

The LM35 temperature sensor consists of three pin feet. The first pin is Vout PIN serves as the output voltage pin, the second pin is Vs PIN serves as a voltage source pin and the third is GND PIN serves as the ground pin.

The required voltage for the LM35 sensor is 5V and has a parameter that every 1°C scale increase its output voltage 10mV so that the following equation is obtained:

$$V_{LM35} = \text{Temperature} * 10\text{mV}$$

For example, device design using LM35 as temperature sensor and the output of ADC produces temperature 20°C, so when the temperature is 20°C the temperature sensor output voltage LM35 (20°C * 10mV) = 200mV = 0.2V. [1,5]

3. METHODOLOGY

This research was used design method by making smart home simulation and design of smart home control system to turn on and turn off the lights, open and close the door, set the room temperature, and maintain home security with android smart phone as a controller or remote also use Bluetooth as a communication media. Then perform system testing and evaluation of hardware and software.

4. RESULT AND DISCUSSION

4.1 System Block Diagram

In Fig2 the workings of System Block diagram as follows: When Android application activated, system will do the pairing

to check if Bluetooth module is active. If Bluetooth module on Arduino Uno microcontroller is active then the Android is ready to give commands, such as selecting the option on android application for turn on lamp1 by shifting switch On and turn off lamp1 with switch Off. That command apply also for lamp2 and lamp3.

If the door switch on is activated (On) then the microcontroller will activate the relay driver and selenoid will open the gate, but if the switch Off is activated then the gate will be closed.

The temperature sensor as an input of the microcontroller detects the temperature of the room, when the room temperature exceeds 30°C then the fan will decrease the room temperature. If the room temperature does not exceed 30°C then the fan is not working (Off).

Laser sensor is used as input of a microcontroller to detect if there are people who pass through the doors, if there are people who pass through the laser sensor then the alarm will sound and the LED indicators also alarms on mobile phones will be active.

If switch on the gate (MP Left) activated then the dc motor will move the gate to the left for open the gate but when touching the limit switch so DC motor will stop (Off). If the gate switch (MP Right) ON then dc motor will move gate to the right for close the gate when touching the limit switch so dc motor will stop (Off).

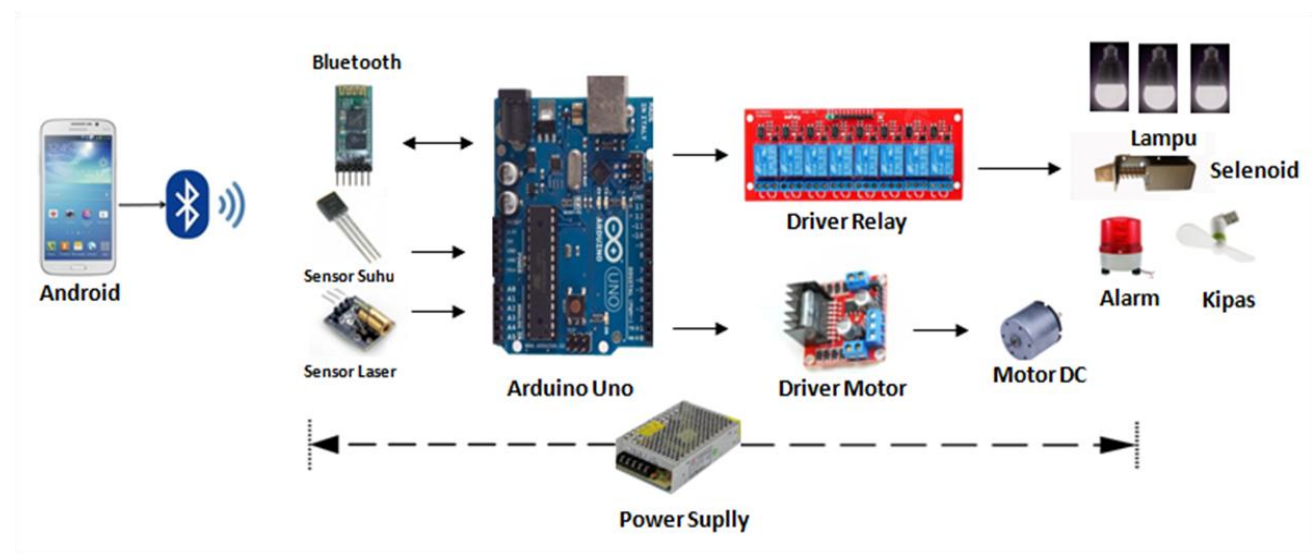


Fig 2. Block Diagram of Smart Home System

Caption:

1. Power supply is used for Input / Output device and microcontroller Arduino Uno control device with the voltage 5 Vdc and 12 Vdc.
2. Smartphone android serves as a media controller for the system control.
3. Controller serves to enable and disable electrical devices
4. Bluetooth serves as a communication media between android smartphone and the controller.
5. Driver Relay serves as a driver to enable and disable electrical devices at home.
6. Driver Motor serves as a motor drive DC to open and close gate.

4.2 Smart home Control System Design

On Fig. 3, If the signal from android smartphone received by Bluetooth module then the microcontroller will process in accordance with the input given so that the desired output is achieved. Assumed that the choice on android application is to turn on the lamp 1 by shifting switch ON lamp 1 then data received in module Bluetooth will process by microcontroller to activate the relay driver and turn on lamp1, otherwise by shifting the switch Off on android then lamp 1 will turn off. This command apply also for the other electronic device.

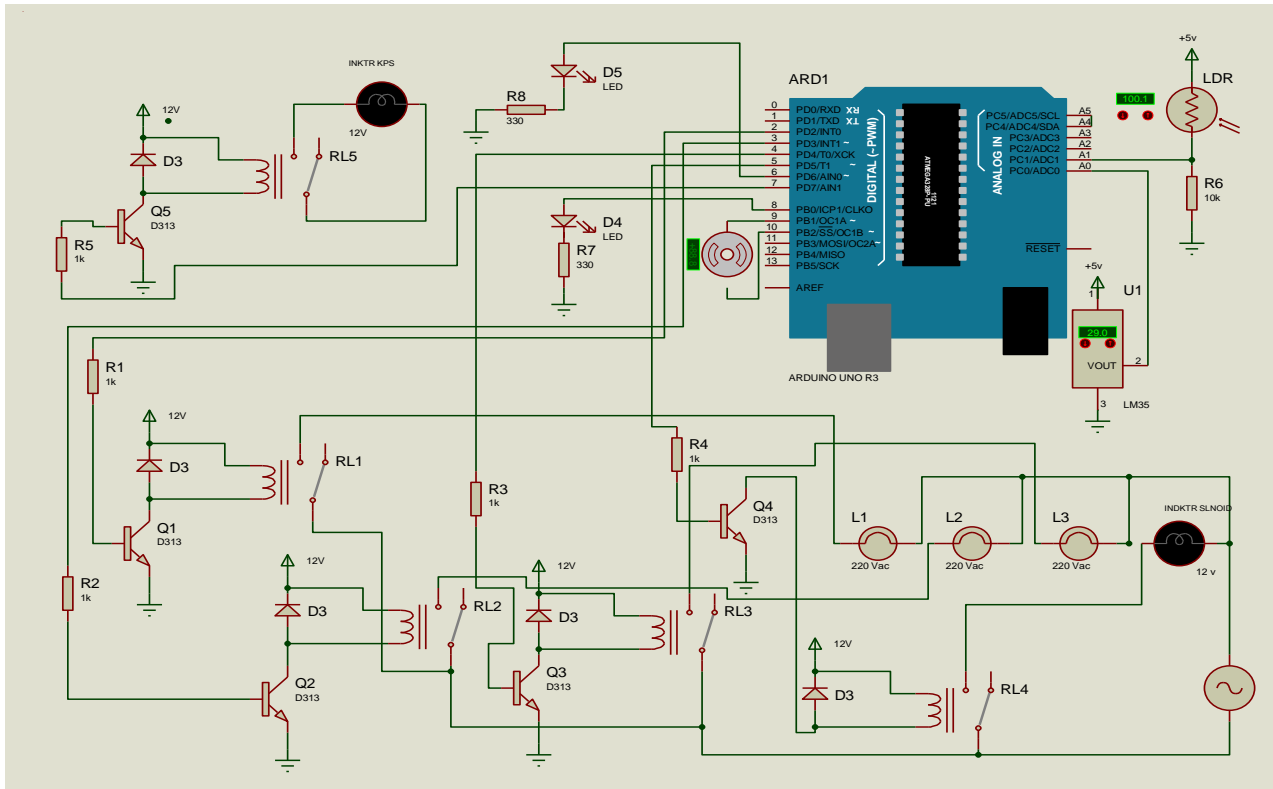


Fig 3. Schematic Design System

4.3 Android Application Design for Smart Home Control System

According to Fig 4. If the Android Smartphone application and the Bluetooth module on Arduino Microcontroller are active then the smart home control system is ready to receive the data.

When lamp 1 switch is On then android send character 'A' to microcontroller so driver relay 1 active and lamp 1 will turn on, but if android send character 'a' (Off) then lamp 1 will turn off.

When the android send character 'B' then the lamp 2 will turn on, but if the sent character 'b' lamp 2 will turn off.

If the sent character 'C' then the lamp 3 will turn On, but when android send character 'c' then lamp 3 will turn off.

If the character 'D' is sent then lamp 1, lamp 2, and lamp 3 will turn On, but when android send character 'd' then lamp 1, lamp 2 and lamp 3 will turn off.

If the android send character 'E' then the gate will open, otherwise android send character 'e' then gate will be closed.

When the room temperature above 30°C is sent the character 'F' then the fan will work, when the temperature below 30°C sent the fan 'f' character does not work. If android send character 'R' then dc motor will rotate to the right, when the character 'r' motor dc stop spinning.

If android send character 'X' then dc motor will rotate to the left, otherwise the character 'x' motor dc stop spinning.

If android send character '* L' then Led and Alarm are On. When character '* l' led and alarm will off.

Design of Android Applications is shown in Fig.5. And the design of smart home program on Arduino Uno microcontroller is shown in Fig. 6.

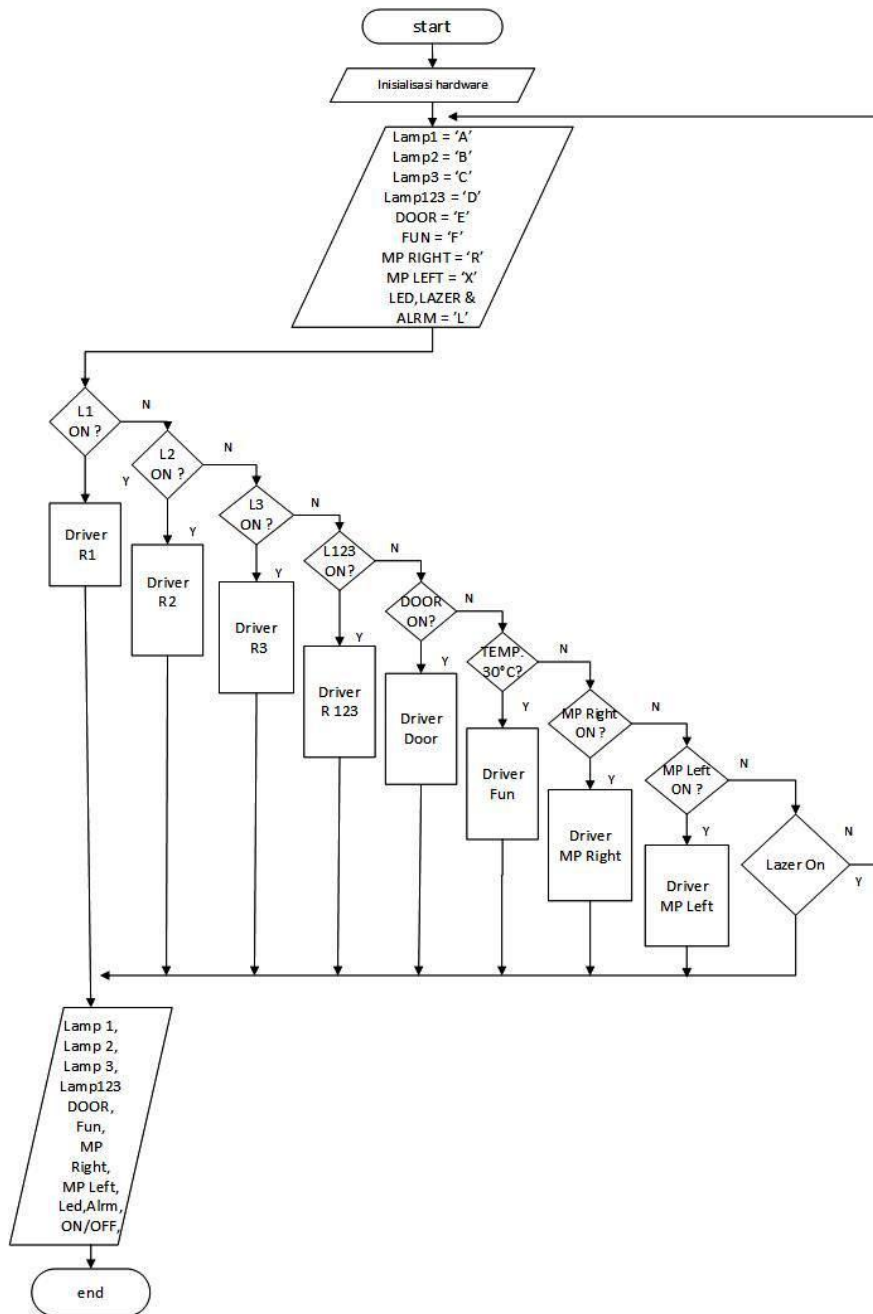


Fig 4. Flowchart System



Figure 5. Android Application Design

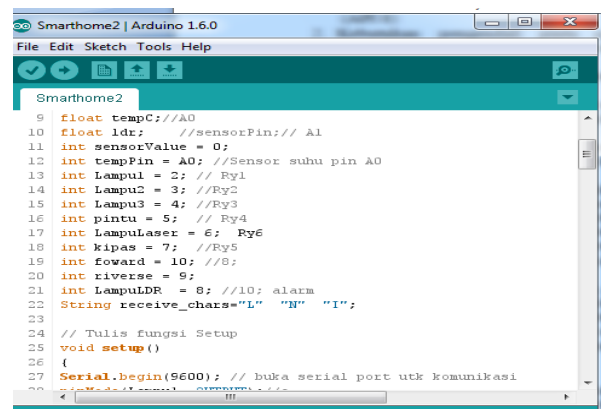


Figure 6. Smart home program design

5. SYSTEM TESTING

5.1 Android Application Testing and Arduino Program

Testing for Android application and Arduino program in sending and receiving data is done to find out whether the data sent from Android successfully received and processed by Arduino.

Fig 7 shows how smart home control system testing by creating prototype electronic devices that will be controlled with android smartphone.



Fig 7. Smart Home Control System

Android smartphone application is activated and bluetooth module to the control system Smart home ready to receive data as shown in Figure 8.



Fig 8. Android Communication With Bluetooth

When Android application is activate then smartphone will be paired toBluetooth deviceand then select the HC-05 (Fig 9).



Fig 9. Android Smartphone with Bluetooth HC-05 Is Connected

After communication between Android Smartphone with Bluetooth HC-05 connected then select Done. So the android applications used are ready to use (Figure 10).



Fig10. Smart Home Control System Using Android Application

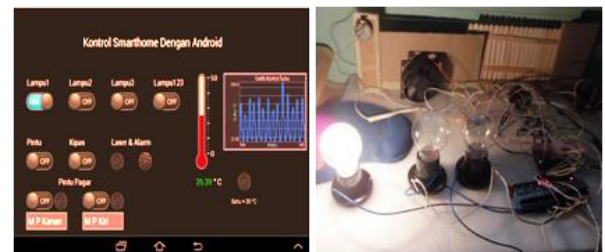


Fig 11. Condition when Lamp 1 is Turn On

In Fig 11. when Switch Onfor lamp1 active then lamp1 will turn on, if switch Off active then lamp1 will turn off.

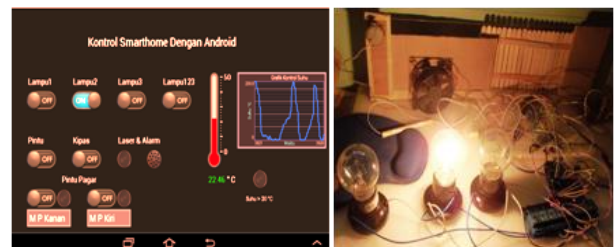


Fig 12. Condition when Lamp 2 is Turn On

In Fig 12. when Switch On for lamp2active then lamp2 will turn on, if switch Off active then lamp2will turn off.

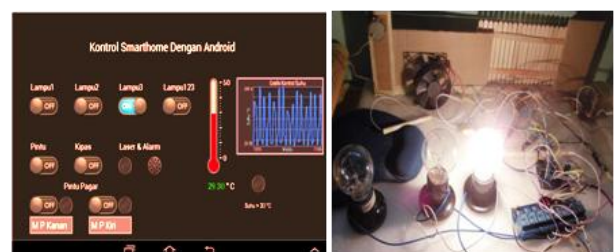


Fig 13. Condition when Lamp 3 is Turn On

In Fig 13, when Switch On for lamp3 active then lamp3 will turn on, if switch Off active then lamp3 will turn off.



Fig 14. Condition when Lamp123 is Turn On

In Fig 14, when Switch On for lamp123 active then lamp123 will turn on, if switch Off active then lamp123 will turn off.

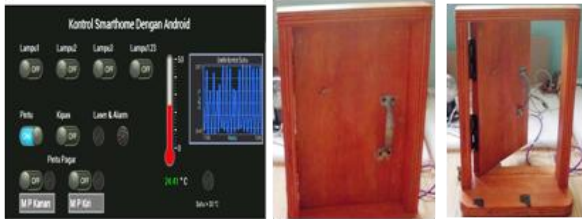


Fig 15. When the Door Button is ON then Door will open

In fig 15, when door button is On then the door will open, otherwise if door button is Off then Door will be closed.



Fig 16. Display for temperature sensor in the room > 30°C

In fig 16, if the temperature sensor detects room temperature exceeds 30°C then the led indicator lights up and fan will active (fig 17) to decrease the room temperature.



Fig 17. Fan is Active when Room Temperature > 30°C

When room temperature is less than 30°C then led indicator off and fan off.

In fig 18, when the laser sensor is blocked then the led indicator on the android smartphone will light up and the alarm sounds, otherwise if the led indicator off and the alarm does not sound.

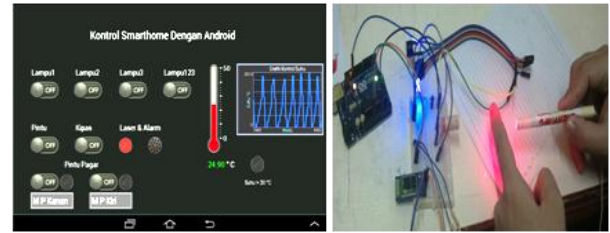


Fig 18. Laser Sensor is Active

In Fig 19, when the Fence Gate button ON then motor will rotate to the right so it closes the gate and will stop when touching the limit switch (fig 20).



Fig 19. Control to Rotate Right Fence Gate

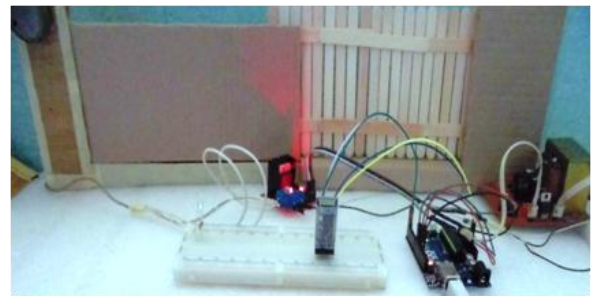


Fig 20. Control to Close the Fence Gate

In Fig 21, when the gate button is ON then motor will rotate to the left so it opens the gate and will stop when touching the limit switch 2. (Fig 22).



Fig 21. Control to Rotate Left Fence Gate

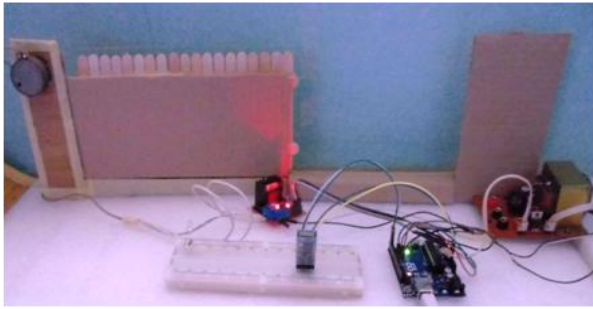


Fig 22. Control to Open Fence Gate

6. ANALYSIS TEST RESULTS

6.1 Testing Distance Between Transmitter (Android) and Receiver (Bluetooth)

In this testing, each electronic device tested in accordance with the specified distance, which is at a distance of 1-10 meters by pressing the button on/off Android Smartphone Applications for turning on and turning off the electronic device at home. When performing the test, the Bluetooth module with Android Smartphone is geared unhindered by any objects. The ability of the Bluetooth module to detect signals from the Android Smartphone is approximately 10 meters (Table 6.1).

Table 6.1. Testing Distance between Android Smartphone and Bluetooth

Distance (meter)	Electronic Equipments at Home							
	Lamp 1	Lamp 2	Lamp 3	Lamp 123	door	fan	MP Right	MP Left
1	On	On	On	On	Open	On	Active	Active
2	On	On	On	On	Open	On	Active	Active
3	On	On	On	On	Open	On	Active	Active
4	On	On	On	On	Open	On	Active	Active
5	On	On	On	On	Open	On	Active	Active
6	On	On	On	On	Open	On	Active	Active
7	On	On	On	On	Open	On	Active	Active
8	On	On	On	On	Open	On	Active	Active
9	On	On	On	On	Open	On	Active	Active
≥10	Off	Off	Off	Off	Closed	Off	pasive	pasive

From the test results, if the distance Android Smart phone and module Bluetooth-HC05 exceed 10 meters is not connected again so that electronic device can't be controlled. Response time when the android switch is pressed for a distance of 1-5 meters is 0.3 seconds and for a distance of 5-10 meters is 0.5 seconds.

6.2 Smart home Control System Analysis

Android application requirements for Smarthome control system is carried out as follows:

1. Application must running on Smartphone Android.
2. Smarthome control needs: three lamps, fan, temperature sensor, laser sensor, gate, 8 relay drivers, DC motor driver, Led, alarm and Arduino Uno microcontroller as platform to enter program and process the data.

3. Bluetooth module to receive the signal string and connect to pin 0 and pin 1.
4. Three lamps for lighting connected to pin 2, pin 3 and pin 4.
5. The gate for incoming out access is connected to pin 5.
6. Laser and led sensor / alarm for home security on pins 6 and 8.
7. Fan to cool the room on pin 7.
8. Motor DC, for moving the gate, located on pin 9 and 10.
9. The temperature sensor detects the temperature of the room is connected to pin A0 and LDR connected to pin A1.

Applications installed on Android smartphones in this research using the Samsung GT-P3100. The created application can communicate with smarthome control using Bluetooth connection.

Type of Bluetooth in this system is Bluetooth module HC-05, the application will send data via Bluetooth is subsequently executed by the microcontroller. The microcontroller sends a signal to be able to control the smarthome.

7. CONCLUSION

From the results of tests performed, it can be concluded that the smart home android control system using Bluetooth Electronics can control the home electronic devices through the interface on the android smartphone screen and the distance of the android smartphone with the module Bluetooth-HC05 can control electronic equipment with a distance of 10 meters. Response time when the android switch is pressed for a distance of 1-5 meters is 0.3 seconds and for a distance of 5-10 meters is 0.5 seconds.

8. ACKNOWLEDGMENTS

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9. REFERENCES

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