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№ 4905

Research Making Prototype IOT Smart Home for Smart City with Arduino Mega 2560 Using Blynk Application

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January 15, 2021

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Article Information

Received:
Accepted:
Published:
DOI: 10.33555/ejaict.v…

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ISSN 2355-1771

ABSTRACT

Along with the times and the increasing economy of the community, the demand for safe and comfortable housing is increasing. As well as the use of the internet which we unconsciously present in our daily lives makes us a society that is in the IoE (Internet of Everything) cycle so I am interested in developing a smart home with the concept of Internet of Thing using the Arduino Mega 2560 microcontroller. This project will discuss in this paper it is targeted to solve various problems in Indonesia in the application of industry 4.0 in everyday life using the IOT Smart home concept in a smart city. This project is a prototype designed to control and monitor equipment in the house using the blynk application via a smartphone using Wi-Fi as the Arduiono Mega 2560 communication protocol as a server that integrates all components on the sensor. All equipment and sensors are connected to the internet which have specific functions aimed at increasing the efficiency, comfort and safety of the occupants. The system is designed to switch to automatic status controlling the equipment automatically according to the sensor. All equipment and sensors are connected to the internet via the NodeMcu microcontroller. The system uses the Blynk application.

Keywords: *Blynk,IOT,Arduiono Mega 2560,Smart Home, Smart Cities*

1. Introduction

This prototype is used as a consideration for someone to apply the smart home concept in the more advanced development of industry 4.0 in this concept it will apply the Internet of Thing Prototype in real life to simulate a smart home so that people need the comfort of being in the house and security in the house when living. out of town. The difference in this study focuses on the security of entering the door of the house using a password keypad, using a blynk control system to help the lights turn off remotely, and using a temperature sensor when the room is hot, the fan turns on automatically. IoT helps in sharing information from sensors over wireless networks, achieving identification and information exchange in open computing networks and achieving transparent system management. The things we use in our daily life get smart with the flow technology but that's not enough until we connect it to act in the changing environment and also make it our own inter-network, that is, machine-to-machine communication.

a. Problem Statement and Significance

In urban areas, Jakarta must innovate in the development of information technology in the form of a smart city. The needs of the people of Jakarta for security in guarding their homes and comfort at home are due to global warming due to a lot of pollution. The plan will be made in a smart city of Kalimantan designed for high mobility workers. Therefore, this study made an IOT smarthome prototype using the Arduiono Mega 2560 with the Blynk remote control application in order to remotely control the device.

2.Literature review

In previous research research using the IOT smart home concept that uses Raspiberry Pi [9] by using a sensor control system of lights on and off automatically using the Smart Home Website application and previous research using Arduiono Uno by using one selenoid sensor opens automatic doors in the difference of this study the authors using Arduiono Mega by combining a variety of complex sensors such as a door control selenoid sensor with a keypad, remote light control using the Blynk application, and a temperature sensor when the room heat reaches 31 Celsius the Fan will automatically turn on. Due to the large amount of air pollution and global warming that makes it less comfortable to live in the house, the purpose of this study is to provide a prototype of a smart home using the concept of the Internet of things with various sensors that help activities in the house.

No	Paper	Objectives	Methods	Contribution	Weaknesses
1	U. Sari, "Design of smart home system with arduiono Uno R3 base on internet of thing (IoT)," vol. 16, no. 1, pp. 25–29, 2019.	iot smart home that uses Arduiono Uno by using a selenoid sensor to open the door automatically and the gas sensor works as a detector when there is a gas leak, then the blower functions to get rid of the smell gas around the house, carry out instructions through the programming language C	-Arduiono uno - Sensor detector gas - Sensor selenoid to open the door - Using type C or Pascal Programming which is easy to understand	identification of the risk of fire hazards in the house	1. Not able to work for a long time because it has only 8 bits of memory capacity 2.Not able to withstand high temperatures unless a cooling fan is provided 3.If there is a short circuit or a short circuit, damage will occur due to the voltage protection on the Arduino Uno which is easily damaged
2	B. Eryawan, A. E. Jayati, and S. Heranurweni, "Rancang Bangun Prototype Smart Home Dengan Konsep Internet of Things (Iot) Menggunakan Raspberry Pi Berbasis Web," Elektrika, vol. 11, no. 2, p. 1, 2019, doi: 10.26623/elektrika.v11i2.1691.	Prototype Smart Home with the concept of the Internet of Things (IoT) using Web-Based Raspberry Pi, by controlling remote automatic light sensor control	- Raspiberry PI - controlling remote automatic light sensor control	• provide remote control system tools	Raspberry Pi is a little slower because the Linux kernel on the Raspberry Pi operating system has a process priority function like all operating systems have. The linux kernel has to handle multiple processes with a set priority, so the process of moving the arms will be slower.

3.Methodology

In a study about making the Prototype IOT Smart home for Smart City with Arduiono Mega 2560 using the Blynk application using the Software Development Live Cycle (SDLC) method. the prototype model is an extension of the iterative waterfall model. Approach systematically and sequentially in building a system. The waterfall method process, namely the work of a system is carried out sequentially. The resulting system will be of good quality, due to its gradual implementation so that it is not focused on certain stages.

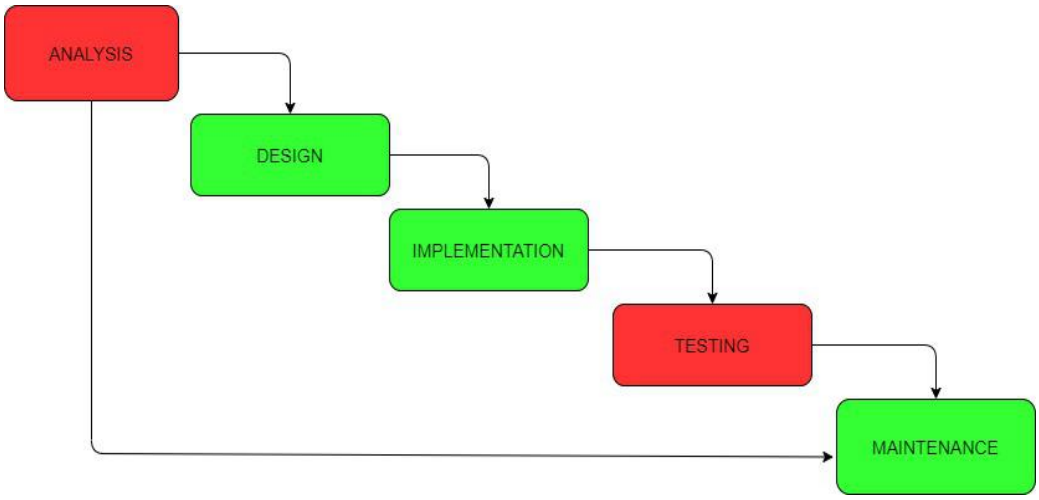

Figure 1. SDLC method

A.Analysis

At this stage the researcher makes observations and interviews with prospective customers who want to buy a smart house or apartment. The results of the interviews are used for data analysis that will be used for system development to help meet user needs. This stage includes problem analysis, research data analysis, system description analysis, system feasibility analysis and design requirements analysis

A. Design

After conducting the analysis, the researchers made the interface and system design stages based on the software function requirements. The user interface design uses mock-up software and the system design uses a flowchart. This stage includes system design, flowchart, and interface mock-up design.

C.Impelementation

At this stage the researcher changed from the design stage into an application so that the software function could be run. To change the design into an application, researchers used Blynk software with the Arduino programming language. The language used is the C language with the Blynk platform to build interfaces to control and monitor hardware projects from IOS and Android devices.

D.Testing

The next stage is testing, this stage is used to find out whether the application being developed is running as expected. Testing or evaluation of the test design used in the application uses the black box testing method.

E.Maintenance

This stage of the process is the stage of software maintenance. Software that is made must have a maintenance or updating stage, because this process allows the addition of new features, and also repairs if there are errors in the system being developed.

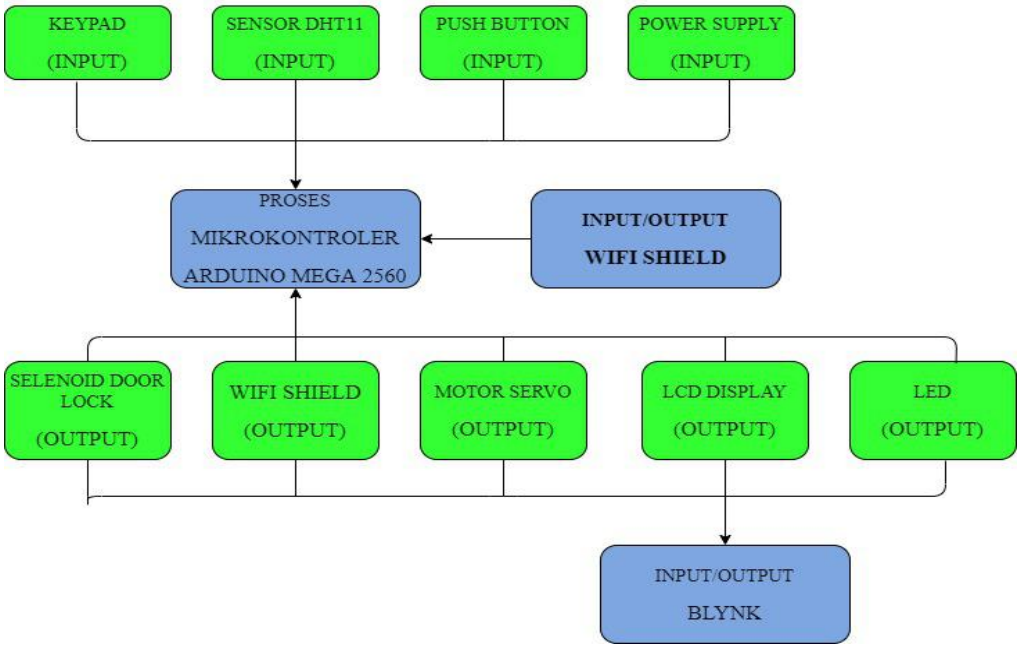

Figure 2. Compound block components

F. Design of component tools

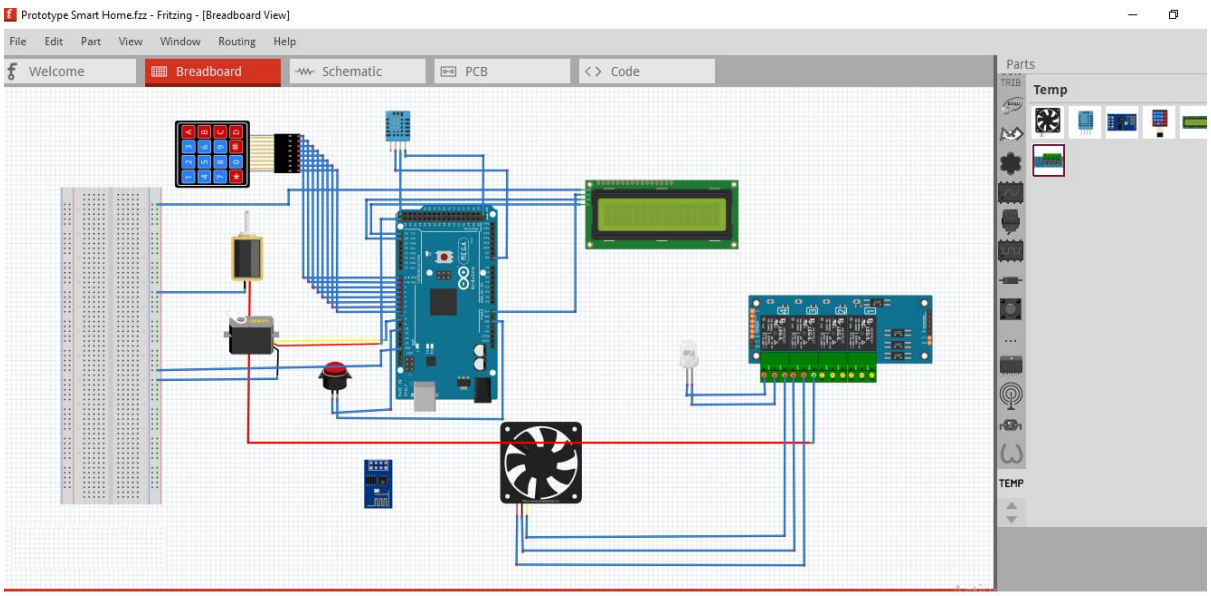

Figure 3. Component tool set

The schematic of this set of tools was created using an open source application called Fritzing. This tool scheme consists of several components that will be used to create a tool or prototype. The main component used is the Arduino Mega2560 microcontroller consisting of 54 I / O pins, 5volt operational voltage ports, 7-12v Input Voltage (recommendation), 6-20v Input Voltage (limit), 20mA DC I / O current, Current DC pin 3.3v, 256 Kb flash memory, 8 Kb SRAM, 4 Kb EEPROM, 16 MHz Clock Speed, LED_BUILTIN 13, which functions as a controller for existing devices. in the scheme of this tool there is a 4 channel relay that is useful or functions to connect and disconnect the flow of electricity in the power supply as input for electrical power, this relay can also be called a switch, the components connected to the relay are the LED leg fan, and the Arduino Mega2560 board. pins GND (Ground), VCC, IN1 to IN4.

Furthermore, in the scheme of this series of tools there is a keypad that functions to input the password to access the doorlock solenoid and the servo motor connected to the Arduino board at Pin I /O numbers 2 to 8. The solenoid in this scheme functions as a lever or door lock, while the servo motor functions as a door opening and closing, the GND (Ground) pin is connected to the GND (Ground) on the Arduino Mega250 Board, the VCC pin is connected to the Arduino VCC Board and the data cable is connected to I / O port number 50.Then there is a Lcd Display which functions as a the screen to display characters, for example to display the results of password input and others. After that the scheme of this series of tools is installed with a push button component which is useful for manually accessing the door from within the room. In the scheme of this series of tools there are also DHT11 components, GND (Ground) Pin to Arduino GND Board, VCC to VCC Board Arduinno Mega2560 and Data Pin to Arduino Mega2560 Board at number 33, which functions to control or read the temperature in the room combined with the fan (FAN), if the room temperature reads high or hot, the FAN that has been installed will turn on and if the temperature is low or cold the fan will die. Finally, there are LED lights that are used for room lighting which will later be accessed via the Wifi Shield ESP8266 and accessed via the Blynk application.

No	Pin Arduino	pin usage
1	VCC	Arduino voltage source
2	GND	Ground Arduino
3	Pin 9	Pins for feet DHT11
4	Pin 10	Pin for Push Button
5	Pin 31	Pin for LED
6	Pin 32	Pin for Fan
7	Pin 33	Pin for Solenoid Door Lock
8	Pin 51	Pins for feet Data Servo
9	Pin D(SDA)	Pins for feet SDA pada LCD
10	Pin D(SCL)	Pins for feet SCL pada LCD
11	Pin D(TX1)	Pins for feet RX pada ESP8266
12	Pin D(RX1)	Pins for feet TX pada ESP8266

Figure 4.Using Arduino 2560 pin

G.How the Tool Works

First a series of tools get a 5V supply voltage from the power supply adapter, which functions to provide voltage to the Arduino Mega 2560 Microcontroller, Keypad, DHT11 Sensor, Lcd Display, LED, Servo Motor, Fan and WiFi Shield. After that, to be able to access the entrance from outside the room using the keypad by entering a static password that has been installed, then after the door is open the door will be closed automatically for 3 (three) seconds. To open the door from the room, a push button is available. Then to turn on the lights, you can use an open source application that comes from an android smartphone called Blynk and must be connected to the Celuller hotspot. This Cellular Hotspot is sourced from the Wifi Shield component. In the blynk application there are ON and OFF buttons that function to turn on and off the LED lights. Furthermore, there is a DHT11 sensor which functions to monitor room temperature by how it works, namely if the room temperature is detected above> = 31 ° Celsius, the fan in the room will turn on automatically to cool the room temperature. If the room temperature is detected below <28 ° Celsius, the Fan will automatically shut down.

F. Flowchart Program

The program begins with initialization and connects to the internet network via Wifi Shield and will be connected to many applications. To access the door, users can use the keypad which functions to enter a password so that they can open the door automatically through a solenoid door lock and will be closed automatically. After that the user can turn on and turn off the lights using the Blynk application. Furthermore, users can control the room temperature if the room conditions are more than 31 ° Celsius, the fan will turn on, if it is less than 28 ° Celsius the fan will turn off.

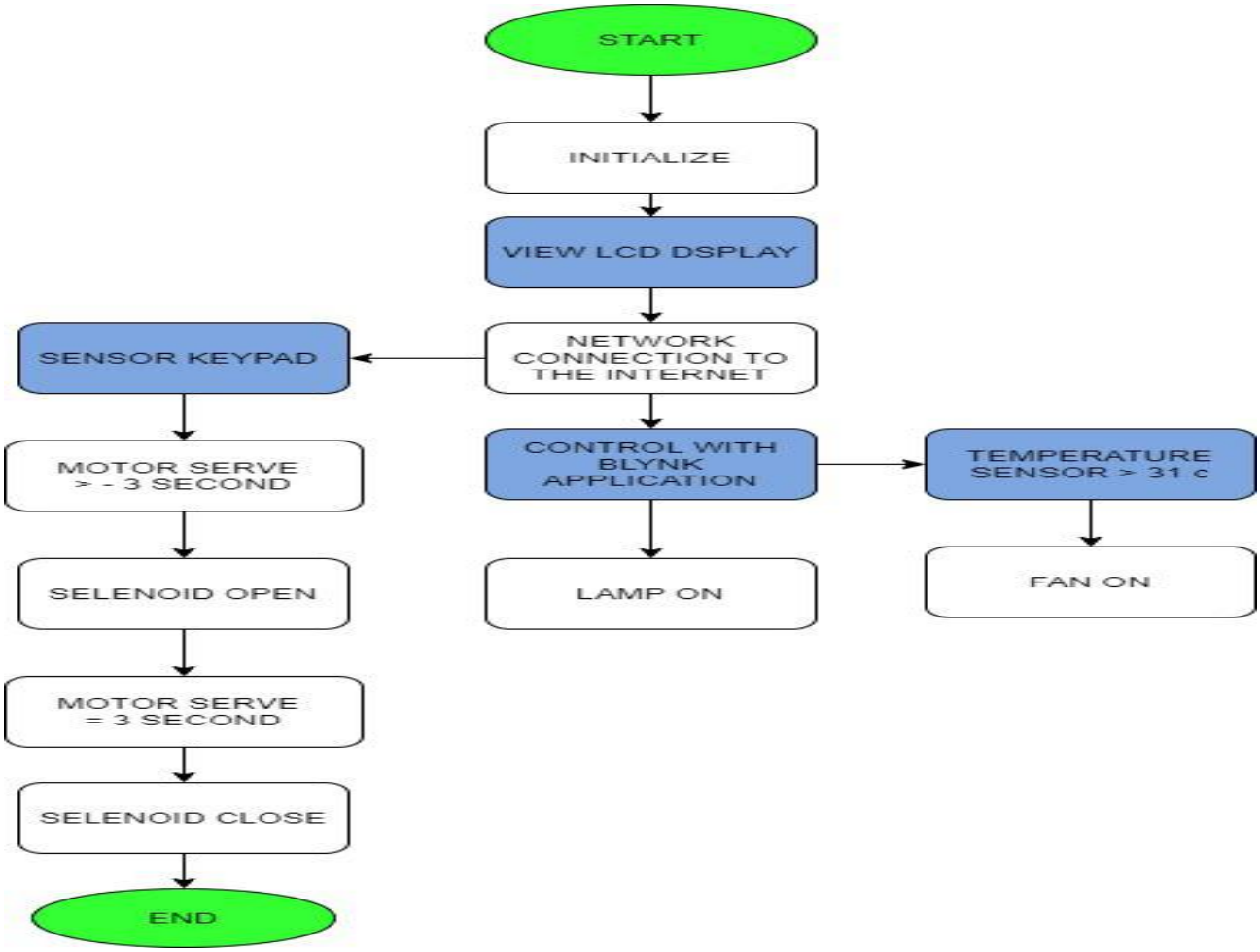

Figure 5. Program Flowchart

G. Hasil Percobaan

In this discussion, the authors explain that the experiments carried out include input and output to the tools made. The results of the experiment are divided into three parts, namely the results of the output, the results of the output and the results of the whole tool.

1. . Input Results

a. Sensor SHT11

This section explains how the results of the input section. The DHT11 sensor works well after experimenting with the tool.

1	> 31°C	Fan ON
2	< 28 °C	Fan OFF

Table 1. DHT Sensor Input Results 11

b.Keypad

Pin this section the Keypad works well after experimenting with the tool.

1	Password Benar	Pintu Terbuka
2	Password Salah	Pintu Tertutup

Table 2. Keypad Input Results

2.Output Results

In this section, it explains how the output results are on components or tools.

a. Solenoid Door Lock

1	>= 3 detik	Solenoid open
2	<= 3 detik	Solenoid close

Table.3 Solenoid Door Lock Output Results

When doing the experiment the door lock solenoid worked fine.

b. **Fan**

At the time of doing the experiment the Fan (fan) worked fine.

1	Kipas On	> 31°C
2	Kipas Off	< 28 °C

Table 4. Fan Output Results (Fan)

c. Overall Results

No	DHT11	Motor Servo	Keypad	LED	BLYNK	LCD
1	< = 31 °C Fan ON	< = 3 detik Solenoid Terbuka	Password Benar Solenoid Terbuka	Blynk ON LED Nyala	Sesuai	Sesuai
2	> = 28 °C Fan OFF	> = 3 detik Solenoid Tertutup	Password Salah Solenoid Terbuka	Blynk OFF LED Mati	Sesuai	Sesuai

Table 4. Overall Tool Results

H. Coding Results

smarthome | Arduino 1.8.9

File Edit Sketch Tools Help

smarthome

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x3F, 16, 2);
#include "DHT.h"
#define BLYNK_PRINT Serial
#include <ESP8266_Lib.h>
#include <BlynkSimpleShieldEsp8266.h>
#include <Servo.h>
Servo pintu;

char auth[] = "dsHdUFV6gi4YkxAf0KqFCfoHqi-6C3--";
char ssid[] = "@AZ";
char pass[] = "31013101";
#define EspSerial Serial1
// Your ESP8266 baud rate:
#define ESP8266_BAUD 115200
ESP8266 wifi(&EspSerial);

#include <Keypad.h>
const byte ROWS = 4; //four rows
const byte COLS = 3; //three columns
char keys[ROWS][COLS] = {
  {'1', '2', '3'},
  {'4', '5', '6'},
  {'7', '8', '9'},
  {'*', '0', '#'}
};
byte rowPins[ROWS] = {2, 3, 4, 5}; //connect to the row pinouts of the keypad
byte colPins[COLS] = {6, 7, 8}; //connect to the column pinouts of the keypad
```

I. Hasil perangkat IOT Smart Home dengan Arduiono Mega 2560

J. Conclusion

From the results of the research discussion entitled "Making Prototype IOT Smart home for Smart City with Arduiono Mega 2560 using Blynk application", it can be concluded that by implementing the concept of internet of things (IoT) on a smart home, it produces a device that can help carry out controlling activities through HP devices remotely, also lighten the human workload by reducing user activity to turn on appliances at home using sensors and applications. Thus the authors conclude the benefits of making IoT as follows:

1. The use of the Arduino Mega2560 microcontroller is used as a core tool to control all existing components.

2. There is a servo motor as a lever to open and close the house door automatically.

3. Application of IOT (Internet Of Thing) by utilizing the ESP8266 wifi module, internet network and the Blynk application which can make it easier to monitor room temperature and control lights in the house.

4. The existence of a FAN (Fan) is useful for cooling the room temperature when the DHT11 sensor has detected room temperature, when the temperature is hot then the FAN (Fan) will turn on automatically and when the room temperature is cold or below the predetermined temperature, the FAN (Fan) will turn off automatically automatic.

References

[1] A. Iskandar, M. Muhajirin, and L. Lisah, "Door Security System Based on Arduino Mega," J. Inform. Upgris, vol. 3, no. 2, pp. 99–104, 2017, doi: 10.26877 / jiu.v3i2.1803
[2] Arifin, J. L. N. Zulita, and Hermawansyah, "Automatic Murottal Design Using an Arduino Mega 2560 Microcontroller," J. Media Infotama, vol. 12, no. 1, pp. 89–98, 2016
[3] A. R. Kedoh, H. Djahi, D. EDG Pollo, J. Electrical Engineering, Faculty of Science and Engineering Undana, and J. Adisucipto Penfui, "Home Control System Based on the Internet of Things (Iot) Using Arduino Uno," J. Media Electrical, vol. VIII, no. 1.
[4] A. R. Kedoh, H. Djahi, D. EDG Pollo, J. Electrical Engineering, Faculty of Science and Engineering Undana, and J. Adisucipto Penfui, "Home Control System Based on the Internet of Things (Iot) Using Arduino Uno," J. Media Electrical, vol. VIII, no. 1.
[5] A. S. Ramadhan and L. B. Handoko, "Design and Build a Home Security System Based on Arduino Mega 2560," Techno.COM, vol. 15, no. 2, pp. 117–124, 2015
[6] B. Bohara, S. Maharjan, and B. R. Shrestha, “IoT based smart home using blynk framework,” arXiv, 220
[7] B. S. R. Purwanti, F. A. Mursyid, and S. D. R. Kusmujianti, "The Finger Of Fingerprint Sensor," J. Polytechnology, vol. 17, no. 2, pp. 129–136, 2018.
[8] C. Pham, “Communication performances of IEEE 802.15.4 wireless sensor motes for data-intensive applications: A comparison of WaspMote, Arduino MEGA, TelosB, MicaZ and iMote2 for image surveillance,” J. Netw. Comput. Appl., Vol. 46, pp. 48–59, 2014, doi: 10.1016 / j.jnca.2014.08.002.
[9] B. Eryawan, A. E. Jayati, and S. Heranurweni, “Rancang Bangun Prototype Smart Home Dengan Konsep Internet of Things (Iot) Menggunakan Raspberry Pi Berbasis Web,” Elektrika, vol. 11, no. 2, p. 1, 2019, doi: 10.26623/elektrika.v11i2.1691.

[10] F. Masykur and F. Prasetiyowati, "Application of a Smart Home (Smart Home) for Web-Based Home Electronic Appliance Controller," J. Teknol. Inf. and Computer Science., vol. 3, no. 1, p. 51, 2016, doi: 10.25126 / jtiik.201631156.
[11] G. M. Pradipta et al., "Making Prototypes of Laboratory Security Systems Based on Arduino Mega." pp. SNF2016-CIP-31-SNF2016-CIP-36, 2016, doi: 10.21009 / 0305020107.
[12] ."Direct Current (DC) Fan Speed and Relay Control with LM35 Temperature Sensor Based on Internet of Things (IoT) .pdf."
[13] Prabowo, M.Y., Budiyanto, A., Nurcahyani, I. and Adinandra, S., 2018. Designing a Smart Home System Prototype with the Internet of Things. ReTII.
[14] P. S. Nagendra Reddy, K. T. Kumar Reddy, P. A. Kumar Reddy, G. N. Kodanda Ramaiah, and S. N. Kishor, "An IoT based home automation using android application," Int. Conf. Signal Process. Commun. Power Embed. Syst. SCOPES 2016 - Proc., Pp. 285–290, 2017, doi: 10.1109 / SCOPES.2016.7955836.
[15] R. W. Gustama, "Website-based door locking system," 2017.
[16] R. Susany and R. Rotar, "Remote Control Android-based Applications for a Home Automation implemented with Arduino Mega 2560 and ESP 32," Technium: Romanian Journal of Applied Sciences and Technology, vol. 2, no. 2. pp. 1–8, 2020, doi: 10.47577 / technium.v2i2.231.
[17] R. System, "Resti Journal," vol. 1, no. 1, pp. 19–25, 2017.
[18] S. Alani, S. N. Mahmood, S. Z. Attaallah, H. S. Mhmood, Z. A. Khudhur, and A. A. Dhannoon, "IoT implemented comparison analysis of two well-known network platforms for smart home automation," Int. J. Electr. Comput. Eng., Vol. 11, no. 1, pp. 442–450, 2021, doi: 10.11591 / ijece.v11i1.pp442-450.
[19] U. Sari, "Design of smart home system with arduiono Uno R3 base on internet of thing (IoT)," vol. 16, no. 1, pp. 25–29, 2019.
[20] S. Kashan Ali Shah and W. Mahmood, "Smart Home Automation Using IOT and its Low Cost Implementation," Int. J. Eng. Manuf., Vol. 10, no. 5, pp. 28–36, 2020, doi: 10.5815 / ijem.2020.05.03.
[21] Taryudi, D. B. Adriano, and W. A. Ciptoning Budi, "Iot-based Integrated Home Security and Monitoring System," J. Phys. Conf. Ser., Vol. 1140, no. 1, 2018, doi: 10.1088 / 1742-6596 / 1140/1/012006.