**PEIZOELECTRIC SENSOR MODEL TO UNLOCK DIGITAL DOORS USING ARDUINO UNO**

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**Abstract:** This research is expected to increase convenience for users from manual systems to automatic systems, door locks using a predetermined knock code. Unlocking the digital key that is generated from the sensor when using a tap will enter through the Peizoelectric sensor of the Arduino Uno microcontroller system. The test results show that the knock code given to this system is related to the number of beats. The interval time value or the distance between each beat is stored in the Array data type which forms a certain rhythm of beats used in the program. This knock interval value (knock code) will be stored first in the microcontroller flash memory. The knock on the system will start working by performing accurate intervals between the beats, if the rhythm/rhythm of the beats matches what has been previously stored, the door opening system will be active. If the rhythm/rhythm of the beat is wrong then the door lock will not open.

**Keywords:** Knock Piezoelectric Sensor, Arduino Uno.

**Abstrak:** Penelitian ini diharapkan dapat meningkatkan kemudahan bagi pengguna dari sistem manual ke sistem otomatis, pengunci pintu menggunakan kode ketukan yang telah di tentukan. Membuka kunci digital yang dihasilkan dari sensor saat menggunakan ketukan akan masuk melalui sensor Peizoelectrik sistem mikrokontroler Arduino uno. Hasil pengujian diperoleh bahwa kode ketukan yang diberikan pada sistem ini terkait dengan jumlah ketukannya. Nilai waktu interval atau jarak antar setiap ketukan disimpan dalam type data Array yang membentuk sebuah ritme/irama ketukan tertentu yang digunakan dalam program. Nilai interval ketukan ini (kode ketukan) yang akan disimpan terlebih dahulu dalam flash memory mikrokontroler. Ketukan disistem akan mulai bekerja dengan melakukan akurasi interval antar ketukannya, jika ritme/irama ketukan sesuai dengan yang telah tersimpan sebelumnya maka sistem membuka pintu akan aktif. Apa bila ritme/irama ketukan salah maka kunci pintu tidak akan terbuka.

**Kata kunci:** Sensor Piezoelektrik Kunci Ketuk, Arduino Uno.

**INTRODUCTION**

The development of modern technological science has now brought humans to a better civilization. There are many benefits and conveniences resulting from technological developments in the digital revolution 4.0 era, especially with the birth of computers, the quality and effectiveness of humans at work has increased. In fact, it is no longer possible for humans to be separated from these tools, because the computer field offers various conveniences to help humans complete their work, for example in mathematical calculations, databases, statistical data processing, presentations, playing games, and even computers. based automation system.

Among people in general, they still use a simple key system. The function of opening doors is still to use conventional (manual) keys such as locking levers, sliding locks or rotating hinges. The use of keys, which are widely used as a general security method, often results in the loss of keys when traveling.

One of the triggers for criminal acts is the very large differences in levels of welfare in society. There are many ways that can be done to avoid criminal acts of robbery at home or private rooms, such as hiring security personnel such as security guards to be on guard. Of course this will increase monthly costs, this is where the problem starts with a weak key security system.

The application of electronic technology is one of the solutions considered the most relevant to implement. The security system that the author will create is a security system equipped with an Arduino microcontroller and a Peizoelectric sensor. Article writing does not use sub-chapters. Arduino is an Open Source Physical Computing Platform, the word "platform" is the right choice of words, Arduino is not just a development tool, but is a combination of hardware, programming language and a sophisticated Integrated Development Environment (IDE). IDE is a software that plays a big role in writing programs, compiling them into binary code and uploading them into microcontroller memory. There are many projects and tools developed by academics and professionals using Arduino, apart from that there are also many supporting modules (sensors, displays, drivers and so on) created by other parties to be connected to Arduino.

Doorlocks like this are relatively expensive, by utilizing a microcontroller and vibration Peizoelectric sensors a security system can be explored using the secret beats and sounds or knock code method that can be applied to access the entrance to a house or private room. This door locking system will be efficient among the public because basically the materials or components used to make it are relatively expensive and in terms of use it is very easy and can modify the knocks that have been determined and stored in the system.

**METHOD**

In this stage the researcher uses the prototype method, because this method is a method that is widely used by software developers. The essence of this method is the process of developing a model into a final system.



Image 1. Stages of the Prototype Method

The following are the stages of creating a prototype methodIn writing formulas and equations using the equation as in the formula.

$\left(x+a\right)^{n}=\sum\_{k=0}^{n}\left(\genfrac{}{}{0pt}{}{n}{k}\right)x^{k}a^{n-k}$1. Requirements Collection

Here the author collects data to make a digital knocker door lock with a peizoelectric sensor using an Arduino Uno microcontroller. This really helps owners of private houses and rooms in opening the doors of private houses and rooms more practically than is usually used by the general public.

2. Prototype Design Process

At this stage of the design process the author carried out design planning and design before carrying out the process of making the "Digital Knock Key" tool.

3. Build a Prototype

In this stage the author builds a prototype and creates a temporary design that focuses on making a digital door lock with a peizoelectric sensor and using an Arduino microcontroller.

4. Protoptype Evaluation

At this prototype evaluation stage, we will discuss the software design that will be used by users, whether the prototype that is built meets their desires and needs, then the next stage will be implemented.

**RESULT AND DISCUSSION**

Prototype Models

A prototype model is an initial version of a software system that is used to demonstrate concepts, design experiments and find more problems and possible solutions. Prototype systems allow users to find out how the system works.

Digital Knock Door Lock Device Model

The system model of the Arduino Uno device on the Digital Knock Door Lock system can be done using the following steps:

1. Connect the electric current source to the electrical power control hardware circuit.

2. After that the Digital Knock Door Lock will light up as will the Arduino supporting devices, the LED lights and the relay circuit.

Knock Sensor Testing

This test is carried out to find out whether the sensor is able to detect knocks that have been programmed in the storage carried out on the Pust Button. This sensor is placed on the back of the door, so that when you knock on the door to unlock the door, this sensor will detect whether the knocking process is correct. If the tap is correct, the solenoid will open, if the tap is wrong, the LED light will flash quickly. The solenoid will not open. The Peizoelectric sensor test results are shown in table 3.1 as follows:

|  |  |  |
| --- | --- | --- |
| **Testing** | **Beat Distance** | **Information** |
|
| 1 | 1 Second | Open |
| 2 | 2 Second | Open |
| 3 | 3 Second | Open |
| 4 | 4 Second | Not open |
| 5 | 5 Second | Not open |

Table 1. Knock Sensor Testing

Based on the sensor test, √ means the knock is correct, the Solenoid is open, and × means it is wrong, the LED light will flash quickly. The Solenoid is not open.

System Testing using the Black-Box Method.

To test the system, the author uses the black-box testing method. This testing is carried out to determine whether the program is suitable for use or not and whether it meets the expected needs or not.

Black-box testing is a stage that focuses on the functional statements of the software. This test case aims to show the function of the software and how it operates. Is the input of beat and sound data running as it should? Thus, black-box testing allows software developers to obtain a set of input conditions that fully utilizes all functional requirements for a program.

Black-box testing tries to find errors in several things, namely: a. Incorrect or incorrect functions. b. Interface error. c. Performance error. The following table illustrates the black-box testing method for applications. Testing is carried out on the entire system with certain inputs or conditions.



Table 2. Black-Box Testing

**CONCLUSION**

After testing and analyzing this thesis, it can be concluded as follows:

1. From the test results, if the door is knocked according to the knock code that has been determined then the door lock will open, if it does not match the LED light will turn on quickly. The door can open because of the recognition of each sensor, the sensor will detect the vibration results of the knock.

2. Detected results from the Peizoelectric Sensor, the sensor will respond properly if the command carried out is correct. The process of detecting each sensor is vibration and frequency, apart from that, the program has been uploaded to each tool that will work.

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