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Design of Dodol Mixer on Based on Microcontroller Arduino Nano

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Abstract
In the process of cooking dodol dough requires the power of several people to continuously stir until the dough releases air bubbles. the process of making dodol generally takes time depending on how much dough you want to cook. If you want to cook 10 kg of dodol dough, then the time needed to cook it is approximately 8-10 hours with normal or medium heat. Currently, the household-scale dodol industry still uses the manual method for the dodol mixing process, which will require energy. more than one person to stir for a long time so that it will take time for one repetitive job and the production costs will be higher. With this tool, it is hoped that the household-scale dodol industry will become more efficient, because there is no need to manually stir and can do another work while the dodol dough is being stirred.

Keywords: Dodol, Mixer, Microcontroller, Arduino Nano, Timer

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1.0 INTRODUCTION

Dodol is a sweet food originating from Indonesia. In Indonesia, dodol is a snack that has a different name in each region. In Java itself there are various types of dodol such as dodol garut originating from West Java, dodol betawi from Jakarta, jenang garut from Central Java, and others(Aliyah & Suryatna, 2019). In the process of making dodol, the main raw materials used are glutinous rice flour, granulated sugar, palm sugar and coconut milk. After all the ingredients are complete, then all the ingredients are mixed into a large cauldron that has been heated over medium heat. In the process of cooking dodol dough requires several people to stir the dodol continuously until the dough emits air bubbles. The process of making dodol generally takes time depending on how much dough you want to cook. If you want to make 10 kg of dodol, then the time needed to cook is approximately 8-10 hours on normal / medium heat (Kelmaskosu et al., 2018).

Currently, the household-scale dodol industry still carries out the dodol stirring process manually, which is still using a stirrer made of wood, the problem if using this traditional method is that it requires the labor of many people, spends time on one repetitive job and production costs become higher. Therefore, here the author wants to make a dodol mixer machine for a household scale so it is necessary to conduct a research entitled "DESIGN OF A DODOL MIXER BASED ON MICROCONTROLLER ARDUINO NANO ".

2.0 LITERATURE REVIEW

Dodol

Dodol is a traditional snack made from a mixture of white glutinous rice flour, brown sugar, and coconut milk, then simmer until thickened, and not sticky to the pot. When it has cooled, the paste will become dense, and chewy. Dodol can be served at any time, either for snacks or cake for guests (Nasaruddin et al., 2016).

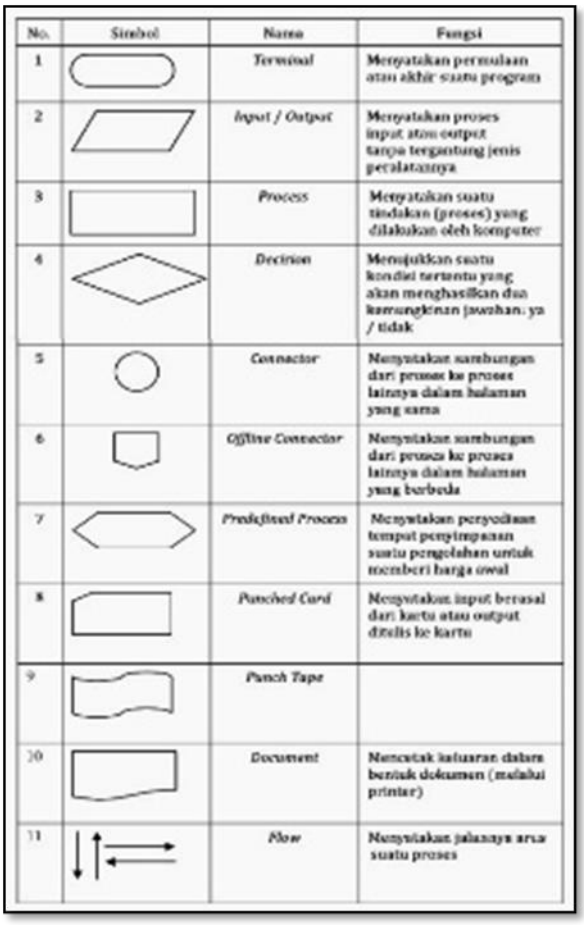
Dodol is a semi-wet food product that can be consumed immediately. The principle of semi-wet treatment is a decrease in water activity until the microbial level of pathogen and spoilage levels does not grow, but the water content is still sufficient so that it can be eaten immediately without rehydration and dry enough to be stable in storage (Setiawan et al., 2017).

Flowchart

Flowchart is to simplify the series of processes or procedures to facilitate the user's understanding of the information. A flowchart is an image or chart that shows the sequence and relationship between processes and their instructions. This image is expressed by symbols; thus, each symbol describes a specific process. While the relationship between processes is described with connecting lines (Saputra & Effiyaldi, 2017).

A flowchart is a graphical representation of the steps and sequence of procedures of a program. Flowcharts help analysts and programmers to break down problems into smaller segments and help analyze other alternatives in operation (Rahmi et al., 2016)

Flowchart means a visual presentation of the flow of data in information processing, operations in the system, and the sequence of processes performed. Flowcharts here are more emphasized on program flowcharts, which describe the operations used and their sequence to complete the operations used and their sequence to solve a problem (Suyanto, 2018).



No.	Simbol	Nama	Fungsi
1		*Terminal*	Menyatakan permulaan atau akhir suatu program
2		*Input / Output*	Menyatakan proses input atau output tanpa tergantung jenis peralatannya
3		*Process*	Menyatakan suatu tindakan (proses) yang dilakukan oleh komputer
4		*Decision*	Menujukkan suatu kondisi tertentu yang akan menghasilkan dua kemungkinan jawaban: ya / tidak
5		*Connector*	Menyatakan sambungan dari proses ke proses lainnya dalam halaman yang sama
6		*Offline Connector*	Menyatakan sambungan dari proses ke proses lainnya dalam halaman yang berbeda
7		*Predifined Process*	Menyatakan penyediaan tempat penyimpanan suatu pengolahan untuk memberi harga awal
8		*Punched Card*	Menyatakan input berasal dari kartu atau output ditulis ke kartu
9		*Punch Tape*	
10		*Document*	Mencetak keluaran dalam bentuk dokumen (melalui printer)
11		*Flow*	Menyatakan jalannya arus suatu proses

Figure 1. Flowchart Symbol

Motor DC

DC (Dirrect Current) motors are basic electromagnetic equipment that serves to convert electric power into mechanical power whose design was originally introduced from a century ago (Nugroho & Agustina, 2015).

DC motor is a type of electric motor that works using a DC voltage source. The direction of rotation of the DC motor is determined by the forward current or reverse current or positive voltage and negative voltage in the DC motor. While the speed of the DC motor is determined by the change / increase in coil voltage in the DC motor.

DC motors require a direct supply of voltage on the field coil to be converted into mechanical energy. In the DC motor, there are two coils, namely the field coil which functions to generate a magnetic field and the anchor coil which functions as a place for the formation of electromotive force (emf E) (Meryanalinda et al., 2019)

Gearbox

The gearbox is a special device needed to adjust the power or torque of the rotating motor, and the gearbox is also a means of converting power from a rotating motor to greater power. Gearbox or transmission is one of the main components of the motor which is referred to as a power transfer system, the transmission functions to move and change power from a rotating motor, which is used to rotate the engine spindle and feeding movement

The gearbox is a system that functions to convert torque and speed (rotation) from the engine into different torque and speed to be forwarded to the final drive (Wiguna et al., 2018)

Pulley
Pulley is an engine element that functions as a component or connecting rotation received from an electric motor then forwarded using a belt or belt to the object you want to move (Iksal, Suherman, 2018).

Arduino Nano
Arduino is an opensource hardware prototyping platform based on flexible and easy-to-use hardware and software. Arduino is also an opensource single-board microcontroller, derived from the wiring platform, designed to facilitate electronic users in various fields. The hardware has an Atmel AVR processor and the software has its own programming language (Turang, 2017).

Arduino nano is the smallest Arduino board, using the Atmega328 microcontroller for Arduino nano 3.x and Atmega168 for Arduino nano 2.x. This variant has the same range as the Arduino Duemilanove type, but with a different size and PCB design. Arduino Nano is not equipped with a power supply socket, but there is a pin for external power supply or can use the power supply from the miniUSB port (Prijatna et al., 2018).

Relay
A relay is a switch that is controlled by current. The relay has a low-voltage coil wrapped around a core. There is an iron armature that will be attracted towards the core when current flows through the coil. This armature is attached to a spring-loaded lever. When the armature is attracted towards this, the shared path contact will change its position from normal-closed contact to normal-open contact (Amarudin et al., 2020).

LCD
LCD or liquid crystal display is used to display electronic information such as text, images, and moving images. Its application is found in monitors for computers, televisions, instrumental panels, and other devices such as clocks, calculators and telephones. LCD is an interface component in the form of letters and numbers. LCD is the output in a microcontroller system (Santoso & Nurmalina, 2017).

LCD is a lot in designing a system using a microcontroller. The use of LCD can function to display a sensor result value, display, or display a menu in a microcontroller application, the LCD used is a 16x2 LCD which means a display width of 2 rows of 16 columns with 16 connector pins (Steven et al., 2016).

3.0 METHODOLOGY

Research framework
To assist in the preparation of this research, it is necessary to have a clear framework (frame work) stages. This framework represents the steps that will be taken in solving the problems to be discussed. The research framework used is as shown in figure 2.

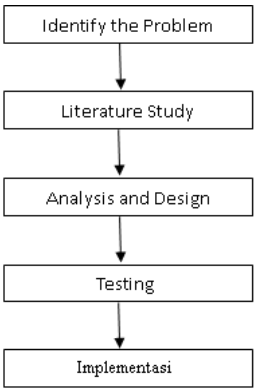


Figure 2. Research Methodology

Identification
At this stage, identification of research problems is carried out by collecting data in the field which is then used as document analysis by researchers and used to identify problems in the object of research.

Literature Study
At this stage, a search for theoretical foundations obtained from various sources such as books, journals and the internet are used to complement the theory, so that it has a good and appropriate theoretical foundation.

Analysis and Design
At this stage, the design of mechatronics, electronics and machine language is carried out.

Testing
At this stage, testing was carried out on the dodol mixer machine to knead dodol dough weighing 3 kg, then the data was taken to compare and then further optimization was carried out to obtain maximum results.

Implementation
After permitting the next stage is direct implementation to the location, here will see the shortcomings of the tools that have been designed.

4.0 RESULTS AND DISCUSSION

Block Diagrams
The salted block is an integrated system, because the system cannot work if one of the devices is not available. The content of this system is Arduino as the main control center of other devices.

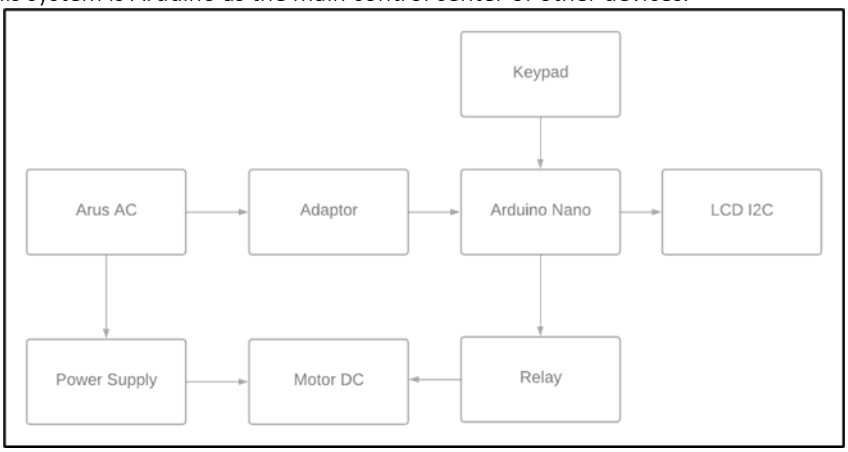


Figure 3. Block Diagram

From figure 3 it can be seen that this system has several parts including:

1. Adapter
   Adapter Serves to turn on the Arduino which has previously been sent a command in the form of a serial to control the system from the design that the author has made.
2. Arduino
   Arduino functions as a microcontroller which is the main component in making this tool.
3. Keypad
   The keypad serves as an input tool to determine the time required in the dodol stirring process
4. Relay
   The relay serves as an opening and closing current used to start the DC motor.
5. LCD
   LCD serves to display a predetermined time through the keypad.
6. Motor DC
   DC motor is used as a stirrer after a specified time.
7. Gearbox
   The gearbox is used to change the rotation of the motor to be slower and more powerful.
8. Overall circuit
   This part is the result of the overall circuit design, namely the incorporation of Arduino nano, 4x4 keypad, I2C LCD, relay, DC motor. Starting from the microcontroller input circuit to the microcontroller output circuit. The circuit used as a whole is a basic electronic component designed so that it can be realized into a prototype control that can be used automatically.

In the path of the circuit scheme made, after the device is turned on the LCD will display the input amount of time that we can specify on the keypad, Then the data is sent to the arduino which will later send commands to the relay to turn on the DC motor for the specified time. The overall circuit scheme can be seen in figure 4.

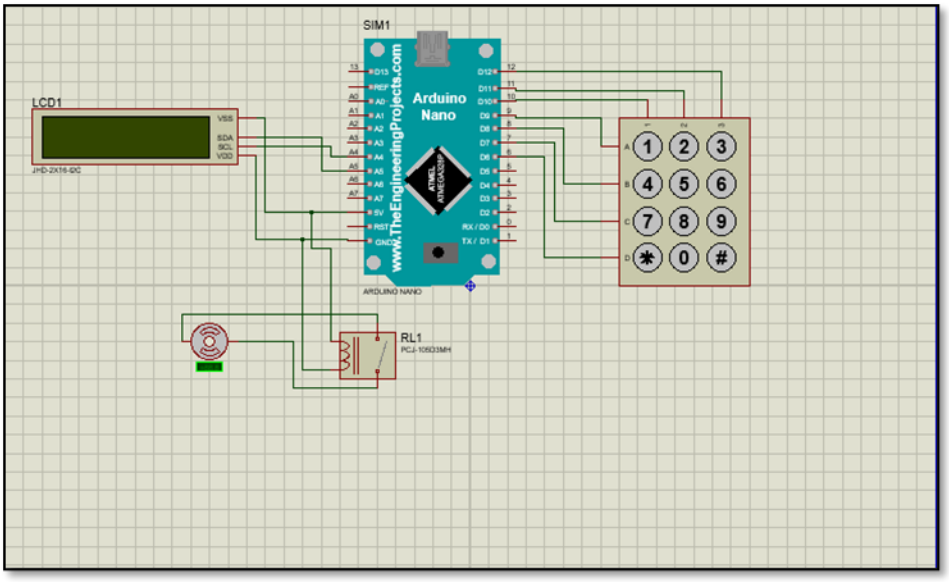


Figure 4. Overall circuit

Program Flowchart

A flowchart is a diagram that displays the steps and decisions to perform a process of a program. Each step is depicted in the form of a diagram and connected by a line or direction of an arrow. The following program flowchart of the circuit system created can be seen in the Figure 5.

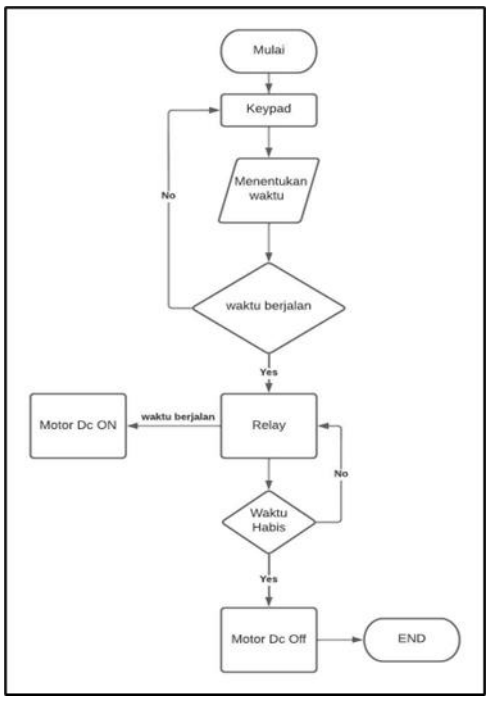


Figure 5. Program Flowchart

System Testing

System testing is carried out to ensure that there are no errors in the program files to be used. System testing carried out is testing on the software and hardware used.

Software Testing

Arduino IDE

For microcontrollers Atmega328 is in sync with many programming languages such as Assembler, CodeVision AVR, C language and others. In making this tool the author uses Arduino NANO. For testing, namely the creation of a new program listing, press the file then select New.

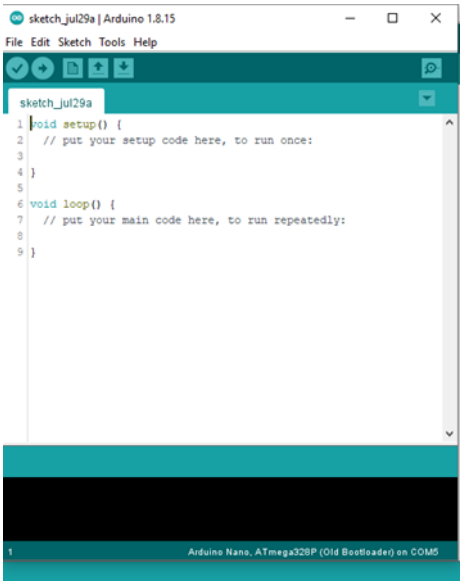


Figure 6. New Project View Arduino IDE

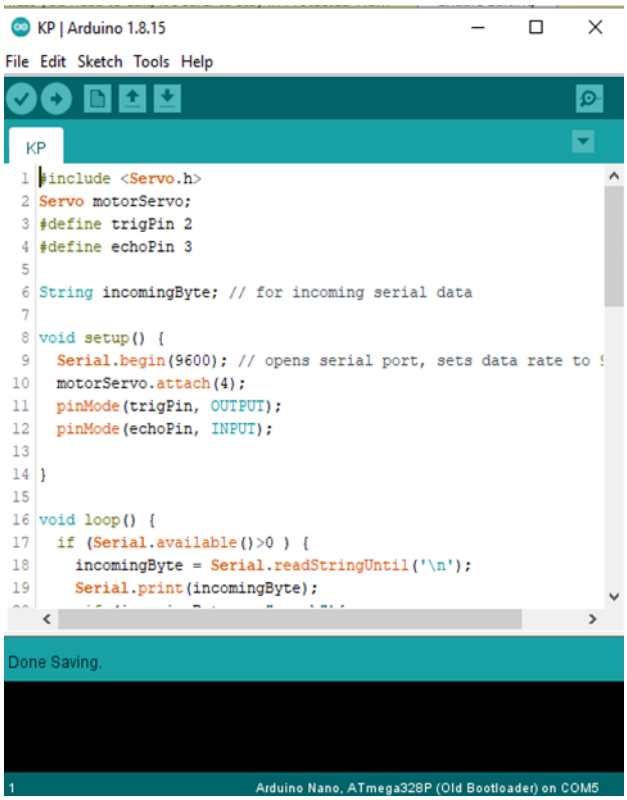


Figure 7. Program Listings

Figure 8. Display in case of errors

Figure 9. Display if there are no errors

Tool Testing

Tool testing is carried out to ensure that the tool that has been made works properly tool testing is carried out by testing the RPM or DC motor rotation:

RPM (Revolution per Minute) Testing

Tabel 1. RPM

Time	Turnover
30 minutes	27.5 rpm
60 minutes	26 rpm
90 minutes	25 rpm
120 minutes	25 rpm
180 minutes	22 rpm

Stirring Process Testing

Tabel 2. Stirring Process

Tested materials	Times	Turnover	Result
1kg glutinous rice flour 4 Old coconut (coconut milk) 1/2 kg brown sugar (palm sugar) 1 wrap flour	30 Menit	27,5 rpm	 
	60 Menit	26 rpm	
	90 Menit	25 rpm	
	120 Menit	20 rpm	
	150 Menit	20 rpm	
	180 Menit	20 rpm	

5.0 CONCLUSION

Conclusion

Based on the results of the design and discussion that has been carried out and described in the previous chapters, the author can draw several conclusions, namely: 1. The dodol mixer provides a more stable stirring process without having to be supervised. 2. By using this tool, the dodol stirring process does not require the energy of many people. 3. This dodol mixer uses a double jacket pan so that the object is not directly exposed to the heat source so as to minimize burnt on the dodol.

Implication

Dodol mixer machine is a machine used in making dodol with the performance of a machine that stirs viscous type materials through the heating process. This dodol mixer can be used for stirrers in the manufacture of dodol food, jenang or jam production and other types of food.

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