Brilliance
Research of Artificial Intelligence

Volume 2, **Number** 2, June 2022
https://doi.org/ 10.47709/brilliance.v2i2.1543

Microcontroller Based Automatic Light Monitoring Implementation Using Sound Sensor

Ovlansisco Lumbantobing
Universitas Panca Budi, Indonesia
ovlansiscolt@gmail.com

open access

***Corresponding Author**

Article History:
Submitted: 02-06-2022
Accepted: 04-06-2022
Published: 05-06-2022

Keywords:
Sound Sensor; Light Monitoring

ABSTRACT

In this study, a device was designed to be able to control devices with sound waves, a smart home control system allows humans to control their home electrical devices such as lights using only voice commands without the need to move from place to place to turn on or turn off an equipment. When the indoor light user runs the system or turns on the light with sound waves, the sound sensor sends an input signal to the microcontroller which is then processed with the microcontroller output in the form of voltage to turn on the load, the system will function when the FC-04 sound sensor gets sound input (sound code) in the form of claps with a value of 1 then accumulated on the Arduino with a value above 400 millis according to the uploaded program to be used as a 5 volt output to turn on/off the lights.

INTRODUCTION

In the modern era as it is today, the use of control systems is increasingly rapid, control systems generally help people to make their work easier, in this case the control system used is a microcontroller which is coupled with a sound sensor as input to run other supporting devices.

One of the technologies that can be used to solve this problem is alternative energy systems. In this case, the technology that can be applied to house lights is to be able to turn on or turn off the lights with the help of sound as input, therefore, a device that can control lights automatically is needed that is integrated using a microcontroller as a controller. Wireless sound system, controls several facilities at home such as lights, fans and television, the function of this voice control is to control home electrical appliances to turn on, turn off and replace button functions with sound. The development of home control voice control with sound wave technology can be a reference for future homes.

The sound sensor is a sensor that has a working method of changing the amount of sound waves into electrical quantities. This sensor uses a microphone that works based on the size of the strength of the sound waves hitting the sensor membrane. These sound waves cause the sensor membrane which has small coils to move up and down. Then the results will be processed by the LM393 chipset into an output signal output. The sensitivity of the microphone can be changed using the trimpot provided on the module.

Condenser mics work based on a diaphragm or backplate arrangement that must be supplied by electricity to form a sound-sensitive capacitor. Sound waves that enter the microphone will vibrate this diaphragm component which is located in front of the backplate which contains the condenser component. When the capacitor is filled with charge, an electric field is created on the diaphragm and backplate. And where the magnitude of the electric field is influenced by the space formed between the two components. Variations in the distance between the diaphragm and the backplate arise due to the effect of sound pressure hitting the diaphragm which causes the movement of the diaphragm relative to the condenser mic.

The working principle of the relay is that the relay consists of Coil & Contact coil is a coil of wire that gets an electric current, while the contact is a kind of switch whose movement depends on the presence or absence of electric current in the coil. There are 2 types of contacts: Normally Open (NO), the initial condition before being activated, and Normally Closed (NC), the initial condition before being activated, close. In simple terms, the following is the working principle of the relay: when the coil gets electrical energy (energized), an electromagnetic force will arise which will attract the springing armature, and the contact will close. The working principle of this relay is: on C1 and C2 there is a coil as a driver, when C1 and C2 have not passed the current, the Com and No terminals will be connected, and when C1 and C2 are passed the current will move the Com plate so that the Com and No terminals will connected.

Brilliance
Research of Artificial Intelligence
Volume 2, **Number** 2, June 2022
https://doi.org/ 10.47709/brilliance.v2i2.1543

LITERATURE REVIEW

In general, it consists of several parts which can be described in the following block diagram: The block image of the system block diagram can be seen in Figure 1.

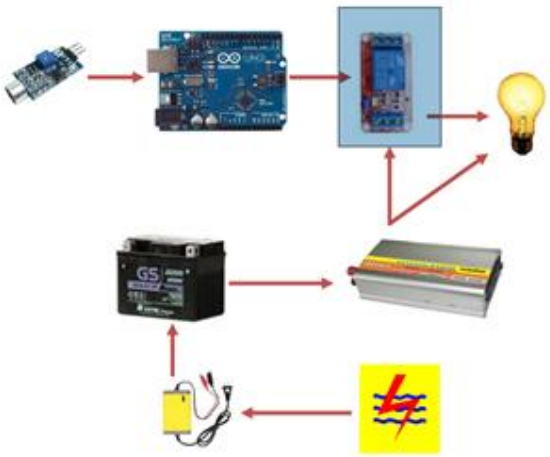

Figure 1. System Design Block Diagram

METHOD

The design scheme for the designed tool can be seen in Figure 3.2. as follows

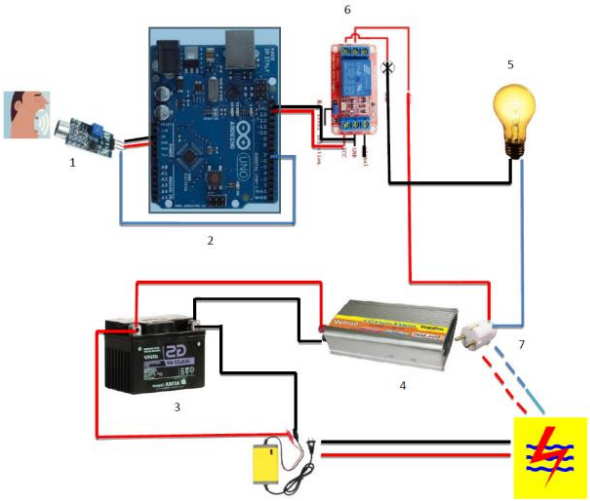

Figure 2. Hardware Design

If someone performs a voice command with the aim of turning on the load/light, the microphone will convert the sound into an electrical signal after which it will be processed by the sound sensor module with outputs such as, ground, vcc, signal, which will then go to the microcontroller, after processing, the microcontroller will provide a signal in the form of a 5 volt input, ground, and an instruction signal to turn on the lamp by means of a relay module with 1 channel. Input from the relay with 3 connecting terminals including: Vcc 5 volts (+), ground (-), signal (0/1) with outputs vcc (+) and NO (Normally Open), the output from vcc is connected to PLN 220 volts and at in principle, if the relay is given a voltage, the terminal from NO at the output will be closed/connected (Normally Close).

Brilliance
Research of Artificial Intelligence

Volume 2, **Number** 2, June 2022
https://doi.org/ 10.47709/brilliance.v2i2.1543

RESULT

If the sound sensor gets input in the form of sound (sound code) then the microphone works based on the size of the wave strength, namely the sound that hits the sensor membrane, this sound wave causes the sensor membrane which has a small coil to move up and down, then the results will be processed by the LM393 chip into an output signal outputs 1 and 0, and to adjust the sensitivity of the microphone can be changed using the available trimpot, this output module is connected to pin 4 on the arduino as input, the input will be processed by the ATmega 328 chip whose program was previously uploaded with a container instruction worth 500 millis with validation value > 400 millis to turn on or turn off the lamp, with output pin 13 as the output voltage value >400 millis or 5 volts output voltage, then the output voltage from pin 13 is connected to the VCC input relay 5 volts dc and the ground port (-) from Arduino to the relay ground input pin where the working principle of the relay is when C1 (ground) and C2 (vcc) which is known to have a coil as a driver when c1 (ground) and c2 (vcc) have not passed the voltage, then the com and NC (Normally close) terminals will be connected and NO (Normally Open) is not connected otherwise if c1 (ground) and c2 (vcc) voltage is passed, then the com and NO (Normally open) terminals will be connected and NC (Normally Close) is not connected, where the relay output com pin is given a 220 volt voltage source and the NO (Normally Open) relay output pin is connected to the lamp for later is turned on/controlled based on input in the form of sound (sound code) from the FC-04 sound sensor.The overall picture of the control system can be seen in Figure 3.

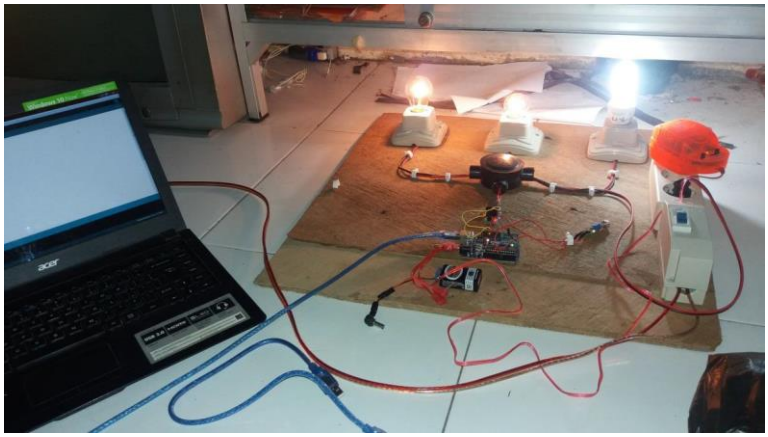

Figure 3. Overall Circuit

The experimental table for the control system with a range of ± 3 meters can be seen in Table 1 below.

DISCUSSION

Based on the results of the design that has been carried out on a solar cell-based garden watering device, it can be concluded that: The system will function when the FC-04 sound sensor gets sound input (sound code) in the form of clapping with a value of 1 then accumulated on Arduino with a value above 400 millis according to program that is uploaded to be used as a 5 volt output to turn on/off the lights. The FC-04 sound sensor is only able to provide digital output signals with values of 1 and 0. To turn on the lights with a certain range, there are several things that affect, such as setting the sensitivity level of the sound sensor and the noise level around the room area.

Table 1. Experimental Results

No	Initial Condition of Lamp	Given Sound	Voice Sensor Input Signal Value	Sound Sensor Output Voltage	Final Condition of Lamp	
					off	Light up
1	off	1 time clap	> 400 m/s	0.5 VDC		✓
2	off	1 time clap	< 400 m/s	0.5 VDC	✓	
3	Light up	1 time clap	> 400 m/s	0	✓	
4	Light up	1 time clap	< 400 m/s	0		✓

Volume 2, **Number** 2, June 2022
https://doi.org/ 10.47709/brilliance.v2i2.1543

CONCLUSION

Based on the results of the design that has been carried out on a solar cell-based garden watering device, it can be concluded that: The system will function when the FC-04 sound sensor gets sound input (sound code) in the form of clapping with a value of 1 then accumulated on Arduino with a value above 400 millis according to program that is uploaded to be used as a 5 volt output to turn on/off the lights.

REFERENCES

[1] Renol.F., Hambali, "Sistem Otomasi Penyalaan Lampu dan AC (Air Conditioner) Pada Ruang Dosen Berbasis Arduino Uno", ", Jurnal Teknik Elektro dan Vokasional, 6(1), hlm.145-152, 2020.
[2] Chomy D.A., Awardi ,"Rancang Bangun Buka Tutup Pintu Air Otomatis Pada Irigasi Sawah Berbasis Arduino dan Monitoring Menggunakan Andorid", Jurnal Pendidikan, Matematika, dan Sains, 6(1), hlm. 167-178, 2020.
[3] Endo.A.S., Hansi E., "Sistem Kendali Kecepatan Motor DC Berbasis Arduino dengan Metode Open Loop", Jurnal Teknik Elektro dan Vokasional, 6(1), hlm. 1-12, 2020.
[4] Ayu L., Oriza. C, "Prototype Sistem Pensortir Barang di Industri Menggunakan Loadcell berbasis Arduino Uno", Jurnal Teknik Elektro dan Vokasional, 7(1), hlm. 27-36, 2021.
[5] Muhammad.K, Aswardi.A., "Rancang Bangun Alat Kendali Sortir Barang Berdasarkan Empat Kode Warna", Jurnal Teknik Elektro dan Vokasional, 6(2), hlm 391- 402, 2020.
[6] Siti.R., Hendri, "Sistem Pendeteksi Ketinggian Air Menggunakan Pompa Berpenggerak Motod BLDC Berbasis Mikrokontroller", Jurnal Teknik Elektro dan Vokasional, 6(1), hlm 286-295, 2020.
[7] Try Y.C., Taali, "Sistem Pengendali Kecepatan Motor DC Penguatan Terpisah Berbeban dengan Teknik Kontrol PWM Berbasis Arduino", Jurnal Teknik Elektro dan Vokasional, 6(1), hlm.199-210, 2020.
[8] Fergiawan.I.P, Ali.B.P., "Alat Pengering Biji Pinang Berbasis Arduino", Jurnal Teknik Elektro dan Vokasional, hlm.89-97, 2020.
[9] Muhammad.K, Aswardi, "Sistem Pengendali Tegangan Berbasis Mikrokontroler Arduino Uno", Jurnal Teknik Elektro dan Vokasional, hlm.134-144, 2020.