

Automatic Door Lock Design with Arduino Mega 2560 Based Knocking Rhythm

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Abstract- As the development of knowledge and technology in the world of education is currently advancing rapidly, many provide ideas for new methods and innovations in the field of technological development, especially automatic door locks with a rhythm of knocking. Door locks are vulnerable to the risk of being left behind or lost, protection or security is needed to store them. This research is designed to build a private room door security by using the knock pattern of the process by performing a knock, identification to verification of each recognized knock pattern. The system will start working by doing the accuracy of the interval between knocks when the rhythm / rhythm of knocking based on previously stored data then the system is active, from that developed a tool that is used as a room door lock by knocking on the door with a rhythm / rhythm that has been adjusted to the knock. Using this tool is expected to help and maintain better room security.

Keywords—Arduino mega 2560, Solenoid, Buzzer, Piezoelectricity

I. INTRODUCTION

Along with the development of technology that is increasingly advanced and used by humans, even technology that is now with the advancement of technology, many security levels have used it. With technology that can be used for various needs and humans already know technology and follow current technological developments. Usually room doors only use conventional locks, such as lock levers, sliding locks, or rotary hinges, these conventional locks have been applied as a common security method but found difficulties in opening them, because the method is arguably still manual and makes it difficult for the user such as the need to pull on the lock lever, the urge to slide and turn it makes it more complicated to apply at this time. In addition, using conventional keys in the security system is also less reliable because conventional keys are easily lost in use, so this system is considered less practical [1]. By utilizing current technology, a security system with a secret knock method or knock pattern that can be applied to access the door of a house or private room is explored [2] [3]. This automatic door lock will be efficient among the community because basically the component materials used to make automatic locks are relatively cheap and in terms of use are very easy and can change the rhythm of the knock. The piezoelectric used as a sensor can function as a vibration detector. With the security system using a piezoelectric knock sensor provides more efficient door security [4].

[5] The author shows that as part of his research he made an automatic door using a keypad mounted on the door. Keypad is a push button switch arranged in a matrix that functions to input data such as, automatic door input, attendance input. Using a keypad has the disadvantage that it

is damaged if exposed to water and does not function during a power outage.

Both researchers used the door to use the key, the disadvantage is that the keypad can be easily tampered with. Therefore, in this study a device was made that uses knocking with the title "Design of Automatic Door Lock with Arduino Mega 2560 Based Knock Rhythm".

II. METHODS

2.1 Product Design

The product design for Automatic Door Locks with Knock Rhythm is a product design from an innovation owned by the author. The following is a flow diagram and explanation of the working system of the designed tool.

2.1.1 System Flowchart

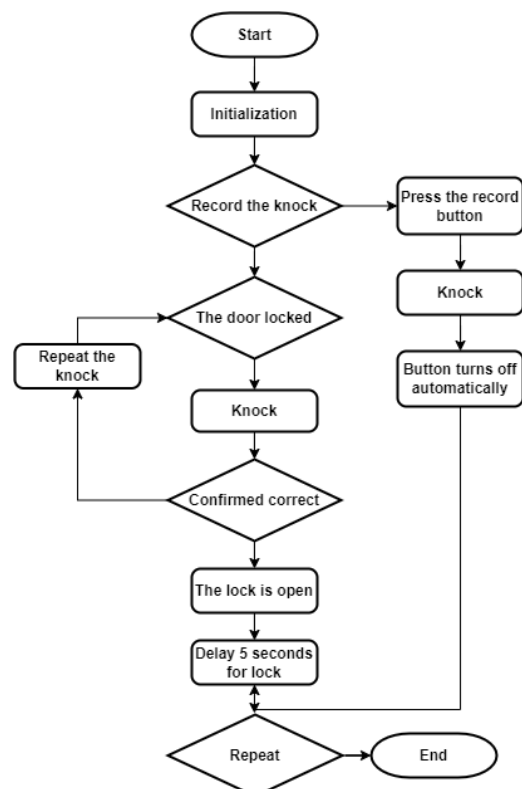


Fig. 1 Automatic Door Lock Flowchart

2.1.2. Block Diagram

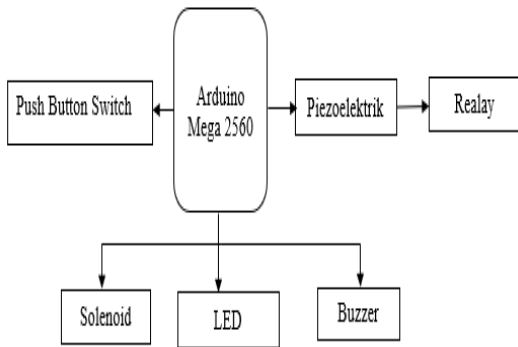


Fig. 2 Block Diagram

Based on this diagram, it explains that the steps of the Automatic Door Lock Design are:

- a) Arduino Mega 2560 to store programs that have been made in the Arduino IDE Software.
- b) Push Button Switch functions for re-recording if the knock is wrong.
- c) Led lights up when the tap code is stored.
- d) Buzzer sounds when the beat rhythm is correct.
- e) Solenoid opens if the beat rhythm is correct and the beat rhythm is wrong then the solenoid remains locked.
- f) Piezoelectric to create a beat rhythm pattern.

2.1.3. Wiring Diagram

In this study, it is explained that the scheme of the Automatic Door Lock Design with Arduino Mega 2560 Based Knocking Rhythm.

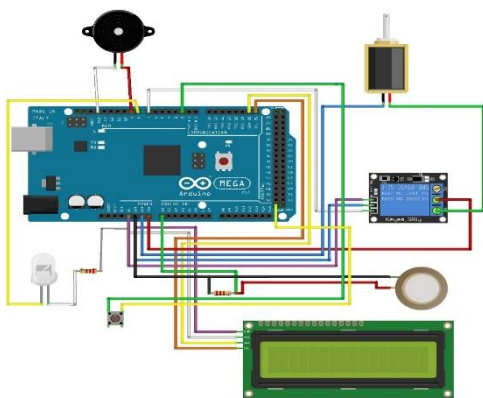


Fig. 3 Wiring Diagram

2.2 Variable and Operational Definition of Variable

Research variables are anything in the form of anything that is determined by the researcher to be studied so that information is obtained about the results of the study, then conclusions can be drawn.

a) Related Variables

The dependent variables are factors that are observed and measured to determine the influence of the independent variables. In this study the dependent variables are as follows:

- Dc Solenoid, Relay

b) Free Variables

Free variables are variables that cause or influence. In this study, the free variables are as follows:

- Changing the Beat Pattern

2.3 Data Collection Method

Sources of data obtained from books, research journals, the internet, and those related to the Design of Automatic Door Locks with Arduino Mega 2560 Based Beat Rhythm.

III.RESULTS AND DISCUSSION

3.1 Product Results and Evaluation

The results and evaluation of the product aim to determine whether the product can be used or there is still something that needs to be improved again, so that the presentation of data in the tool can be done optimally.

a. Product Results

From the results of the design of the tools that researchers do using several components consisting of a 30 cm high door 24 cm wide, Arduino mega 2560, LCD 16X2, buzzer, doorlock solenoid, relay, adapter, Led, resistor, Piezoelectric, Push Button Switch, jumper cable, and bread board.



Fig 4. Product Results

b. Product Evaluation

In the Arduino Mega 2560-based Automatic Door Lock Design tool, if there are newer and more accurate sensors, researchers recommend using the latest and more accurate sensors.



Fig 5. A Product Front View, B Product Rear View

3.2 Data Presentation

Based on the experiments carried out, the data analysis obtained produces the following data:

- Testing Changing Beat Patterns

Performing a beat rhythm using a stopwatch to measure time and piezoelectric replacing the beat pattern.

Table 1 Data Collection of Interval Changing Beat Pattern on the First Day

Knocks Intervals	Experiment 1	Experiment 2	Experiment 3	Experiment 4	Experiment 5
Knocks Time (ms)	0,07	01,1	02,0	03,4	10,0
Knocks Value	1	4	8	14	20

Table 2 Data Collection of Beats Pattern Interval on the Second Day

Knocks Intervals	Experiment 1	Experiment 2	Experiment 3	Experiment 4	Experiment 5
Knocks Time (ms)	0,07	01,9	02,6	03,4	11,1
Knocks Value	1	6	10	16	20

Table 3 Data Collection of Beats Pattern Change Intervals on the Third Day

Knocks Intervals	Experiment 1	Experiment 2	Experiment 3	Experiment 4	Experiment 5
Knocks Time (ms)	0,07	02,2	03,0	04,4	12,16
Knocks Value	1	8	13	18	20

In the first experiment the researcher did one tap and the beat would not be detected in the program because the minimum program was at least 2 beats and at most 20 beats. And experiments 2, 3 and 4 by doing a quick tap and a different beat pattern, the system will still be read and beats within 30 milliseconds (ms). With a slow tap in experiment 5 the system will also remain readable within a maximum beat time of 1 second (s), if it exceeds the beat the system will be saved automatically. The time to do the tap must be the same time as pressing the push button with a beat value of how many seconds (s) and milliseconds (ms).

Table 4 Failed Trials on Day 1

Knocks Intervals	Experiment 1	Experiment 2	Experiment 3	Experiment 4	Experiment 5
Knocks Time (ms)	0,07	01,1	02,0	03,4	10,0
Knocks Value	1	Wrong knocks	Wrong knocks	Wrong knocks	Wrong knocks

Table 5 Failed Attempts on Day 2

Knocks Intervals	Experiment 1	Experiment 2	Experiment 3	Experiment 4	Experiment 5
Knocks Time (ms)	0,07	01,9	02,6	03,4	11,1
Knocks Value	1	Wrong knocks	Wrong knocks	Wrong knocks	Wrong knocks

Table 6 Failed Trials on Day Three

Knocks Intervals	Experiment 1	Experiment 2	Experiment 3	Experiment 4	Experiment 5
Knocks Time (ms)	0,07	02,2	03,0	04,4	12,16
Knocks Value	1	Wrong knocks	Wrong knocks	Wrong knocks	Wrong knocks

On the first day of the experiment, the second and third researchers did the same beat rhythm, fast or slow, the beat would be wrong if there was a vibration or rhythm and the beat was broken due to a loose hinge. which exceeds the beat, the wrong beat will be displayed on the LCD.

3.3 Data Analysis

Aims to detail the data obtained from the test results that have been carried out by researchers in the previous sub-chapter. Based on the test results above, it can be seen in the test results in Table 1, 2, and 3 that each beat pattern has a different delay in experiment 1, the researcher did a beat pattern by doing a beat once, in experiments 2, 3, 4, the tester did a different delay and did an accelerated beat pattern based on the rhythm at the beginning of the beat, and experiment 5 the tester did 20 beats according to the initial rhythm where the beat tempo was slowed down.

3.4 Discussion

The results of data analysis that has been carried out as in the table of device test results, researchers can discuss the results of system research that has been made. The results of the test change the knock pattern if it does not match the knock pattern then the door will not be opened and displayed on the LCD, if the knock pattern is wrong in the table above the researcher knocks at most 20 beats and in the fifth experiment, the knock time is different, in the fifth experiment the researcher makes where the beat tempo is slowed down.

VI. CONCLUSION

4.1 Conclusion

From some research and testing analysis of the Automatic Door Lock Design with Arduino Mega 2560 Based Knock Rhythm.

- The security system used is an automatic door lock with a knock rhythm where the piezoelectric sensor receives vibrations when doing a knock pattern.
- The door lock used is a dc solenoid. LCD to display the status if recording, door open, door closed, knock stored or wrong knock pattern.

4.2 Suggestions

The suggestions that can be given for further research are as follows:

- The door design tool using this knock pattern is expected to add a sensor or alarm if the door is broken into by the thief then the sensor will sound.
- Developed by adding a servo motor so that the door can open automatically.
- It is hoped that further research will be developed so that it can be accessed from the telegram application.

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