Design and Build an IoT-Based Door Locking System Using Google Assistant

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ABSTRAK

Keamanan rumah merupakan hal yang sangat penting dalam kehidupan sehari-hari. Pencurian yang sering terjadi di rumah dapat membuat pemilik merasa cemas. Salah satu faktor penyebab pencurian adalah kelalaian dalam mengunci pintu rumah dan kelemahan sistem keamanan yang digunakan. Umumnya, pemilik rumah masih mengandalkan kunci pintu manual yang rentan terhadap pembobolan, serta sering kali lupa meletakkan anak kunci. Untuk meningkatkan keamanan, diperlukan sistem keamanan yang lebih baik. Penelitian ini mengusulkan penerapan teknologi Internet of Things (IoT) untuk mengatasi masalah ini. Tujuan dari penelitian ini adalah mengimplementasikan IoT dalam sistem kontrol pintu rumah dengan menggunakan perintah suara melalui Google Assistant. Dengan demikian, pemilik rumah dapat mengunci dan membuka pintu dari jarak jauh, yang meningkatkan keamanan rumah dan mengurangi risiko pencurian. Penelitian ini merancang sistem kontrol prototype yang dapat diterapkan pada konsep kunci pintu dan dikontrol menggunakan Google Assistant. Penggunaan modul NodeMCU dalam penelitian ini memungkinkan koneksi internet untuk mengontrol pintu rumah secara efisien. Hasil penelitian membuktikan bahwa dengan menggunakan Modul NodeMCU dan perangkat lainnya mampu diterapkan sistem IoT, sehingga mengunci pintu dengan sistem IoT berhasil dilakukan.

ABSTRACT

Home security is very important in everyday life. Frequent theft at home can make owners feel anxious. One of the factors causing theft is negligence in locking the door of the house and weaknesses in the security system used. Generally, homeowners still rely on manual door locks which are vulnerable to burglary, and often forget to put the key. To improve security, a better security system is needed. This research proposes the application of Internet of Things (IoT) technology to overcome this problem. The aim of this research is to implement IoT in a home door control system using voice commands via Google Assistant. This way, homeowners can lock and unlock doors remotely, which increases home security and reduces the risk of theft. This research designs a prototype control system that can be applied to the door lock concept and controlled using Google Assistant. The use of the NodeMCU module in this research allows an internet connection to control the door of the house efficiently. The research results prove that by using the NodeMCU Module and other devices the IoT system can be implemented, so that locking the door with the IoT system can be successfully carried out.

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1.   INTRODUCTION

Home security is a very important thing to pay attention to, frequent thefts at home make home owners feel anxious and one of the factors that occurs when theft occurs is because the home owner is not at home and the home owner is negligent in locking the door of the house and the security in the house is weak [1]. In general, home owners only use manual door locks, where the security of the house key is not guaranteed and is vulnerable to burglary. With manual locks, home owners are often careless and forget to put the key in and this results in wasted time because they have to look for it. key to open the door of the house. To maintain security, a good security system is needed, to prevent theft. Deploying current technology applications for home door security systems is one of the best security enhancement solutions at an affordable cost.

In the current development of science and technology, from time to time technology is developing very rapidly and therefore many new innovations have emerged related to electronic devices that are increasingly sophisticated and innovative, such as electronic devices that can be combined with the Internet of Things (IOT).). In the current era of digital technology, electronic devices related to IoT are highly prioritized in various fields and currently developers are competing to develop IoT-based technology in every field, and one of them is in the field of architecture in home buildings, where the Internet of Things can be combined with electronic devices at home such as lights, TV, fans, AC, and also door locks, which are connected to the internet network [2]. If it is connected to the internet, humans act as regulators and supervisors of the device [3]. IoT consists of two words, namely Internet and Things. Internet means a communication network that is connected to each other using the TCP/IP protocol. In IoT, objects are everyday objects from which information is sought, sensors that read and monitor environmental conditions in real time and without human assistance [4]. The times are also becoming more sophisticated with the existence of Google Assistant. The main function of Google Assistant is to follow our voice commands, voice searches and device controls. This makes it easier for us to complete tasks or organize things by saying the words "OK Google" or "Hi, Google" [5].

The aim of this research is to implement the application of the Internet of Things (IoT) to create a control system for house doors [6]. In this research, the application of the Internet of Things is really needed in the remote control and control system for home door locks using voice commands via the Google Assistant application. Based on the above, the author created a door locking system that can be done via Smart Phone where this door locking system can be controlled remotely using voice commands with the application of the internet of Things (IoT), so that access to open and lock the door can only be accessed by the owner. house which will make the security of the house more secure and minimize the occurrence of theft in the house.

This research designs a prototype control system that is applied to the concept of door locks and controllers with Goggle Assistant. It is hoped that this research can become an appropriate and useful technology for everyday life. This research uses the NodeMCU module. In terms of function, the NodeMCU module is almost similar to the Arduino platform, but the difference is that the NodeMCU is only "Connected to the Internet" [7]. This research is strengthened by a research journal conducted by [8] with the title "Design of automatic doors using RFID".

2. METHOD

This research uses a prototype method which uses the concept of direct observation and allows changes iteratively until the desired results are achieved. So this prototyping method makes it possible to display the display directly. In general, the tool design planning is as follows, in the picture
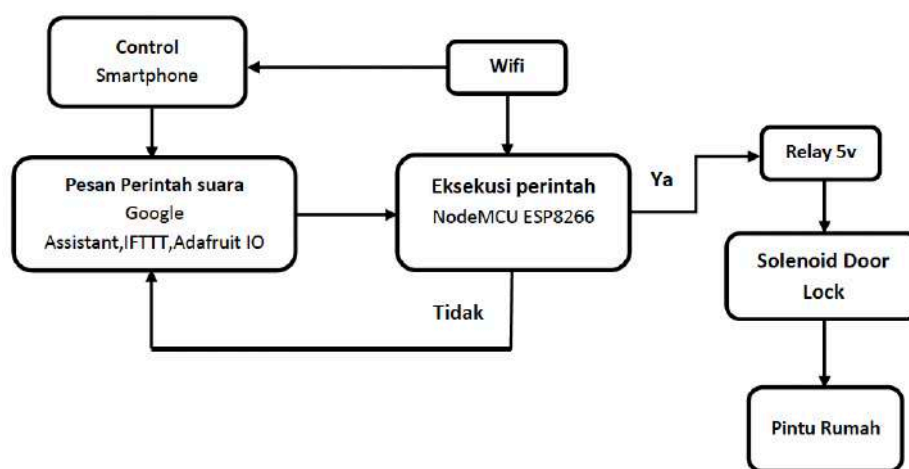

Figure 1. NodeMCU ESP8266 System Block Diagram

Next is the running system framework. The application framework aims to understand the work process of the application and aims to simplify the design process for the controller system application using Google Assistant. The application framework can be seen in Figure 2.
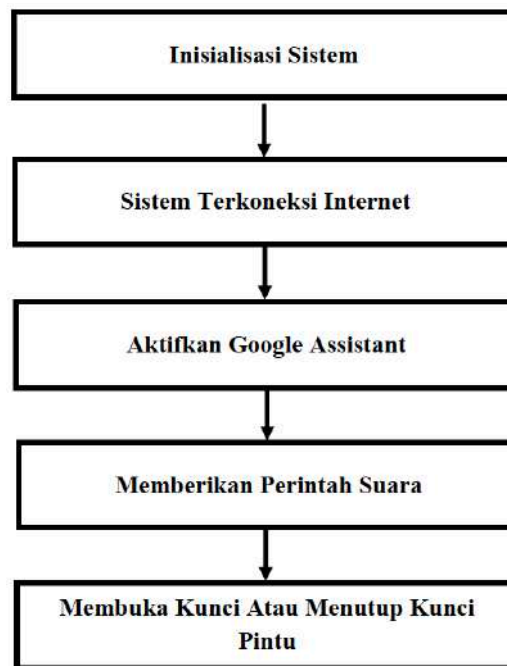
Figure 2. Google Assistant System framework

In Figure 2, these are the main stages in which the door lock control system works with Google Assistant. At this stage, instead of a system flowchart, control system steps are used. The description of the application framework above is as follows:

1. Initialize the System
When using the system, start by connecting the system to a resource so that the system is active, then make sure the SSID and Password have been adjusted so that the system automatically connects to the internet.
2. Internet Connected System
If the system cannot be connected to the internet, make sure there is an internet station around the system with a WiFi modem and make sure the SSID and password match the guide provided.

3. Activate Google Assistant
On your smartphone, make sure it is connected to the internet, then activate Google Assistant by opening the Google Assistant application on your smartphone.

4. Give Voice Commands
When Google Assistant is successfully opened, it will give a voice command.

5. Unlocking or Locking the Door
Next, give a voice command by saying open the door or lock the door as needed

2.1 The entire series of tool systems
This circuit is composed of the components needed to design the tool so that the data tool works as desired, which can be seen in Figure 3 below.
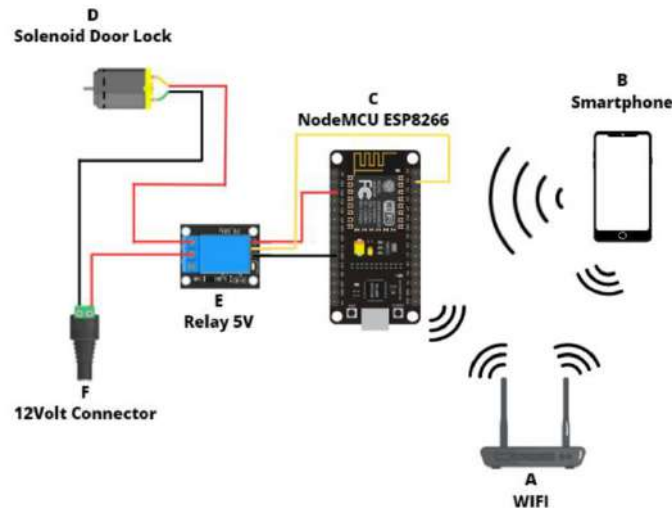
Figure 3. The entire series of tool systems

2.2 Tool Flowchart

The design of the device begins with making a flowchart (flow diagram) to make it easier to plan and create programs on the microcontroller. Making a flowchart aims to make it easier to understand the work process of the tool, the program flowchart from this research includes the tool running control system which can be seen in Figure 4.
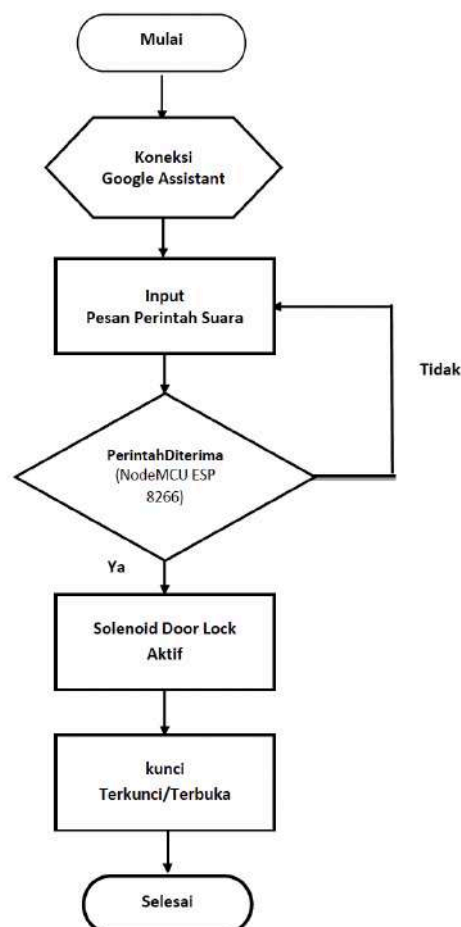

Figure 4. Flowchart of IoT-Based Door Locking Device Using Google Assistant

2.3   System Flowchart

The design of the system flowchart aims to make it easier to understand the work process of the system, the program flowchart from this research includes the application control system which can be seen in the picture.
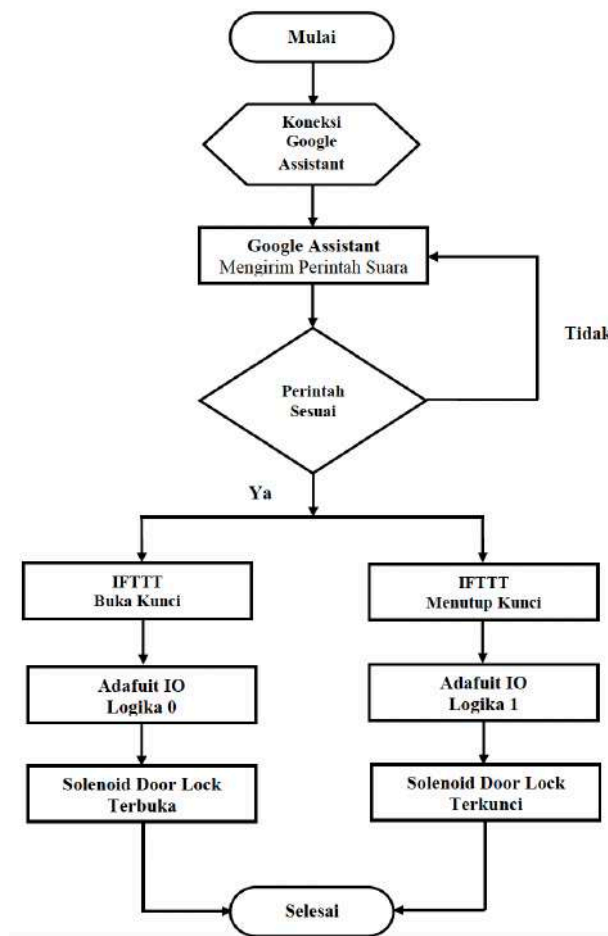

Figure 5. Flowchart of IoT-Based Door Locking System Using Google Assistant

3.   RESULTS AND DISCUSSION

The results of the tests carried out are a tool that was created or designed and programmed using the Arduino application. The tools created will be used to help the community in securing home door locks with the following tools and materials:

1. 12 Volt adapter functions as an electrical power source.
2. The 1chan relay functions as a switch that works according to electromagnetic principles. The relay will work if there is an electric current and will stop if there is no electric current
3. NodeMCU ESP8266 functions as a data processor, receiver and sender.
4. Android functions as monitoring and controlling open and closed door locks.
5. The WI-FI network functions as a communication medium between Android and the NodeMCU ESP8266 Microcontroller electronic system.
6. The door lock solenoid functions as an opening and closing door lock.

3.1   Software Testing

To find out whether the NodeMCU ESP8266 Microcontroller circuit is working properly on the device, a test is carried out by giving a command program to the Microcontroller by inputting data from the computer into the Microcontroller. When installing, first connect the

computer to the downloader via a USB cable to the microcontroller circuit. To test the tool with commands, you can do several steps, including:

1. The first step to take is to run the Arduino software. After the application loads, you will see a display like figure 4.1.

Figure 6. Arduino Software Display.

2. Next, to program the NodeMCU ESP8266 microcontroller, type the program according to what is required on the tool. As seen in figure 7.

Figure 7. Program View

3. Before continuing with the microcontroller installation stage of the completed program, first save the program before compiling it. To save the program, see Figure 8.
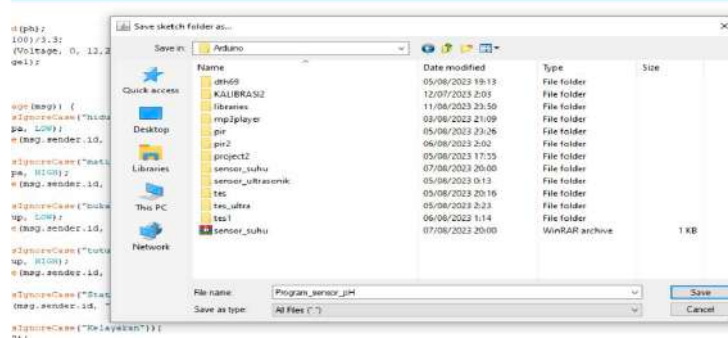

Figure 8. File Saving Process

4. To continue with the microcontroller installation stage, the program must first be checked by clicking the "Compile" function button to set the program into the Microcontroller Chip. It can be seen whether the program created has errors or not, if successful it will say "No errors". The compile process can be seen in Figure 9.
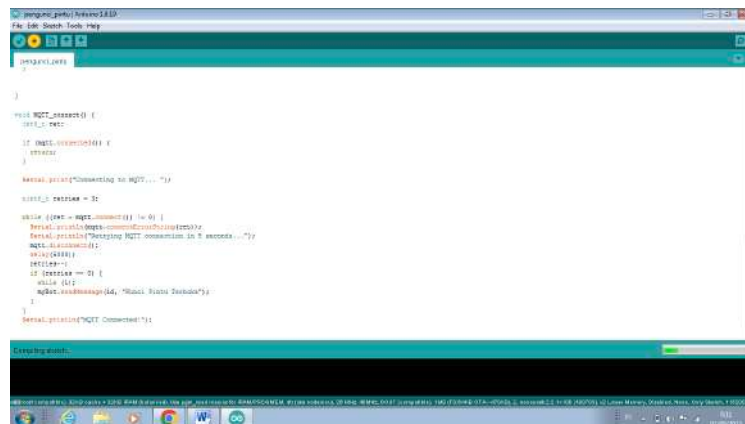

Figure 9. Compile Results

3.2 Hardware Testing

After all the circuits that have been completed are designed in "IoT Based Door Locking System Design Using Google Assistant", then all the completed circuits are combined. The following is an image of the results of the system design shown in Figure 10.

Figure 10. Entire Hardware

3.3 Device Testing

After all components are installed and the program has been compiled, the next step is to test the tool. This testing is carried out in stages from series to series.

3.4 Downloader Programmer Testing

Testing this downloader circuit can be done by moving program data from the computer to the NodeMCU ESP8266 microcontroller. The downloader is first connected to the PC, via the USB port. The program data is typed into the Arduino software using C language then compiled and downloaded to the microcontroller. If there are no errors in the downloading process, then the downloader and microcontroller used are in good condition.

3.5   Hardware Device Test Results

After the hardware device has been programmed into the microcontroller and executed using the downloader, the program will automatically be entered into the microcontroller. It can be seen in figure 11.
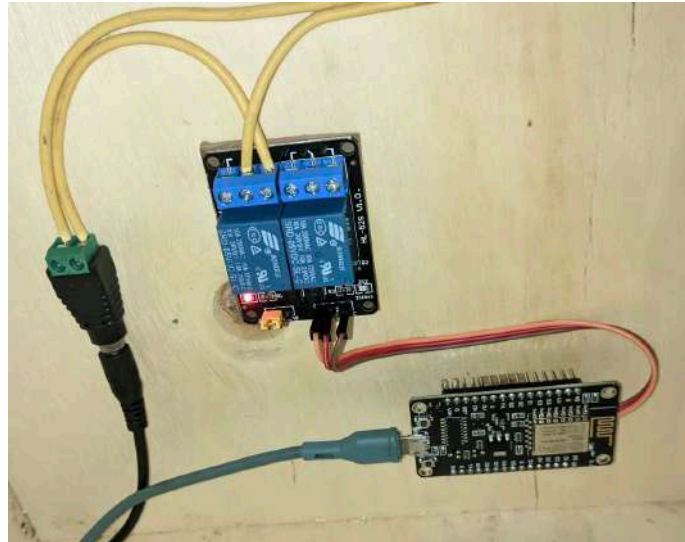

Figure 11. Tool Chain System

For the results of the door lock solenoid unlocking test, here I used the Telegram application as a notification for the door lock opening. It can be seen in figure 12.
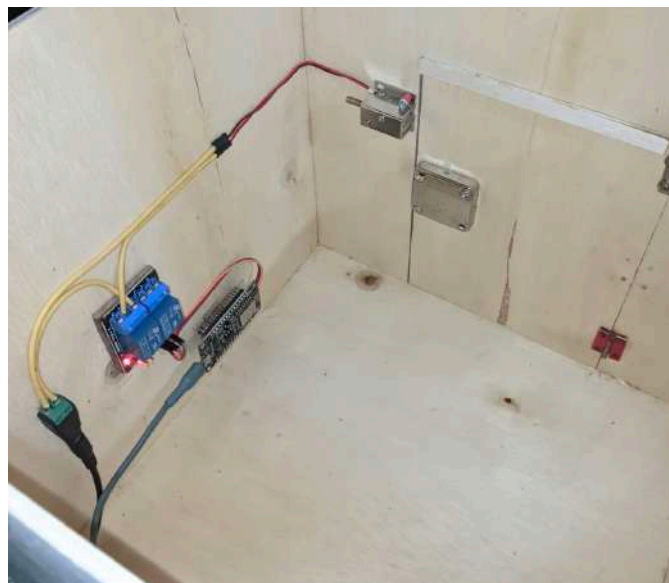

Figure 12. Door Lock Solenoid Test Results Unlock

For the results of the door lock solenoid unlock test, here I use the Telegram application as a notification for the door lock being locked. It can be seen in figure 13.

Figure 13. Door Lock Solenoid Test Results Close the lock

4.   CONCLUSION

After carrying out the system design and creation stage, which is then continued with the testing and analysis stage, the following conclusions can be drawn:

1. The working principle of WI-FI on a device system is as a communication medium between the device system and an Android smartphone.

2. Android smartphones can be used as a control tool for door locks using applications that can be downloaded on the internet.

3. NodeMCU ESP8266 functions as a controller, data receiver and data processor as well as a WI-FI signal receiver that can be connected to Android.

4. The design cannot be opened manually, because it is only used using Google Assistant.

REFERENSI
[1] Siregar, A., Setiawan, D., & Iswan, M. Kontrol Rumah Pintar Dengan Google Assistant Berbasis Iot (Internet of Things). *Jurnal Cyber Tech*, vol. 1, no. 4, pp.1-18, Jul 2018, doi: 10.53513/jct.v1i4.1825
[2] Bahri. S, Rancang Bangun Smart Home System Pada Rumah Yang Terintegrasi Smartphone, *Indonesian Journal of EducationAnd Computer Science*, vol. 1, no 1, pp.23-29, Apr 2023, doi: 10.60076/indotech.v1i1.6
[3] Gunawan, I., Akbar, T., & Ilham, M. G. Prototipe Penerapan Internet of Things (Iot) Pada Monitoring Level Air Tandon Menggunakan Nodemcu Esp8266 Dan Blynk. *Infotek: Jurnal Informatika Dan Teknologi*, vol. 3, no. 1, pp. 1–7, Jan 2020, doi: 10.29408/jit.v3i1.1789
[4] Faturrachman, M., & Yustiana, I. Sistem Keamanan Pintu Rumah Dengan Sidik Jari Berbasis Internet of Things (IoT). *Jurnal Teknik Informatika Unika Santo Thomas*, vol. 6, no.2, pp. 379–385. Dec 2021, doi: 10.54367/jtiust.v6i2.1517
[5] Prabowo, E. Perancangan Sistem Kontrol Motor Penggerak Pemindah Barang Melalui Perintah Google Assistant. 2021.
[6] Wulandari, D. E. A. F. Rancang Bangun Smart Door Lock System Menggunakan Perintah Telegram Berbasis Internet of Things (IoT). *Politeknik Negeri Sriwijaya*. 2022.

[7] Nurul Hidayati Lusita Dewi, N. H. L. D. *Prototype Smart Home Dengan Modul Nodemcu Esp8266 Berbasis Internet of Things (Iot)*. Universitas Islam Majapahit Mojokerto. 2019

[8] Novianti, T. Rancang Bangun Pintu Otomatis Dengan Menggunakan Rfid. *Jurnal Teknik Elektro Dan Komputer Triac*, vol. 6, no. 1, pp. 8–13. Mei 2019, doi: 10.21107/triac.v6i1.4878