

SHAMSU: Smart Heat and Motion Sensor for Home Use

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Abstract

The crime rate is increasing in several areas during the pandemic Covid-19. Losing jobs, stress, and hunger drive people to commit crimes. On the other hand, mobile internet users are growing rapidly in Indonesia. Based on those facts, the researchers think probably there must be a way in using mobile and user-friendly apps to detect and prevent crime acts.

Based on the assumption above, the researchers made a simple home security device that can detect suspicious people based on their temperature and movement of living things within certain distances, then sending the data through internet and take control with mobile phone applications. The device use infra-red sensor, micro servo motor and other accessories that supporting security system. Through several tests, the researchers have succeeded in proving that the device can be used to a home security system in the neighbourhood.

Keywords: *IoT, security system, detector*

I. INTRODUCTION

I.1 Preface

Praise and gratitude are dedicated to Allah SWT, God Almighty. Because of His grace, the researcher was able to complete a scientific work entitled SHAMSU (Smart Heat And Motion Sensor for home Use).

This scientific work was made to improve the home security system by using Internet of Things (IoT). The researchers are very aware of the shortcomings in this study and open for inputs and critics to improve this project.

I.2. Background

During the pandemic Covid-19, the crime rate is increasing due to economic and psychological reasons. In several areas, many people losing their jobs or income, being poor, hunger, and high stress cause by government restriction policy. As mentioned in several online newspapers, the percentage of theft cases in Yogyakarta was increasing from 2020 to 2021 from about 1,13 million cases to 1,29 million cases. Meanwhile, criminal cases increase to 35% during the pandemic in Palangkaraya.

On the other hand, Indonesia is one of the biggest online markets worldwide. Based on the World Bank's data, the internet users in Indonesia was around 54% of the population in 2020. This figure continues to grow to 70% until the end of July 2021.

Meanwhile, the Statista highlighted that mobile internet usage is undergoing double-digit growth rates and currently stands at over 64% among the population.

The facts above have inspired researchers to develop a device that can quickly detect and prevent criminal acts (especially theft and robbery) in residential homes using internet-based applications and mobile phones. The researchers assumed that the device made in this project can reducing criminal rate in Indonesia.

I.3. Purpose

- To create a home security monitoring system through Arduino and Blynk-based heat and motion sensors.
- Testing the effectiveness of this system is tested by a standard method.

I.4. Aim

For the community, this device can be a simple home security system and user-friendly internet-based apps. The owners can easily monitor, detect, and prevent criminal acts in their homes through internet and mobile phone apps.

Meanwhile, for scientific purposes, this device can enrich scientific and technological innovation regarding the use of IoT particularly in improving home security systems.

II. BASIC THEORY



1. Arduino

Arduino is an open-source electronics platform designed to make electronics more accessible to everyone who is interested in creating interactive objects or environments. An Arduino board can be purchased or accessed pre-assembled; users can adapt the boards according to their needs, as well as update and distribute the versions.

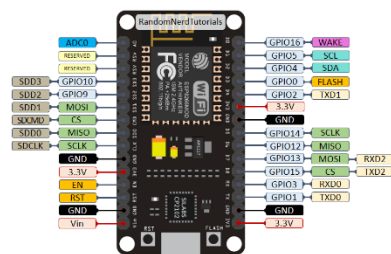
2. Internet of Things



The Internet of Things (IoT) is a

interrelated system of computing devices, mechanical, digital machines, and objects that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. IoT can also make use of artificial intelligence (AI) and machine learning to aid in making data collecting processes easier and more dynamic.

3. NodeMCU



NodeMCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Express Systems,

and hardware which was based on the ESP-12 module.

4. Relay 8 channels



The 8 channels relay module is an operate device based on electromagnetic principles equipped with the ON/OFF button. This closed and opened event of the contactor occurs because of magnetic induction arising from the electric induction coil. The most basic difference between a relay and a switch is when it is moved from the ON to the OFF position or vice versa, the relay will automatically transfer with an electric current, while the switch did manually.

5. Led



Light Emitting Diode (LED) Modules or circuits is a self-contained LED device designed either to function on its own or to plug into a compatible unit. LED modules are commonly used to create energy-efficient or portable lighting.

6. Infra-Red Sensor



An Infra-Red Sensor (IR sensor) is an electronic device that measures and detects infrared radiation in its surrounding environment. IR sensor can detect motion and temperature of object and can be used in building services to detect unwelcome guests or objects. The researchers use HC-SR

501 Pyroelectric Infra-Red Sensor in this project.

Tower Pro Micro Servo Motor 9G SG90 for RC Robot Helicopter Airplane.

7. Adaptor 1A and 2A



Adapter is a circuit that is useful for converting a high AC voltage into a low DC voltage. Adapters are also widely used in tools as a power supply, such as amplifiers, radios, mini television sets and other electronic devices.

8. Buzzer



A buzzer or speaker is a component in a circuit that makes a sound when electricity goes through it. Typical uses of buzzers and beepers include alarm devices, timers, train and confirmation of user input such as a mouse click or keystroke.

9. Servo Motor



Servo Motor is an electrical device used in intelligent industrial machines that function to propel or rotate objects with high-precision control in terms of angular position, acceleration, and speed by sending the servo a coded signal. As long as the coded signal exists on the input line, the servo will maintain the angular position of the shaft. In this project, the researchers use the

10. Blynk



Blynk is an app for IOS and Android OS to control Arduino, NodeMCU, Raspberry Pi and others. Blynk can be used to control hardware devices, display sensor data, store data, visualization, and others.

III. METHOD

III.1. Time and Place

➤Time: The time used to develop this project is around 3 months for planning, programming, designing, testing, analysing.
➤Place: school lab.

III.2. Timeline

Planning	Looking for inspiration, learning process, find out materials Time: 1 week
Programming	Programming the applications (sensor tools, Arduino, Blynk) Time: 2 weeks
Designing	Develop and setup circuit, connecting circuit to Arduino and Blynk Time: 3 weeks
Testing	Running test circuit, Arduino, and Blynk and record the data Time; 2 weeks
Analyzing	Analyse the data obtained from running test Time: 1 week

III.3. Black Box

Black box method is a test of the functionality or usability of an application. Black box trials are essential to find bugs or problems with the tool or application.

IV. DISCUSSION

IV.1. Tools and Materials

Tools: Laptop, Mobile Phone, Wifi Connection, Soldering Iron, Screwdriver, Pliers, Scissor, Cutter, Tweezers, and Glue Gun.

Materials: Adaptor, LED Module, Cable, LCD 16×2 , Jumper, Relay 8 channels, Node MCU, PIR Sensor, Buzzer, and Servo Motor.

IV.2. How It Works?

The device made in this project is expected to work well through the following steps:

First, make sure that the device, laptop, and mobile phone are connected to electricity and internet through the outlet.

Second, make sure that PIR sensor, Buzzer, LCD, and Servo Motor are undamaged and working properly.

Third, make sure that the Arduino and Blynk coding have been made correctly.

Fourth, put PIR sensor, Buzzer, LCD, and Servo Motor in the desired places and its cables have connected properly to the device.

Fifth, turn on the device through the switch control.

Finally, the device will work when the PIR sensor detects certain temperature and movement of living object. Automatically, the Buzzer will sound, the LCD will turn on, and the Servo Motor will move as desired (for the case of home installation, the Servo can be connected to door or window). Every device can be controlled by switch control in installed Blynk apps on the mobile phone.

IV.2. Simulation using tools

1. The tool must get electricity



2. After connecting to wifi then blynk will turn on



3. Tool has not detected



4. There is human movement



5. This tool detects the presence of human movement



IV.3. Black Box

The researchers examine some processes related to: 1) the connection between Arduino with PIR, Buzzer, Servo Motor, and LCD; and 2) the Connection between Blynk, Arduino and devices (PIR, Buzzer, Servo

No	Testing	Test case	Expected Results	Result
1.	PIR Sensor	Can PIR detect presence of living things?	PIR can detect Human present	Valid
2.	Servo	Can Servo move as desired?	Servo can serve to push or rotate objects with high-precision control in terms of angular position	Valid
3.	Buzzer	Can Buzzer sound following PIR sensor?	Buzzer will sound automatically when PIR succeed in detecting something	Valid
4.	LED	Can the light on following PIR sensor?	LED will light on automatically when PIR succeed in detecting something	Valid
5.	Blynk App	Can Blynk show the sensor value in the app?	Blynk can show the sensor value dan set the tool from the app	Valid

Motor, and LCD). This test includes the completion of Arduino and Blynk coding. This table below shows the testing framework and its result, as follows:

IV.4. Result

After going through several tests, the Arduino program is successfully synchronized with PIR, Buzzer, Servo Motor, and LCD. Every device could work properly. In addition, the Blynk program is successfully connected to Arduino and the devices. Every device has been successfully controlled through the Blynk application installed on the mobile phone.

The test has also shown that PIR sensor could detect temperature and movement of living object. This sensor has automatically made the Buzzer sound, the LCD turned on, and the Servo Motor moved as desired. Therefore, the test has succeeded in proving that the device and its components are working properly as desired by the researchers.

V. CONCLUSION

- The researcher has succeeded in proving that the device made in this project can detect temperature and movement of living things through internet and mobile phone applications.
- Arduino and Blynk are smart programs or applications that can be used to operate detectors such as PIR Sensor with support from several devices such as Buzzer, LCD, and Servo Motor which functioned as warning and preventing systems.

- As the Blackbox test, concluded that The device has proven to be very effective in increasing home security.

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