Sublime Text is a program used to perform editors such as HTML, PHP, CSS. The editor program is easy to use and can be downloaded for free or for free.

J. Prototype Method

Pressman (2012), the Prototype Method in Picture 1 is a new comparison in software development methods, but also revolutionizes the old software development method, namely the sequential system commonly known as SDLC or the waterfall development model. Picture 2.16 shows a series of development stages with an explanation of the stages in the method used in research.

Picture 1. Prototype Cycle

1. Listen to costumer or listen to customers. At this stage, the system needs to be collected by listening to complaints from customers. To create a system that fits your needs. So it must be known in advance how

the system is running to then find out the problems that occur. Quick design, namely making designs in general for further development. (Muhammad, 2012)

2. Build / revise mock-up or Designing and making Prototypes: at this stage the design and manufacture of a prototype system is carried out. Prototypes that are made are tailored to the system requirements that have been previously defined from customer or user complaints. (Yatini, 2010

3. Customer test or trial: at this stage, the prototype of the system is tested by the customer or user. Then do an evaluation of the deficiencies of the needs. Development then returns to listening to complaints from customers to improve the existing prototype (Pioto, 2014)

K. Black Box

According to Pressman (2012), black-box testing is also called behavior testing, which focuses on the functional requirements of the software. That is, black box testing techniques allow one to derive a set of input conditions that will fully carry out all functional requirements for a program. Black-box testing is not an alternative to the white-box method. Rather, this method is a complementary approach to finding a class difference of white-box method errors.
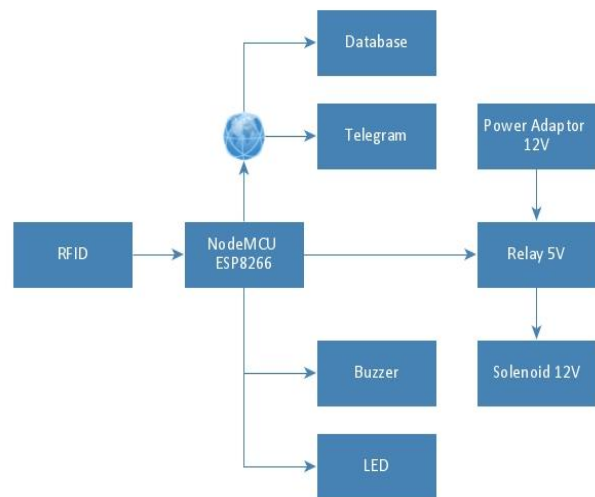
Black-box testing aims to find errors in categories.
1. Wrong or incorrect function.
2. Interface error
3. Errors in data structures or external database access
4. Behavior or performance errors
5. Initialization and termination errors.

III. RESEARCH METHODS

A. Block Diagram

Based on the results of the needs analysis in Picture 2, which is a list of the needs of potential users, a block diagram design is made (Hafid, 2017). This block diagram design is made to design hardware in accordance with the specifications and workings of the system to be built so that it is expected to be efficient in time, cost, and energy.
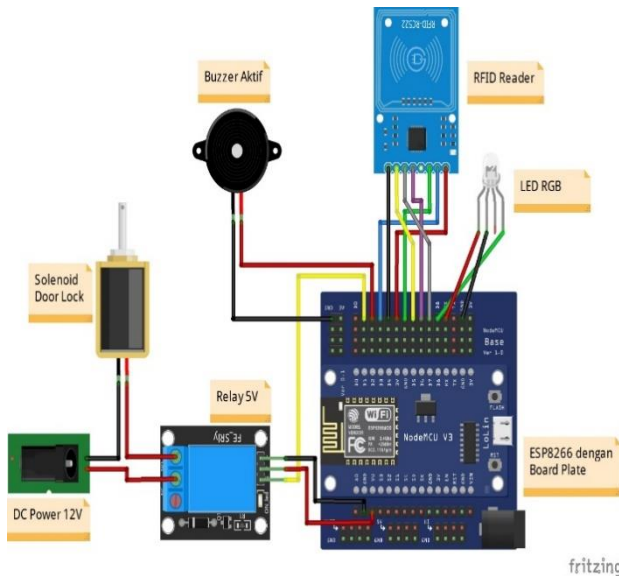

Picture 2. Block Diagram

1. NodeMCU as a control center to handle input and output data on the system and work as the center where orders are received. (Yuwono, 2015).
2. RFID functions as a key to open doors, RFID uses an identification system with radio waves, because it requires two devices for this tool to function, while the required devices are called TAG and READER. (Rosa, 2013)
3. Telegram functions as an application to send notifications to the head of Lab Kom STMIK's smartphone when the staff or admin reads the RFID card into the RFID reader to open the door.
4. Collections of data stored systematically in a computer that can be processed with application software to produce information. In this case the database serves to classify data and facilitate the data identification process. So the data received from rfid to NodeMCU will be stored in the database.
5. Buzzer functions as sound output for every running process.
6. The Power Adapter functions to convert a high AC (alternating) voltage to a lower DC (unidirectional) voltage according to the adjustable voltage divider in the adapter.
7. Relay functions as a device that regulates signals to turn on and off electronic devices in the form of a solenoid.
8. The solenoid functions as a door lock, where the mechanism is determined by a relay whose signal is regulated by the NodeMCU.
9. LED as indicator light for marker, if the RFID card is registered or not.

B. Schematic of Smart Security Toolkit

The circuit scheme of smart door security tools using RFID with a Telegram monitor in Picture 3 is NodeMCU loin v3 ESP12-E, RFID MFRC522, Solenoid 12V, 5V Relay, Buzzer, LED, and 12V Power Adapter. Image of the whole of the smart security device design on the door using RFID with a NodeMCU-based monitor, in this Picture everything is connected to NodeMCU according

to the function of each device. This design is made to make it easier to connect the cables from each device so that there are no errors when assembling the smart security device on the door using RFID.
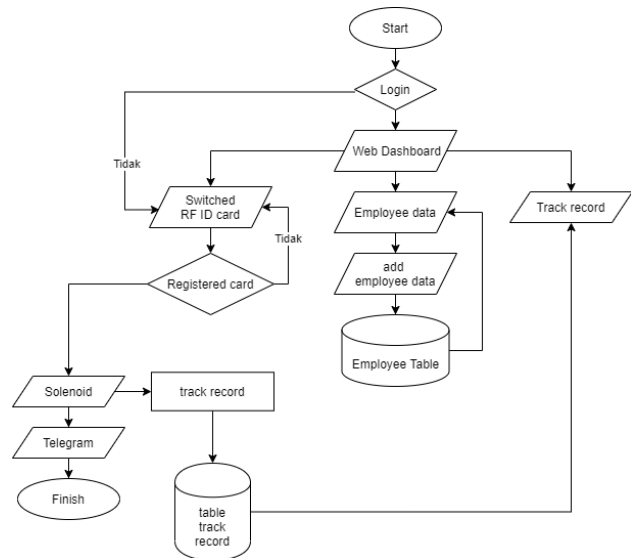

Picture 3. Schematic of Smart Security Tool Set

C. Flowchart System

The system flowchart design in Picture 4 describes the overall flow in the main system of this tool (Yahwil, 2013). The smart security prototype on the door uses RFID with a NodeMCU-based Telegram monitor as follows.
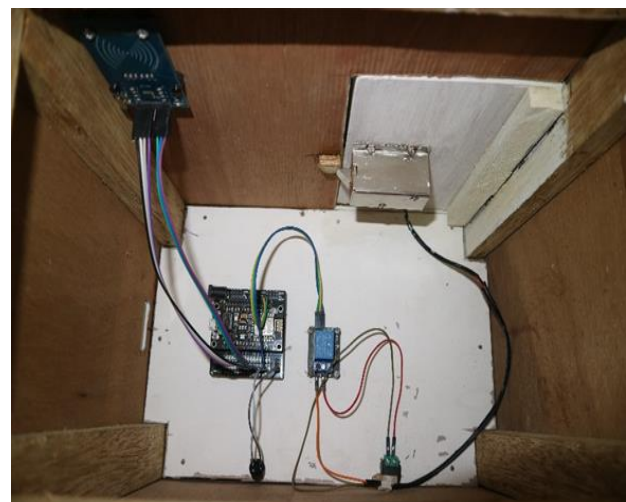
Based on the flowchart in Picture 4.2, we can find out how the work process of the smart security prototype at the door using RFID with a NodeMCU-based telegram monitor, which starts from the entry page where on the entrance page there are two menus, namely the login menu and scan the RFID card, after login is complete enter the web homepage on the web homepage there are three menus, Scan RFID Card, Employee Data and Track Record. On the RFID card scan page, there is a door opening process, where the user taps the RFID card on the RFID Reader, then the system checks whether the card ID is registered or not, if not registered, the system will reject, if the card is registered, the system will receive two processes simultaneously where the data will be saved to the track record table and the solenoid will open then the telegram bot will send a notification to the head of the STMIK Lab Kom in the form of a message via the Telegram application. On the employee data page there is data from the head of Lab Kom, Lab Kom staff and there is also a menu for adding employees, on the track record page there are process results from a scan of the RFID card stored in the track record table and then displayed on the track record menu.

Picture 4. System Flowchart

IV. RESULTS AND DISCUSSION

In principle, to operate the Smart Security Prototype in Picture 5, it begins with powering the NodeMCU by 5V via the USB port. When NodeMCU gets power, all components connected to NodeMCU via the female - female jumper cable will be ready for use.

Picture 5. The work process of the tool

The first work process.
1. The first thing to do is to connect the device to a server computer with the same Wi-Fi network to connect NodeMCU to the database.
2. After the tool is activated, open the website on Chrome so that the system can be connected to one another.
3. The process of entering using an RFID Tag card, the first step that must be taken when entering using an RFID Tag card is that the RFID Tag must be registered in the database first. then the user Tap on the RFID Reader then the microcontroller will process the data from the RFID Reader, the data will

be sent to the database to reconfirm whether the RFID Tag has been registered in the database, the solenoid will open and the Lab Kom head will receive a notification in the form of a message via the Telegram application.

4. The process of adding an RFID Tag card, the process of adding an RFID Tag card can only be done by the admin. The first thing the admin has to do is log into the web with admin access rights, then select employees, select add employee data, then paste the RFID Tag card on the RFID Reader to register the RFID Tag card, then fill in the employee's ID, employee name, password employee, employee level and save.

A. Web Appearance

In Picture 6 is the homepage of the website where there are several menus, namely scan, employee, track record and exit.

Picture 6.Home page

V. CONCLUSION

To build a smart security prototype at the door using RFID with a telegram monitor requires main components, namely, NodeMCU ESP12-E as the main hardware microcontroller), RFID MFRC522 as a radio frequency recognition sensor or as a medium for opening doors, Buzzer as sound output in each process which is running, Power Adapter 12V as a high AC voltage converter to a lower DC voltage, 5V Relay as a device that regulates signals to turn on and off electronic devices, Solenoid 12V functions as a door lock.

Based on the results of testing the smart security prototype on the door using RFID can function properly, where each device can function properly and notifications are also sent according to the process of opening the door.

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