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# Design and Construction of Room Door Security Using ESP 32 Cam and Blynk Based on Internet of Things

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## ABSTRACT

Security is the most important thing in life. Everyone needs more security in their residence. It is expected that a well-designed security system will provide a sense of security and comfort. In addition, of course, the security system that will be created will help reduce the crime rate in society, especially theft. Current door security is like using conventional keys. So, it is less efficient to use on doors because too many keys have to be carried, besides conventional keys are easily opened by thieves. In this study, the author created a door security tool to help the community. This tool was created by the author to allow the community to experience developments such as doors that can be controlled via smartphones and monitored automatically using ESP32 CAM and security to open a room based on Internet Of Things (IOT) technology through internet network media. Based on the tests carried out, this system is able to respond well to the security of a room.

## INTRODUCTION

Security is the most important thing in life. Everyone needs more security in their residence. It is expected that a well-designed security system will provide a sense of security and comfort. Various technological advances are designed to protect even personal assets. In addition, of course, the security system that will be created will help reduce the crime rate in society, especially theft (Amari, 2023).

Current technological advances have penetrated all aspects of our lives, so that we seem to be filled with tools that can help us. With high crime rates, especially theft and robbery that occur in an empty room. Room security is very important, and because of the increasing crime rate, room security must be tightened. To create a room security system, usually using a key or padlock, but this does not always make the room safe because of human negligence in using keys or padlocks, such as losing keys or getting duplicate keys without our knowledge (Putranto et al., 2019).

Theft is very likely to occur in a room that is often left empty by the occupants due to some activities. Therefore, new devices that can anticipate theft must be added to the existing locking system. With the development of mobile phone communication technology, also known as mobile technology, smartphones and mobile phones can now be integrated with various control or monitoring tools, such as Internet of Things (IoT)-based home monitoring system tools (Yulita & Afriansyah, 2022).

Current door security is like using conventional keys, so it is less efficient for houses with many doors because too many keys have to be carried, besides conventional keys are easily opened by thieves (Novianti, 2019). Then, the development of technology such as using door security with fingerprint sensors (Dita et al., 2021). After that, the door lock device uses a keypad to open the door where the keyword or password is a security code model (Suwartika & Sembada, 2020).

The author created this tool based on several theft cases to help the Indonesian people. This tool was created by the author to allow the community to experience developments such as being able to be controlled and monitored automatically using esp32 cam and security to open a room based on Internet Of Things (IoT) technology through internet network media.

Therefore, the purpose of making this tool is to implement a home security detection system to reduce material losses caused by negligence and to stop theft. This system makes people more comfortable when leaving the room they are leaving. The author wants to make a thesis entitled "Design and construction of security doors for room doors using ESP32 CAM and Blynk based on the Internet of Things" based on the problems above.

## SITUATION ANALYSIS

Research conducted by Mirza Faturrachman, Indra Yustiana, (2021) namely the Home Door Security System with Fingerprints Based on the Internet of Things uses the prototyping method to create a security system based on the Internet of things (IoT) using an Arduino microcontroller and a fingerprint sensor that can be read by the homeowner, because it is easier to use and effective for making the system, this system aims to design tools for home security, especially the door of the house which is very vulnerable to theft. To reduce the risk of theft at home, a fingerprint sensor will be used to verify people who will enter (Rosa et al., 2019).

Research conducted by Fitria Ratnasari, Prahenusa Wahyu Ciptadi, R. Hafid Hardyanto, (2021) namely IoT-Based Home Security System Using Microcontroller and Telegram as Notification, To send images from ESP32 CAM, the Telegram application must be connected to the internet network. As a result of the test, the PIR sensor will detect motion and will send and receive notifications on the user's smartphone via the Telegram application within three to six seconds. The internal network connection used can affect delivery. A Smart Home has also been built with the Telegram application to protect the house (Ratnasari et al., 2021).

Research conducted by Rini Suwartika and Gandang Sembada, (2020), namely the Design of a Security System Using an Arduino Uno-Based Solenoid Door Lock on Laboratory Doors at PT. XYZ, regarding the design of a laboratory door lock using a keypad for input that has been given a keyword or password as a security code model (Suwartika & Sembada, 2020).

## IMPLEMENTATION METHOD

### *Metode Prototyping*

Prototype model is a technique for quickly gathering specific information about user information needs. The focus is on presenting the aspects of the software that are visible to customers or users (Pricillia & Zulfachmi, 2021). Prototypes are evaluated by customers/users and used to refine software development requirements. Prototypes are defined as tools that provide developers and potential users with an idea of how the system will work in its complete form, and the process of creating a prototype is called prototyping.

### *Circuit Design*

The following is a series of cables between all the components of the materials used to create a room security system:

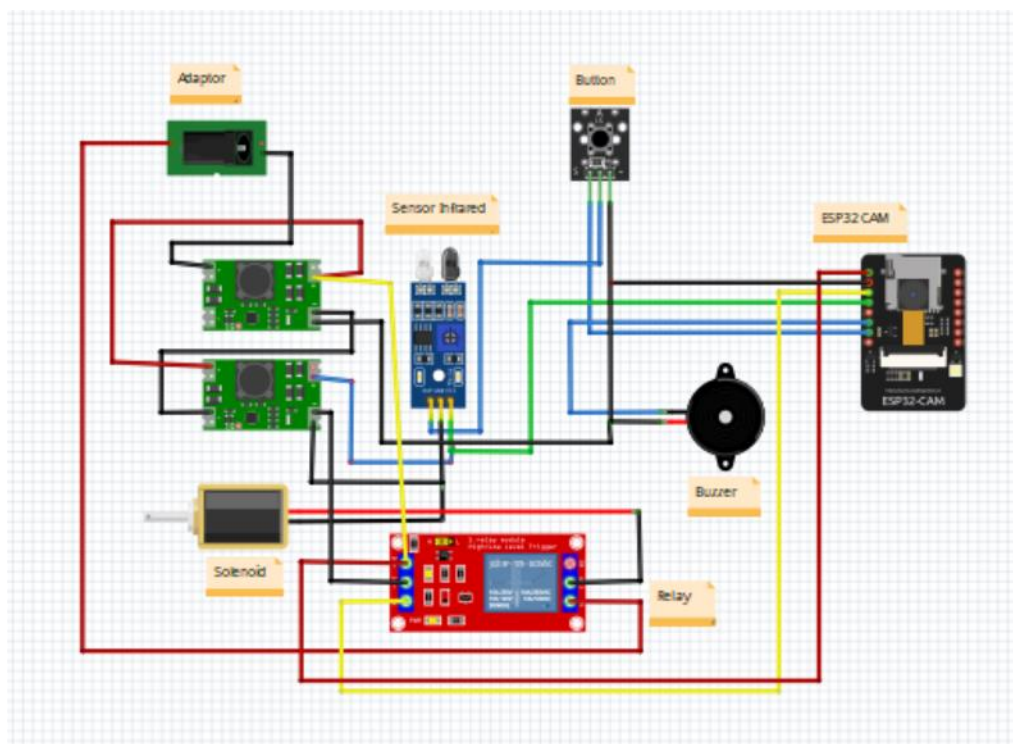


Figure 1. Metode Prototyping

The components of the circuit above are as follows:

1. ESP32 CAM
2. Infrared Sensor
3. Relay
4. Buzzer
5. Breadboard
6. Solenoid
7. Button
8. Mini560 Stepdown

The circuit above shows the parts used to build a room security based on the Internet of Things using ESP32 CAM to capture images in real-time, and open the room door via blynk. Infrared sensor to detect movements around the sensor. Jumper cables are used to connect the entire circuit.

#### ***ESP32 CAM and Relay Cable Circuit***

ESP32 CAM is a microcontroller module that has the ability to capture images in real-time and detect faces that must be connected to a WI-FI network. While the relay is an electronic device that can control the flow of electricity to other devices.

#### ***System Block Diagram***

A block diagram can be used to show system activities to better understand how the system will be built. However, it is also necessary to create an overview of how the current system operates (Indah et al., 2023). The following is a block diagram used in this study:

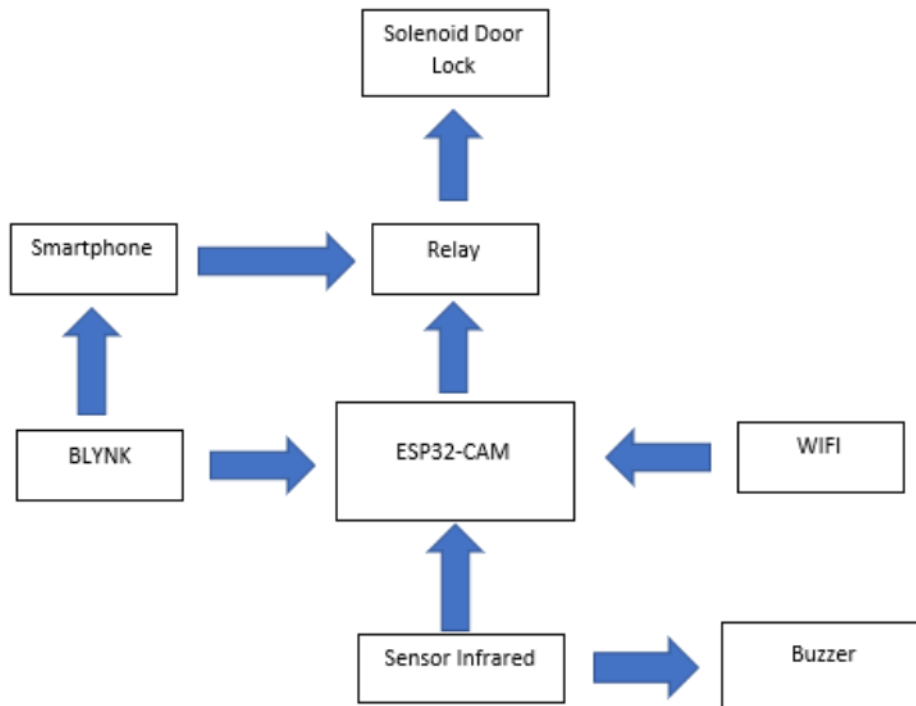


Figure 2. Block Diagram

The image above explains that the Blynk and WIFI applications must be connected to the ESP32 CAM Microcontroller. Then, if there is movement outside the room door, the infrared sensor will detect the movement, then the buzzer will give a signal in the form of sound. ESP32 can see real-time images outside the room door on the smartphone. Then, the smartphone will control the relay component to command the solenoid to open the room door.

## RESULTS AND DISCUSSION

Based on the results of the analysis and design that have been done in the previous chapter, the design of the security door of the room using esp32cam, blynk, infrared sensor, button, and buzzer has been made. Testing is done to find out how the condition of the system and this tool can be used optimally and appropriately.

### *Infrared Sensor Testing*

Sensor testing is done to get the performance of the infrared sensor. The Infrared Sensor testing on door security can be seen as follows:

Table 1. Infrared Sensor measurement results

| No | Detection Distance | Infrared Condition |
|----|--------------------|--------------------|
| 1  | 1 cm               | Active             |
| 2  | 2 cm               | Inactive           |
| 3  | 3 cm               | Inactive           |

The table above explains that at a distance of 1 cm the infrared sensor detects movement outside the room, and at a distance of 2 cm and 3 cm the infrared sensor does not detect any movement.

### *Button Testing*

Button testing is done to find out whether the button is functioning properly or not. The test results can be seen below:

Table 2. Button Test Results

| No | Condition Button | Status  |
|----|------------------|---------|
| 1  | ON               | Success |
| 2  | OFF              | Success |

In the button test results table section, it is explained that the button functions properly and as desired.

### **Buzzer Testing**

The results of the buzzer test can be seen in the table below:

Table 3. Buzzer Test Results

| No | Indicator                    | Status                |
|----|------------------------------|-----------------------|
| 1  | Infrared Sensor detected     | Buzzer Sounds         |
| 2  | Infrared Sensor not detected | Buzzer Does Not Sound |

The table above explains that the infrared sensor is functioning properly. If there is movement, the Infrared Sensor detects movement and the buzzer will sound.

### **Testing on the Blynk Application**

The Blynk application is used to find out the presence of someone who is outside or in front of the door so that it can be monitored via the Blynk application so that the room can be monitored and opened from a distance.

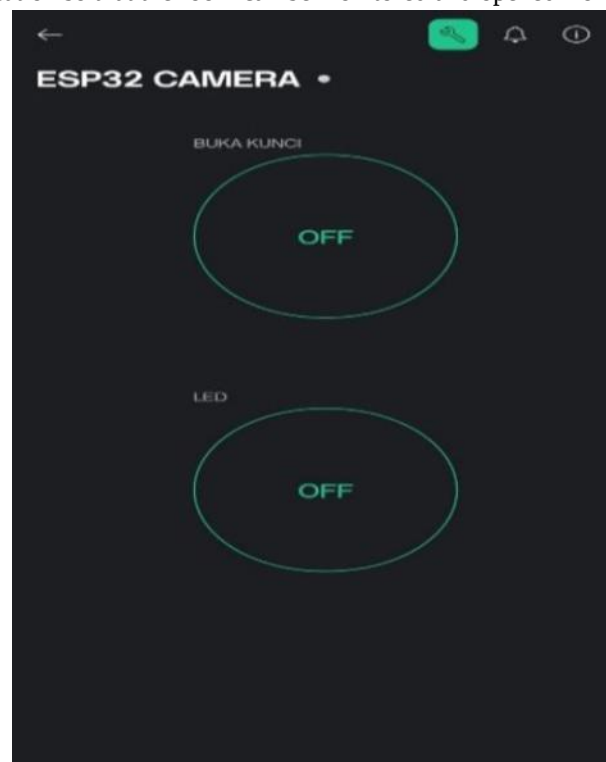


Figure 3. Blynk notification view

In this blynk application, monitoring of the security of the designed room can be done. In this blynk application, we can control/open the room door using only a cellphone.

### **Testing on ESP32 CAM for Face Recognition**

In this test, face recognition is carried out to open the room door via the esp32 CAM microcontroller by registering the face on the given IP address and also to monitor in front of the room door.

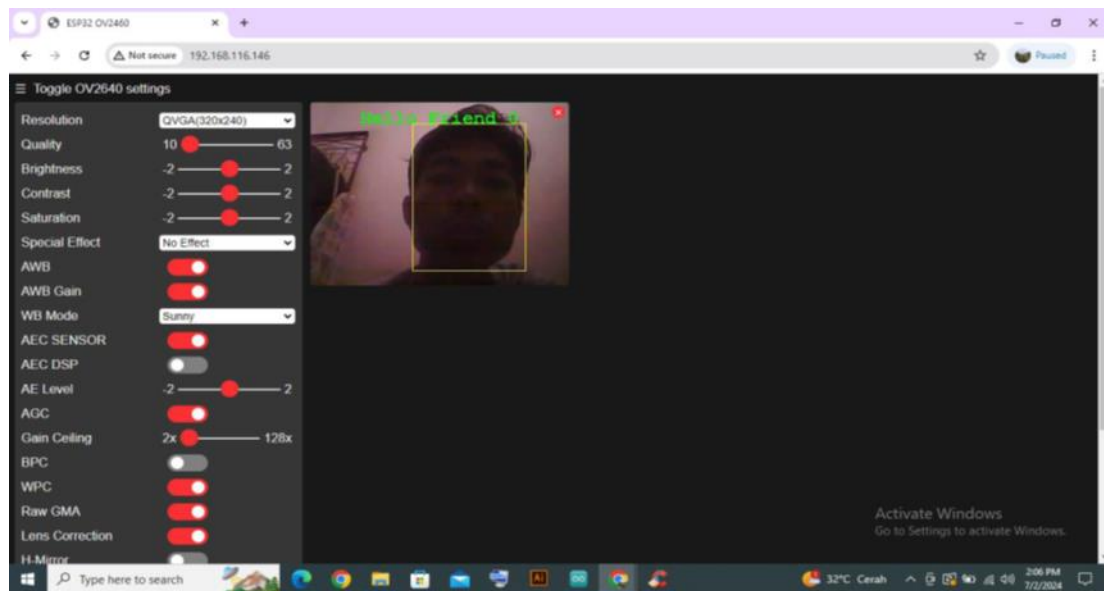


Figure 4. Web View For Face Registration

### ***Testing All Components***

Testing on all components is testing tools that are interconnected between input and output controlled via ESP32 CAM. The input process includes infrared sensors and buttons, while the output process includes solenoid door locks and buzzers. All input processes will be entered into the ESP32 CAM as a controller.

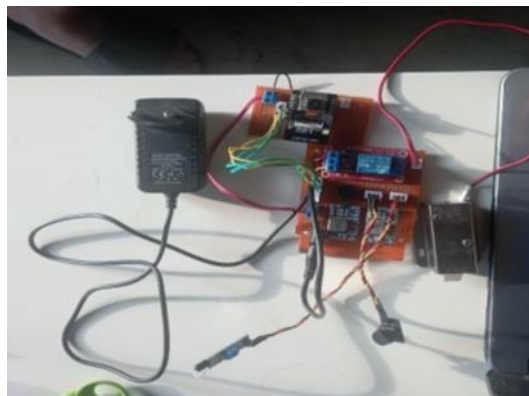


Figure 5. Room Door Security Device Series

### ***Coding Implementation***

After the hardware design process is complete, the next stage is coding, which will help configure the system design of the tool that has been created. This working principle is implemented through the use of an interface display. The script will be created using the C/C++ programming language, and using the Arduino IDE software to run it.

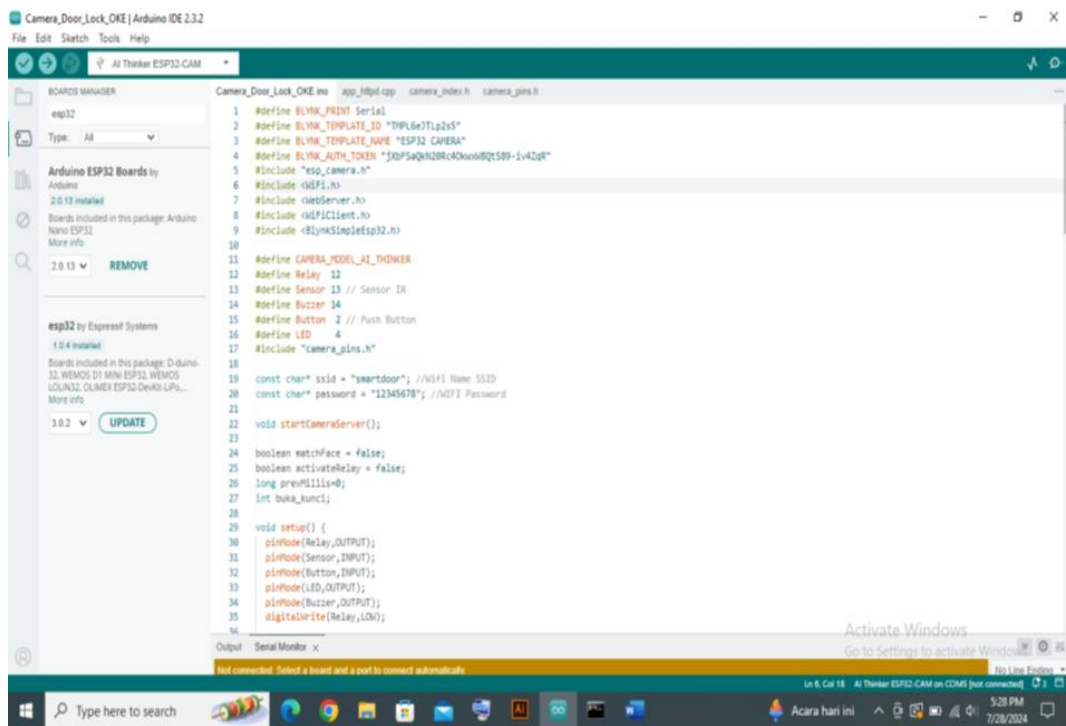


Figure 6. Coding in Arduino IDE for Blynk

The image above shows the Arduino IDE software interface and the display of the script that has been written. This program has been typed into the Arduino IDE software to enable the formation of the system.

## CONCLUSIONS AND RECOMMENDATIONS

Tools such as ESP32 CAM, infrared sensors, buttons, buzzers, and relays can work well and correctly on the Internet of Things-based room door security system. In addition, ESP32 CAM works well to monitor and open room doors via smartphones. The circuit will be active when connected to a power source, all components of the tool will automatically function. Infrared sensors are used to detect movement outside the room. When this sensor detects movement, the system will activate the next security steps. The buzzer is activated when there is motion detection by the infrared sensor. The buzzer functions as an alarm to notify someone in the room. The button is used to open the room door security system manually.

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