

---

## SIMULATION SLIDING DOOR IMULATION USING ATMEGA32 MICROCONTROLLER

I Nyoman Sukarma, I Ketut Darminta, I Gusti Putu Mastawan Eka Putra, I Made Wiryana,  
I Wayan Raka Ardana  
Bali State Polytechnic, Indonesia  
Emails: [sukarma@pnb.ac.id](mailto:sukarma@pnb.ac.id)

---

### ABSTRACT:

Most people consider the door only as medium to enter or exit the room. But when observed in more detail again when this door is used by people in public places such as supermarkets, hospitals, offices and malls to open and close of a large size doors by manually feels less effective and efficient. So for that required a control system that can support the function and usefulness of the door in order to provide convenience to the community when using it. This automatic door simulation uses an ATMEGA32 type microcontroller as the controlling center on the automatic door control system. Also use Infrared sensors to detect when someone is about to enter a room, then move the door using DC motor automatically and limit switch as stopper. How this device works is based on microcontroller. The programming language used is the C language programming language. Based on the design, testing and operation can be stated that simulation of automatic sliding doors using microcontroller based Infrared sensor ATMEGA32 work in accordance with expected conditions. This indicates that the simulated sliding door can be implemented to the actual shape.

**Keywords:** ATMEGA32 microcontroller, Infrared sensor, DC Motor, Limit switch.

---

### Article History

Received : 20 April 2023  
Revised : 01 May 2023  
Accepted : 25 May 2023  
DOI : 10.xxxxx

---

### INTRODUCTION

Most people think of the door only as a medium to enter or exit a room (Alonso et

al., 2022). But when considered in more detail when this door is used by many people in public places such as

supermarkets, hospitals, offices or malls, to open and close large doors if done manually may feel less effective and efficient (Elsaid et al., 2021). Therefore, a control system is needed that can support the function and usability of the door in order to provide convenience to the community when using it (Li et al., 2013). Therefore, to achieve this, this research will design a system that can make the door open and close itself automatically (Hasibuan et al., 2021).

In the design of this automatic door will use an ATmega32 type microcontroller as the control center in the automatic door control system (Kasmawan et al., 2022). The advantage of using this microcontroller is because of its smaller size when compared to using a PLC as the center controller (Mukendi & Adonis, 2017). In addition, this design will also use an Infrared sensor to detect when there are people who want to enter a room (Wibowo et al., 2017). There have been several studies that have been conducted in the design of automatic sliding door simulations (Koç et al., 2022).

The first research conducted by Hendra Maryanto, in 2010 has discussed the Making of One-Way Automatic Door Prototype Based on ATmega8535 Microcontroller Using Double IR. Further research was examined by Rahmat Fauzan Siregar, in 2013 who had discussed the Application of Servo Motors on Automatic Doors Based on AT89S52 Microcontroller.

Of all the studies, no one has examined the ATmega32 Microcontroller-Based Automatic Sliding Door (Dollas, 2022). So the author will discuss Sliding

Doors Using ATmega32 Microcontroller Based Infrared Sensors (Carminati & Scandurra, 2021). So this sliding door can be used automatically and manually if when the automatic sliding door does not function properly, it will be operated manually by pressing the bottom push button.

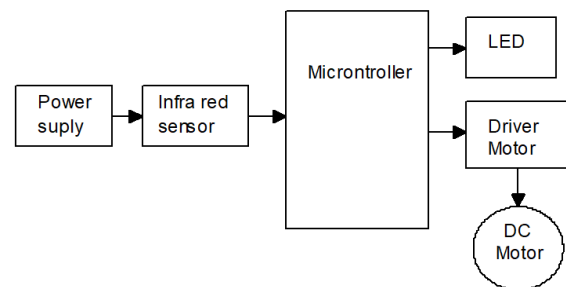
## RESEARCH METHODS

### 1. System Design

In system design there is a circuit schematic that will be a guideline in making the entire system circuit (Mukherjee et al., 2017). All the work of this sliding door simulation system is controlled by a control module, namely a microcontroller (Amole et al., 2020). In the overall circuit using the ATmega 32 microcontroller.

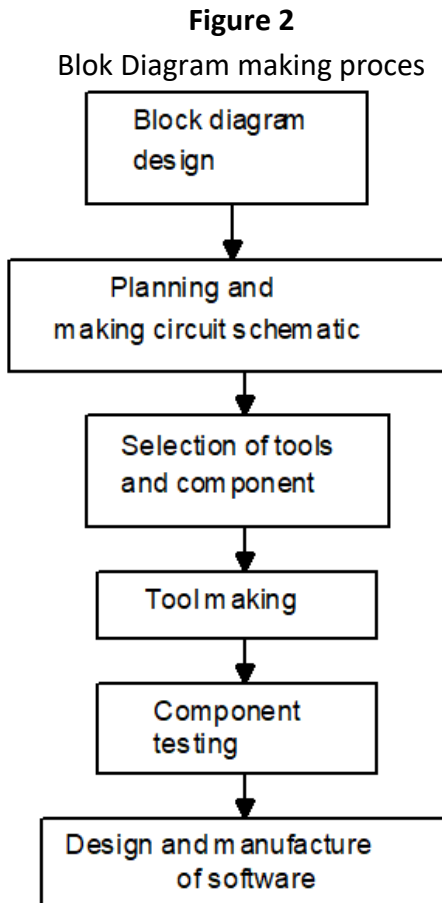
**Figure 1**

Blok Diagram circuit



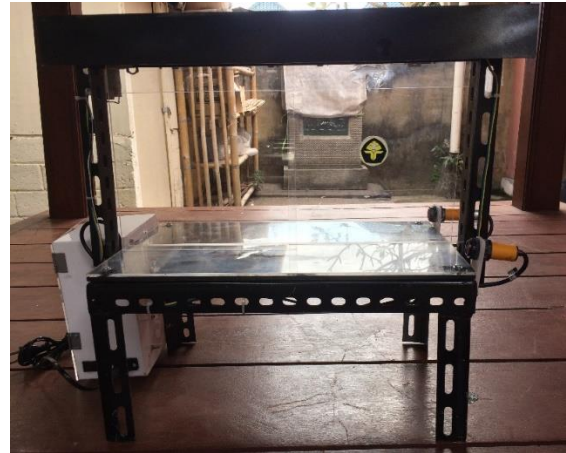
The ATmega 32 microcontroller works with a TTL voltage level, in this case a voltage of 5 volts is used. All ports, namely digital pins 0 to 13 and analog pins 0 to 5, are bidirectional I/O with internal pull-ups. To generate the working frequency in this design using a

crystal oscillator of 16 MHz. with input in the form of infrared sensors, timers, push buttons, and outputs in the form of servo motors.



In the process of making automatic sliding door simulations, it starts from planning block diagrams, designing circuits, making PCB layouts, installing components, soldering and making programs from a circuit that will be made so that the circuit can work (Alonso et al., 2022). For more details on the flow diagram of the device manufacturing process from start to finish, can be seen in Figure 2.

**Figure 3**  
System design display

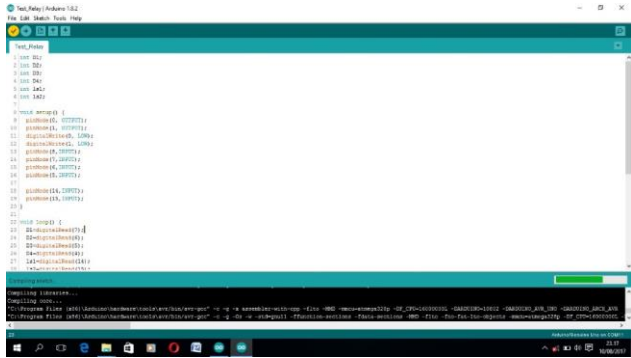


## RESULTS AND DISCUSSION

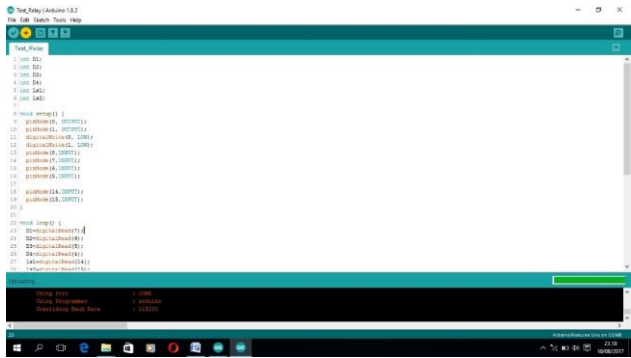
### 1. Implementation and Testing of Arduino IDE Software.

Implementation and testing of Arduino software by including a program sketch of each connected component, so that devices and systems can become a unit. To do program compiling, thesequence of program creation is done then select the compile option in the application software. The program is said to be successful if when the program is compiling there is a word done compiling in the lower left corner. If there is an error in the program, the Arduino ide software will show what errors are contained in the program. The error is displayed in the comments at the bottom of the application.

**Figure 4**  
Arduino software testing



**Figure 5**  
Uploading Programs on Aduino IDE Software



The design of the software program according to the working system of the device using the Arduino IDE software is as follows:

```
void setup() {
  pinMode(2, OUTPUT); //led
  pinMode(3, OUTPUT); //led
  pinMode(10, OUTPUT); //pin motor
  pinMode(11, OUTPUT); //pin motor
  digitalWrite(10, HIGH); //turn right
  digitalWrite(11, LOW);
  pinMode(14, INPUT); //limit switch kanan
  pinMode(15, INPUT); //limit switch kiri
  pinMode(16, INPUT); // front sensor
  pinMode(17, INPUT); // rear sensor
```

```
    delay(1000);
  }
  void loop() {
  front
    if (digitalRead(16)==LOW &&
    digitalWrite(14)==LOW) {
      digitalWrite(2, HIGH);
      digitalWrite(10, LOW); Rotate left
      digitalWrite(11, HIGH);
      delay(700);
      digitalWrite(2, LOW);
      digitalWrite(10, LOW);
      digitalWrite(11, LOW);
      delay(3000);
    }
  back
    if (digitalRead(17)==LOW &&
    digitalWrite(15)==LOW) {
      digitalWrite(3, HIGH);
      digitalWrite(10, HIGH);
      digitalWrite(11, LOW); turn right
      delay(700);
      digitalWrite(3, LOW);
      digitalWrite(10, LOW);
      digitalWrite(11, LOW);
      delay(3000);
    }
  }
```

```
//-----
front
  if (digitalRead(17)==LOW &&
  digitalWrite(14)==LOW) {
    digitalWrite(2, HIGH);
    digitalWrite(10, LOW); Rotate left
    digitalWrite(11, HIGH);
    delay(700);
    digitalWrite(2, LOW);
    digitalWrite(10, LOW);
```

digitalWrite(11, LOW);	4	40	Function
delay(3000);	5	50	Function
}	6	60	Function
back	7	70	Function
if (digitalRead(16)==LOW && digitalRead(15)==LOW) {	8	80	Function
digitalWrite(3, HIGH);			
digitalWrite(10, HIGH);			
digitalWrite(11, LOW); turn right			
delay(700);			
digitalWrite(3, LOW);			
digitalWrite(10, LOW);			
digitalWrite(11, LOW);			
delay(3000);			
}			
}			

From the results of measuring the input voltage from the sensor, a stable voltage measurement result of 5Vdc has been obtained. Then in testing sensor sensitivity in accordance with the data obtained in Table 4.5 it can be explained that this infrared sensor is functioning properly. So for the ideal distance used or set on the sensor is 20 cm because it matches the width of the door simulation of this device.

## 2. Sensor system testing

This test is carried out by using objects to block the sensor as a marker of the maximum distance according to the setting, namely by means when the sensor is blocked by an object, the *infrared* sensor will be active. This test is intended to determine the voltage when the infrared sensor is blocked and unobstructed, then the output of the infrared sensor is measured using a measuring aid, namely by using a volt meter.

**Table 1.** Sensitivity sensor testing

No.	Hitch with distance (cm)	Information
1	10	Function
2	20	Function
3	30	Function

## 3. Testing of device by adjusting the input voltage

In this test, the input voltage of the cooperation national of electrical government (PLN) mesh will be set at 110 and 220 VAC intended whether there are changes to the circuit that has been made. And this test will be measured at the input voltage of IC7805 and Infrared Sensor.

**Table 2.** Testing on circuits

No.	Input voltage (V)	Input IC7805	Sensor infra red (V)	Remark
		11,8		circuit
1	110	VDC	5 VDC	Stable
2	220	11,8 VDC	5 VDC	circuit Stable

From the results of the above data measurements on the input voltage from cooperation national of electrical government (PLN) meshes of 110 V and 220V, the input range of IC7805 and Infrared Sensor remains stable.

## CONCLUSION

Based on the results of testing and analysis on the application of the ATmega32 micro-controller for this automatic sliding door simulation, it can be concluded as follows: (1) From the results of the design and testing of the circuit that the author did, for each circuit made can work in accordance with the program that has been made. Where the author has tested the work of the infrared sensor, and the test results show the sensor can function. Furthermore, in testing the power supply circuit that the author did, the rectifier circuit whose voltage is not yet stable and the LM7805 regulator IC is needed to obtain a stable voltage of 5V DC, so the output voltage of the LM7805 Regulator IC is measured to be stable at 5V DC. So with the results of the tests that the author has done, it can prove that the circuit made has worked in accordance with the desired device work description. So that the purpose of the re-search is in accordance with the test results. (2) This sliding door simulation device based on a microcontroller can be operated automatically and manually. When the automatic position of the door can shift (open or close) if the sensor detects the distance of objects that will pass through

the door. Sensor 1 detects, the door will shift (open), and then sensor 2 detects, the door will shift (close). Or if sensor 2 detects movement, the door can shift (open) and if sensor 1 to shift then the door close. Furthermore, for manual positions when the sensor does not work / cannot detect people to enter or exit, manual positions are used. Red button to open the door and green button to close the door.

## BIBLIOGRAFI

- Alonso, J. F. S. J., Sanz-Tejedor, M. A., Arroyo, Y., & San José-Gallego, M. R. (2022). Analysis and assessment of factors affecting air inflow from areas adjacent to operating rooms due to door opening and closing. *Journal of Building Engineering*, 49, 104109.
- Amole, A., Oyediran, M. O., Olusanya, O. O., Elegbede, W. A., Olusesi, A. T., & Adeleye, A. O. (2020). Design and implementation of a prototype active infrared sensor controlled automatic sliding door for mitigation of coronavirus disease 2019 (COVID-19). *Journal of Electrical, Control and Technological Research*, 2, 1–17.
- Carminati, M., & Scandurra, G. (2021). Impact and trends in embedding field programmable gate arrays and microcontrollers in scientific instrumentation. *Review of Scientific Instruments*, 92(9), 91501.
- Dollas, A. (2022). Meta-Arduino-ing Microcontroller-Based Cyber Physical System Design. In *Heterogeneous Cyber Physical Systems of Systems* (pp. 11–35). River Publishers.
- Elsaid, A. M., Mohamed, H. A., Abdelaziz, G. B., & Ahmed, M. S. (2021). A critical

- review of heating, ventilation, and air conditioning (HVAC) systems within the context of a global SARS-CoV-2 epidemic. *Process Safety and Environmental Protection*, 155, 230–261.
- Hasibuan, A., Rosdiana, R., & Tambunan, D. S. (2021). Design and Development of An Automatic Door Gate Based on Internet of Things Using Arduino Uno. *Bulletin of Computer Science and Electrical Engineering*, 2(1), 17–27.
- Kasmawan, I., Gunawan, A. A. N., & Mahardika, P. S. (2022). Design of Automatic Door Lock Based on ATMEGA328P Microcontroller with MLX90614ESF DCI and HC-SR04 Sensors. *Journal of Engineering Research and Reports*, 48–56.
- Koç, İ., Mermer, Ö., Kirimça, N., ÇAkır, F. H., & KarakÖSe, M. (2022). Modeling and Simulation of Platform Screen Door (PSD) System using MATLAB-SIMULINK. *2022 International Conference on Data Analytics for Business and Industry (ICDABI)*, 629–633.
- Li, M., Yu, S., Ren, K., Lou, W., & Hou, Y. T. (2013). Toward privacy-assured and searchable cloud data storage services. *IEEE Network*, 27(4), 56–62.
- Mukendi, K. H., & Adonis, M. (2017). The development of a remotely controlled home automation system for energy saving. *2017 International Conference on the Domestic Use of Energy (DUE)*, 265–270.
- Mukherjee, C., Ardouin, B., Dupuy, J.-Y., Nodjiadjim, V., Riet, M., Zimmer, T., Marc, F., & Maneux, C. (2017). Reliability-aware circuit design methodology for beyond-5G communication systems. *IEEE Transactions on Device and Materials Reliability*, 17(3), 490–506.
- Wibowo, P., Lubis, S. A., & Hamdani, Z. T. (2017). Smart Home Security System Design Sensor Based on Pir and Microcontroller. *International Journal of Global Sustainability*, 1(1), 67–73.

---

**Copyright holder:**

I Nyoman Sukarma, I Ketut Darminta, I Gusti Putu Mastawan Eka Putra, I Made Wiryana,  
I Wayan Raka Ardana (2023)

**First publication right:**

Asian Journal of Engineering, Social and Health (AJESH)

**This article is licensed under:**

