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# Prototype Motion Sensor And Automatic Locking Based On The Internet Of Things (IOT)

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**A B S T R A C T**

The application of IoT in remote control systems to home security is becoming a necessity. This research designed 2 parts of the application of IoT, namely the automatic locking control system and motion sensor detection. With IoT, it can help reduce the risk of laziness in households. The equipment used in the IoT circuit is the nodemcu esp8266 internet module, 5vdc relay module, electrical sockets and pitting and cellphone chargers. The way this electrical IoT works is by controlling it from a smartphone that is connected to a device using applications and the internet. With a note on the IoT tool at home, there is already a living internet network. If the internet network has a problem, the tool will not work properly. The output of this research is a Control System IoT product in the form of a prototype that can be used for the motion detection process and an IOT-based door locking system that can be controlled from a smartphone



## 1. Introduction

Information technology in this era is a supporting source of information used by all community attachments in their activities. The government has intensively developed information technology infrastructure in the form of superfast internet service providers and providers of cheap home internet services to public internet services. With information technology, humans can modernize daily activities to achieve effective life goals.

The development of science and technology encourages humans to continue to think creatively not only to find something new, but also to maximize the performance of a technology. The rapid development of technology allows the formation of systems that are interconnected through an internet connection as a medium. Internet of things (IoT) is a technology that allows electronic devices to have the ability to communicate with each other, send and receive data through the internet network.

IoT is a control system utilizing the internet network to control the system. In Indonesia, the application of IoT has not been too much based on the article (Michael, 2019) on the web https://www.merdeka.com/ entitled "Application of IoT in Indonesia, What Should Be Prepared?". IoT in Indonesia is still in the stage of introduction and implementation because not all regions of Indonesia are affordable by cheap and economical internet.

Why IoT is considered important to implement, because the application of IoT can help in carrying out security control at home by utilizing fairly simple tools. Control can be done using a computer or smartphone that is already connected to the internet.

Because the application of IoT at home can facilitate the process of controlling the house and monitoring the house from afar. In addition, IoT is expected to answer the challenges of the times to the development of information technology and its application.

## 2. Method

In a study, research methods are the first steps in obtaining good research results and in accordance with the output desired by the researcher. Basically the initial steps of the research are as follows:

a. Observation
   Observing / analyzing research needs on simple IoT design that can be applied to the home. In the process of observation, it is not only carried out to the place of research but also to literature relevant to the object of research
b. Interview
   A question and answer process to experts that aims to explore information about the use of material tools and the process of completing research and provide input on the research that is being carried out.
c. Literature Study
   Make a visit to the library to find research references. Can be done online or directly to the library. Literature studies can also be carried out on the search for references from scientific journals published nationally and internationally.

The algorithmic approach used is machine learning. Machine learning is a discipline that includes the design and development of algorithms that allow computers to develop behaviors based on empirical data, such as from database data sensors. In this case machine learning has the ability to acquire existing data with its own commands. Machine learning can also learn existing data and the data it obtains so that it can perform certain tasks.

In general, machine learning has two basic techniques in learning cases including

a. Supervised Learning
   is a technique that you can apply to machine learning that can receive information that already exists in the data by assigning certain labels. It is hoped that this technique can provide a target for the output carried out by comparing learning experiences in the past.
   Suppose you have a number of films that you have labeled with a certain category. You also have films with comedy categories including the films 21 Jump Street and Jumanji. In addition, you also have other categories, for example horror film categories such as The Conjuring and It. When you buy a new movie, you will identify the genre and content of the film. After the film is identified, then you will save the film in the appropriate category.

b. Unsupervised Learning
   Unsupervised learning techniques are techniques that you can apply to machine learning that is used on data that does not have information that can be applied directly. It is hoped that this technique can help find hidden structures or patterns in data that do not have labels.
   Slightly different from supervised learning, you don't have any data that will be used as a reference before. Suppose you have never once bought a movie at all, but at one time, you bought a number of movies and wanted to divide them into several categories to make them easy to find. Of course, you will identify which movies are similar. In this case, suppose you

identify based on the genre of the film. For example, if you have the Conjuring movie, then you will save The Conjuring movie in the horror film category.

## 3. Results and Discussion

Internet of things is a concept in which an object or object is implanted with technologies such as sensors and software with the aim of communicating, controlling, connecting, and exchanging data through other devices as long as it is still connected to the internet.

IoT has a close relationship with the term machine-to-machine or M2M. All tools that have M2M communication capabilities are often referred to as smart devices or smart devices. This smart device is expected to help human work in solving various existing affairs or tasks.

To create an IoT ecosystem, we not only need smart devices, but also various other supporting elements in it. Here are the various elements that make up the internet of things:

a. Artificial intelligence
   Artificial intelligence (AI) is an intelligence system owned by humans that is implemented or programmed in machines so that machines can think and act like humans. This AI itself has several branches, one of which is machine learning. You can learn about machine learning in Machine Learning Developer Dicoding as a first step to developing AI.
b. Sensor
   This element is the distinguishing element of the IoT engine from other advanced machines. With this sensor, the machine is able to determine instruments that can transform IoT machines from those that were originally passive to machines or tools that are active and integrated.
c. Connectivity
   Connectivity is also commonly referred to as a connection between networks. In the world of IoT itself there is a possibility for us to create new networks, networks that are specifically used for IoT devices.

In this study, several equipment were used, including

a. Module Relay (Dua Channel)
   The relay module is an electrical switch operated by an electromagnet. The electromagnet is activated by a separate low-power signal from the micro controller. When activated, the electromagnet attracts to open or close the electrical circuit. A simple relay consists of a coil of wire wound around a soft iron core, or solenoid, an iron yoke that provides a low reluctance path for magnetic flux, a movable iron armature, and one or more contact circuits. The movable armature is hinged onto the yoke and connected to one or more sets of moving contacts. Held in place by a spring, the armature leaves a gap in the magnetic circuit when the relay is not energized. While in this position, one of the two sets of contacts is closed while the other set remains open.


When an electric current is passed through the coil, it generates a magnetic field which in turn activates the armature. This movement of the moving contact makes or breaks the connection

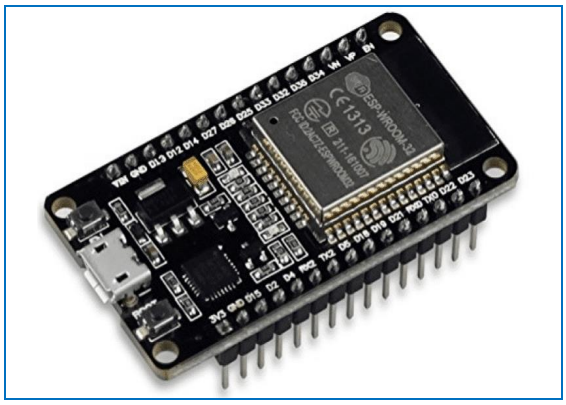
with the fixed contact. When the relay is turned off, the contact circuit is closed, opening and disconnecting and vice versa if the contact is open. When turning off the current to the coil, the armature is returned, by force, to its relaxed position. This force is usually exerted by springs, but gravity can also be used in certain applications. Most power relays are built to operate quickly.

For power distribution in high-current applications, GEP Power Products is an industry leader in the design and manufacturing of high-power relay modules.

Rated up to 70 amps, GEP power relay modules are designed for seamless integration in high power distribution applications. A convenient integral mounting bracket provides ease of installation and accessibility. With endless options such as terminal position guarantees available for cable retention, GEP Power Products' power distribution solutions and off-road industry knowledge are second to none.

b. ESP 32 Module

The ESP 32 module is a low-priced, energy-saving microcontroller with integrated wifi and dual-mode bluetooth. The ESP32 generation uses the Tensilica Xtensa LX6 microprocessor as the core. Both in single-core and dual-core mode. ESP32 is made by Espressif Systems, a company based in Shanghai, China



ESP32 is capable of functioning reliably in industrial environments, with operating temperatures ranging from –40°C to +125°C. Powered by advanced calibration circuits, the ESP32 can dynamically eliminate external circuit imperfections and adapt to changing external conditions.

Engineered for mobile devices, wearable electronics, and IoT applications, the ESP32 achieves ultra-low power consumption with a combination of several types of proprietary software. The ESP32 also includes advanced features, such as fine-grained clock coating, various power modes, and dynamic power scaling.

The ESP32 is deeply integrated with built-in antenna switches, RF baluns, power amplifiers, low noise receiver amplifiers, filters, and power management modules. The ESP32 adds invaluable functionality and versatility to your application with minimal Printed Circuit Board (PCB) requirements.

The ESP32 can function as a complete standalone system or as a slave device to the host MCU, reducing the communication stack overhead on the main application processor. The ESP32 can interact with other systems to provide Wi-Fi and Bluetooth functionality via SPI/SDIO or I2C/UART interfaces.

c. Cable Jumper

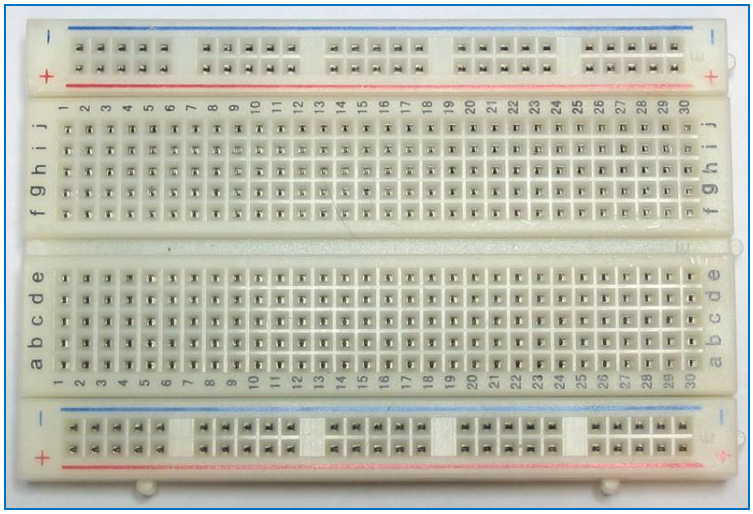
One of the components that is quite important in making a circuit is the Arduino jumper cable. Abel jumper is an electrical cable that has connector pins at each end and allows you to connect two components involving Arduino without the need for solder.

In essence, the use of this jumper cable is as an electrical conductor to connect electrical circuits. Usually the jamper cable is used on the breadboard or other prototyping tools to make it easier to fiddle with the circuit. The connectors at the end of the cable consist of two types, namely male connectors and female connectors. The male connector functions to puncture and the female connector functions to be pierced.

d. Project Board

Project Board or often referred to as BreadBoard is the basis of the construction of an electronic circuit and is a prototype of an electronic circuit. In modern times this term is often used to refer to a certain type of board on which to assemble components, where this board does not require a soldering process (directly plugged in).

Because this board is solderless aka does not require soldering so that it can be reused, and thus it can be used for temporary prototyping as well as assisting in experimenting with the design of electronic circuits. Various electronic systems can be prototyped using breadboards, ranging from small analog and digital circuits to creating a centralized processing unit (CPU).



Explanation:

a) 2 Install the upper and lower lines connected horizontally all the way to the center of the breadboard. Usually this line is used as a power line or a commonly used signal line such as clocks or communication lines.

b) The 5 component holes in the middle are where the components are assembled. The path to these 5 holes is connected vertically to the center of the breadboard.

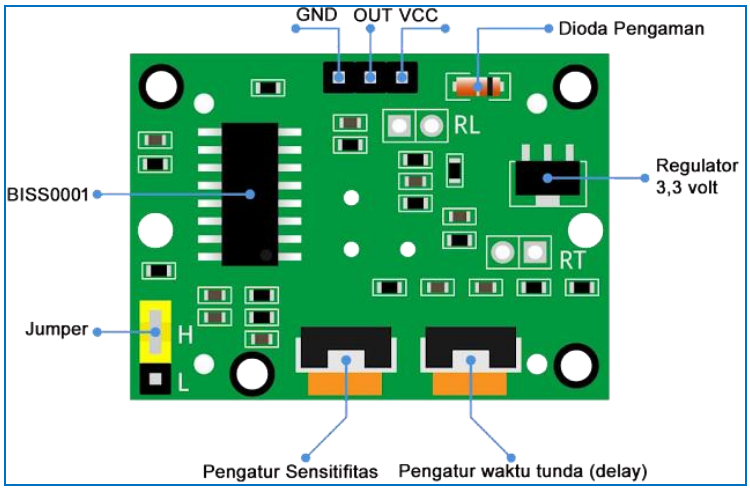
c) The center limiter of the breadboard is usually used as a place to plug in IC components

e. Selenoid Lock

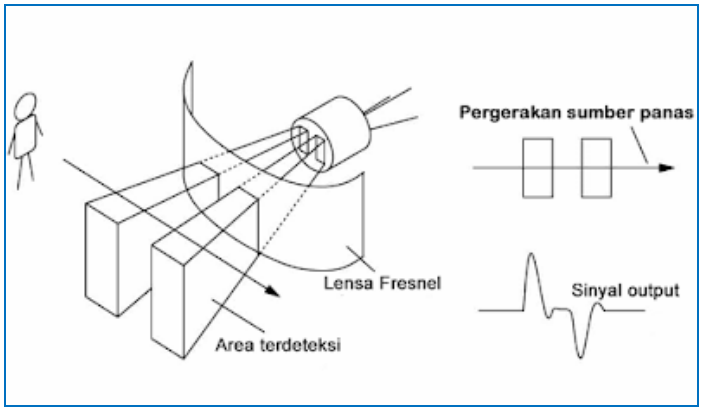
Selenoid door lock is an electronic device whose working principle uses electromagnetics. Selenoid door locks generally use a working voltage of 12 volts. Under normal conditions this device is in a closed state (locking the door), when given a voltage of 12 volts then the lock will open.

d. Motion Sensor (PIR)

It is a passive infrared sensor that is usually used to detect movement within the range of the sensor. Usually the Passive Infrared Receiver sensor is applied to security alarms and automatic lighting applications.

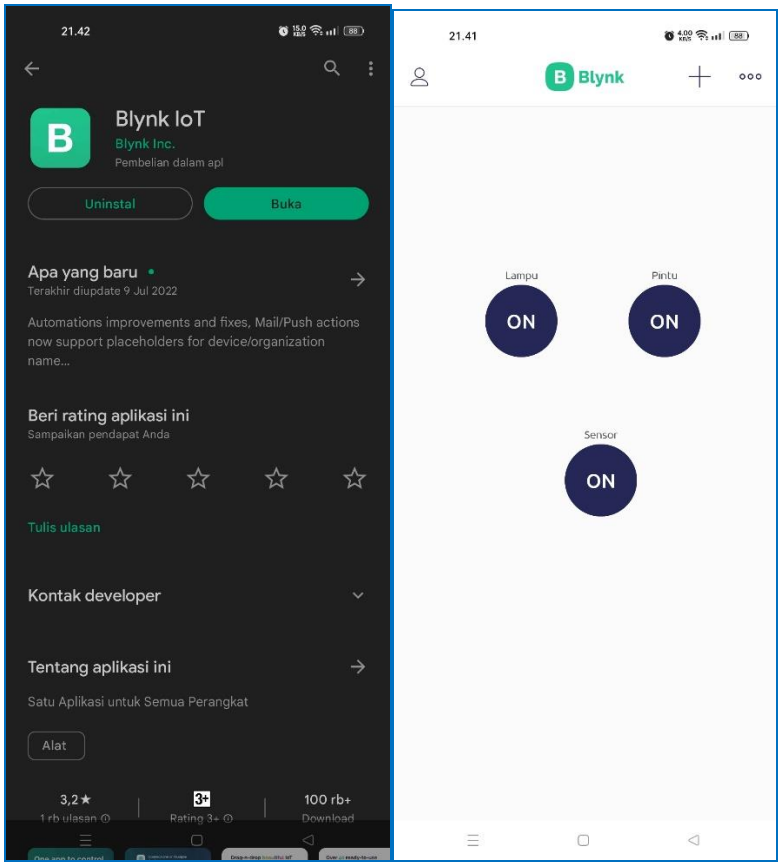



The pyroelectric sensor has two rectangular slots and inside is a thin material that allows infrared radiation to enter. Behind this sensor are two separate electrodes, which can produce both positive output and negative output. These two electrodes are connected so that they can receive incoming IR radiation. And for Set the low height, can rotate the potentiometer located next to the sensor.




e. Software Blynk

Is a platform for Mobile OS applications (iOS and Android) that aims to control modules Arduino, Raspberry Pi, ESP8266, WEMOS D1, and similar modules via the Internet.

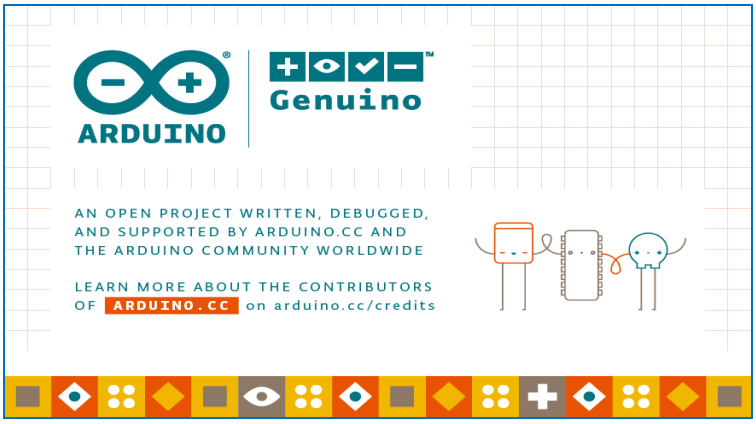



This application is a creative container for creating a graphical interface for projects that will be implemented only by the drag and drop widget method. Its use is very easy to organize everything and can be worked on in less than 5 minutes. Blynk is not tied to a specific board or module. From this application platform can control anything remotely, wherever we are and anytime. With a record of being connected to the internet with a stable connection and this is what is called the Internet of Things (IOT) system.

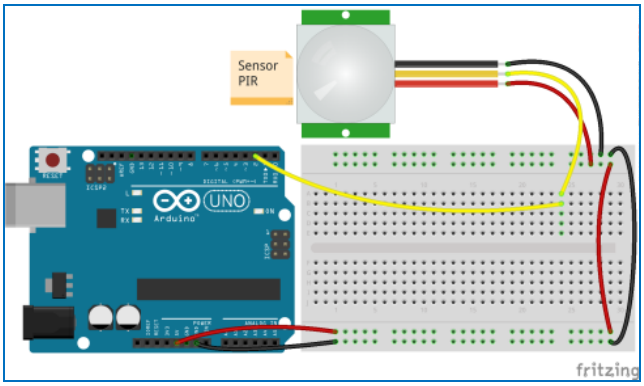
f. Arduino IDE

Is an application issued by Arduino that can be used in transferring syntax or coding to ESP 32 using a laptop / computer. Arduino IDE needs to be installed on a laptop device to be connected to ESP 32 using data cable media.

Arduino IDE can be downloaded at the following link https://www.arduino.cc/en/software

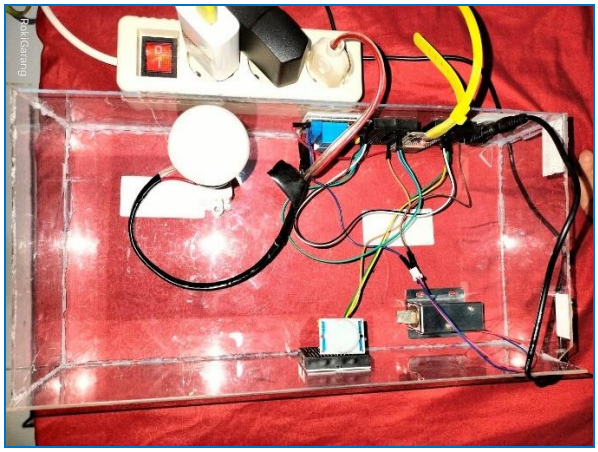


Below is the design of the tool to be built using ESP 32, PIR Sensor, Selenoid Lock. The technique of this design is to design the application of automatic locking and IOT-based movement detection sensors that are connected to the user's smartphone using Blynk IOT software. Smartphones that can be used are Android and I Phone.

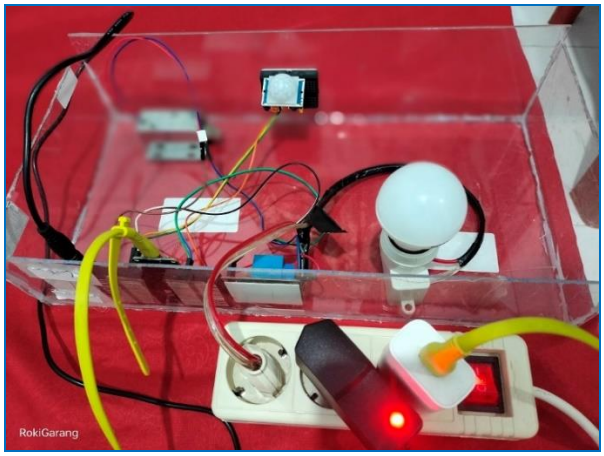



The working principle of this prototype is

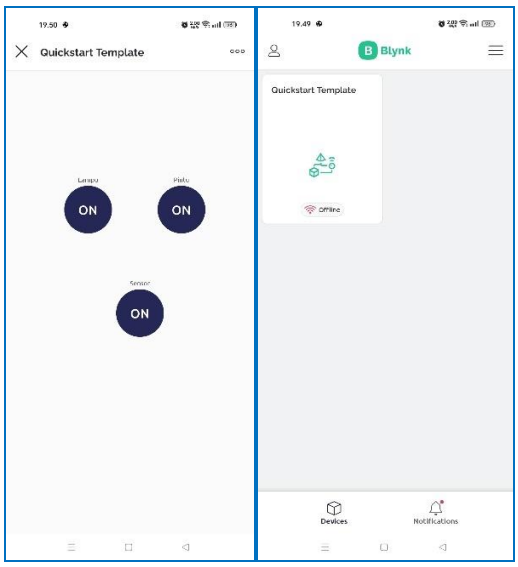
a. Connect ESP 32 and Selenoid Lock with a power source



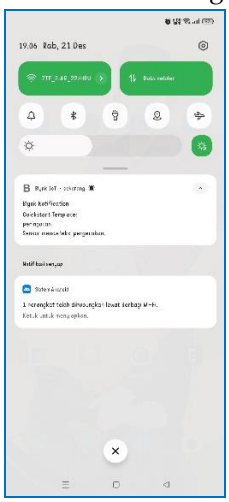

b. Then connect ESP 32 with an internet network source



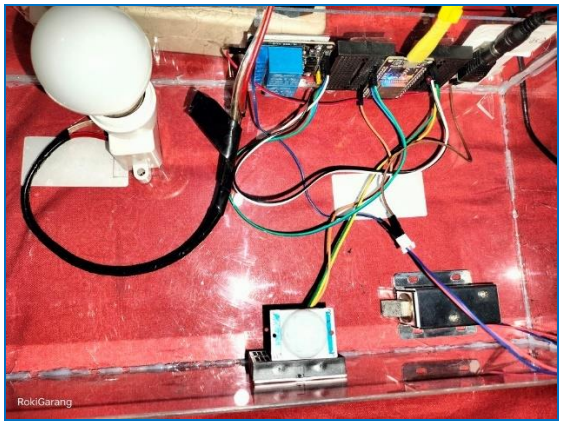

c. Open the Blynk IOT app




d. If it is connected, it can immediately control the sensor and door lock
e. The PIR sensor detects movement and will send a message to the user's Smartphone



f. If you want to lock the door, you can do off the Blynk IOT application




The test results of the automatic locking device design are obtained as follows:

| Testing | Motion Sensor | Auto Locking |
|---|---|---|
| 1 | Success | Success |
| 2 | Success | Success |
| 3 | Success | Success |

| | | |
|---|---|---|
| 4 | Success | Success |
| 5 | Success | Success |
| 6 | Success | Success |
| 7 | Success | Success |
| 8 | Success | Success |
| 9 | Success | Success |
| 10 | Success | Success |

## 4. Conclusion

Based on the research conducted, conclusions were obtained:

a. Research output in the form of door locking prototypes and IOT-based motion detection sensors
b. The prototype that is built runs well and can be developed to be applied at home or office
c. Prototype using Blynk IOT software as controlling of the smartphone
d. Tool activities can be done and monitored from the Blynk IOT software installed on the smartphone

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