Design of a Clap Detection Light Control
System Based on Arduino Uno

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Article Info	ABSTRACT

Lamp technology can also provide lighting, currently it has helped many people's activities in their daily life activities. Here the author aims to make a prototype in the form of a tool with a system that can turn on and turn off the lights, by turning off different lights and efficiency so that it no longer requires physical contact to turn them on and off. so that the lights can turn on and off by utilizing a sound from the movement of the human body that can be received directly without having to touch the switch of the lamp. In making it the author uses the Arduino Uno microcontroller as the brain of this system, with input in the form of the FC-04 sound sensor module, namely the sound sensor works based on incoming sound waves. If the sound waves hit the sensor membrane, it will have an effect on the sensor membrane vibrating. The membrane will convert sound waves into electrical quantities which can later be used as parameters to control output devices. This system is designed in such a way that it can work according to the desired features.

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1. INTRODUCTION

The need for electrical energy is a vital need for man. Lots of electronic equipment such as lights that are on all the time even if they are no longer in use. In general, lighting consumes 20% to 50% of electricity consumption. As a result, a lot of electricity is wasted. Savings in electrical energy must be taken into account, of course, so that budget allocations are not wasted. Energy-saving electronic equipment can also be realized by controlling the power supply more effectively and efficiently.

As users of electricity, humans often forget, are lazy, or struggle to turn lights on and off. This makes the use of electricity in lamps inefficient and inefficient. The current voice commands can replace the role of the manual switch so that the user only has to say a command by the clap method which is read by the FC-04 sound sensor system and makes it more convenient.

2. LITERATURE REVIEW

In a study entitled design of a light control system by detecting applause based on Arduino Uno, it discusses the design of an automatic lamp prototype with sound control or clapping. Research on control

systems that can automatically act as regulators of the use of lighting in the application room that will be made for this system is to use the C programming language and to program the microcontroller board the author uses the C programming language which has been simplified to become the C-Arduino programming language.

A new method of turning on lights with voice commands based on Arduino Uno using a microcontroller by turning on lights with voice commands based on Arduino Uno. The results obtained improve the aspects of comfort and convenience for the physically handicapped or the elderly, who have difficulty in getting up or reaching for a switch, where this tool can be operated automatically using only a clap of the hand.

Based on the above background, the author will design a technological system that can be applied to home lighting, namely being able to turn lights on or off using sound input. So you need a tool that can automatically control the lights. using the Arduino UNO R3 microcontroller as the controller.

During this research, the authors design a light controller with voice input that has been programmed. 1 lamp used for room lighting, with work orders on, off and flashing.

3. RESEARCH METHODE

This study uses experimental research methods, which include analyzing and designing systems used to produce new products, and then testing the effectiveness of those products. This research method was chosen because it is relevant to the purpose of the research, namely to manufacture certain products. In this research, a design prototype of an Arduino Uno-based clap-sensing light control system will be designed.

1. Research object

   Design in this series includes prototype design, hardware, software, data diagram design, and interface design.

2. Data collection methods

   At this point, a study was conducted on the problems of lights used in circuit design, including detecting the sound necessary for its control, and studying the theory of Arduino, Android and other components

3. System design

   The design of this circuit consists of several parts, namely the Sound Sensor circuit, the Driver circuit and the Lamp circuit which is connected to the Arduino microcontroller.
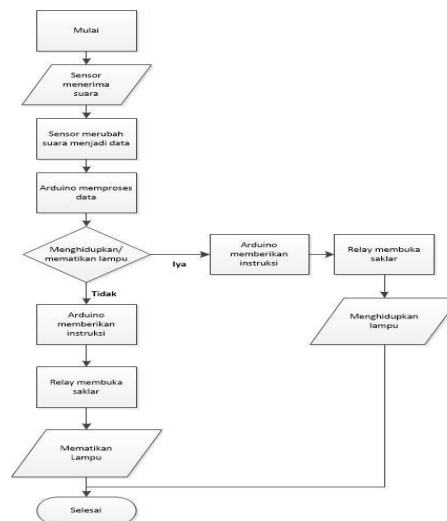
4. Flowcharts

Figure 1. Flowcharts

The system flowchart starts from the end of the boot, then the sensor detects the applause sound 2 times, does the sound sensor play the applause sound, if not, it needs to clap 2 times again to make the sound sensor plays digital clap sound signal. If the sensor successfully reads the clap sound, the light will

turn on via the active switch of the relay. Then do you want to turn off the light, if so, the process is to restart the clap once. The next process will always loop until there is another command or the power is turned off and the process is finished.

5. Tool Design

The equipment used to create an arduino microcontroller system with a sound sensor is :

1. Arduino Uno R3
2. Sound sensor (FC-04)
3. Breadboards
4. USB cable
5. Connection cable
6. 5 watt lamp
7. 1 channel 5 volt relay module,
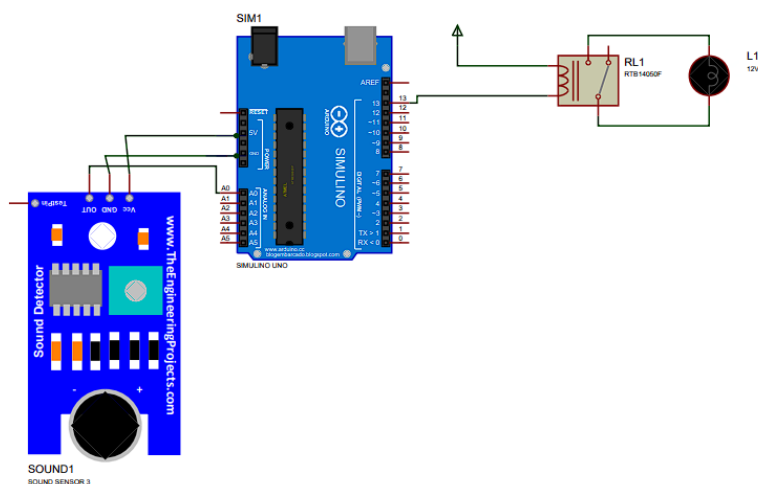8. light fixtures
9. To change
10. Laptop

Figure 2. Tool Design

4. RESULT AND ANALYSIS

At this point, we tested 8 times by providing sound input in the form of hand clapping six times at different distances. With the condition of the tools and materials working normally, we obtain completely optimal results.

This test uses the clap input twice in a time period, with the initial condition that the light is not on.
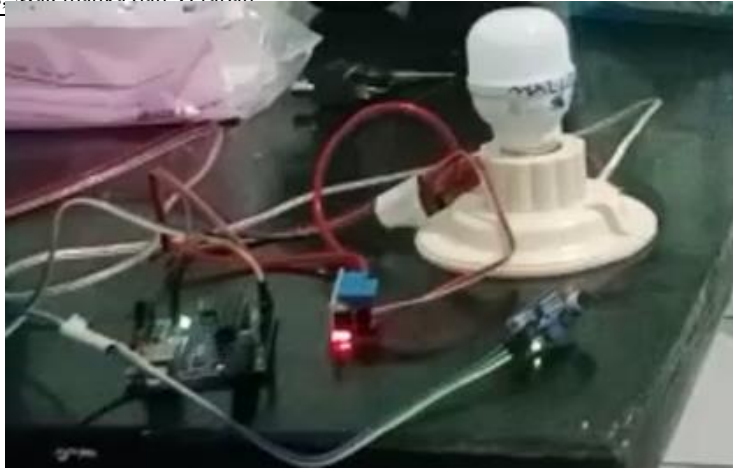
Figure 3. Testing Stage

Table 1. Test Result

interaction	Variable lamp start	The initial state of the lamp	Voice input (applause)	distance	The final state of the lamp	Variable position light
1	dead	dead	2	50 cm	life	life
2	dead	dead	2	1 m	life	life
3	dead	dead	2	3 m	life	life
4	dead	dead	2	>3 m	dead	dead
5	life	life	2	50 cm	dead	dead
6	life	life	2	1 m	dead	dead
7	life	life	2	3 m	dead	dead
8	life	life	2	>3m	life	life

In the experiments carried out, here are the results of the discussion that were obtained.

Table 2. Testing discussion

Test	Explanation
1	In the first experiment, the light was initialized "Off" and the state of the light was turned off at a distance of 50 cm. Then, given the clap sound input twice, the lights are turned on and change the light variable to "On". The first attempt was successful
2	In the second experiment, the lights were initialized "Off" and the lights turned off at a distance of 1 m. Then, given the clap sound input twice, the lights are turned on and change the light variable to "On". The second attempt was successful
3	In the third experiment, the lights were initialized "Off" and the lights were turned off at a distance of 3 m. Then, given the clap sound input twice, the lights are turned on and change the light variable to "On". The third attempt was successful
4	In the fourth experiment, the lights were initialized "Off" and the conditions of the lights turned off with a distance >3m. Then, given the clap sound coming in twice, the lights were turned off and the light variable was changed to "Off". The third attempt was successful
5	In the fifth experiment, the lights were initialized "On" and the state of the lights was on with a distance of 50 cm. Then, given the clap sound coming in twice, the lights were turned off and the light variable was changed to "Off". The first attempt was successful
6	In the sixth experiment, the lights were initialized "On" and the state of the lights was on at a distance of 1 m. Then, given the clap sound coming in twice, the lights were turned off and the light variable was changed to "Off". The sixth trial was successful.
7	In the Seventh Experiment, the lights are initialized "On" and the state of the lights is On with a distance of 3 m. Then, given the clap sound coming in twice, the lights were turned off and the light variable was changed to "Off". The seventh trial was successful

8	In the eighth experiment, the lights were initialized "On" and the state of the lights was On at a distance of 1 m. Then, given the clap sound coming in twice, the lights were turned off and the light variable was changed to "Off". The eighth trial was successful

From the results of the chat, we only get two claps then the light will be active. As for turning it off with a double clap as well. The distance that the sound sensor can receive is 50cm-3m, more than 3m is not detected by the sound sensor. The FC-04 sound sensor accepts audio input (beep code) as a clap and collects a value in the Arduino tool, the system operates based on the downloaded program for use with a 5 volt output that can turn on/off the lights and only provides digital outputs with values 1 and 0.

From the research found and the tests of the system by the Professor of Artificial Intelligence, it can be concluded that the constructed system is free from syntax errors and functionally produces results in line with expectations.

And there are still many gaps to allow for further development, such as voice guidance can be door with voice recording to control lights with additional sensors and FC-04 sound sensor specifications for loudness of applause in decibels are unknown.

5. CONCLUSION

The whole system has proven itself and is capable of executing the given commands. The application must be connected to the system microcontroller first, after connection the tool can be used and run programs on the Arduino Uno application. The LED will light according to the command given.

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