

HELPER FİLTER COFFEE STAND

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Group

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Introduction to Electrical-Electronics Engineering Project Report

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ABSTRACT

Coffee beans are turning to coffee by roasting it for brewing. The temperature of the water is the key thing for the final taste of coffee. If the water is poured when it is too hot, the result could end up with burnt coffee and a bitter taste. Coffee machines are brewing at the correct temperature for us but while using manual methods, need to be careful. In this case, the helper stand was designed. The main function of the stand is to measure the heat of the water. DS18B20 Digital Thermometer is the sensor that implements the main function. Also, two servos, a receptacle, cooler fan, buzzer and a 9V battery are added. The process starts with putting a French press that is full of hot water on the stand and adding coffee to the receptacle. After all actions, an alert sound is given to indicate the process ended.

Keywords: filter coffee, french press, helper stand, thermometer.

1. INTRODUCTION

Today a great number of people drink coffee for many reasons such as social interaction, getting through the day and many health benefits [1]. Also, it has an addictive side, when you used to drink coffee, you want to drink coffee every time. So, almost every time somebody is brewing a coffee using different methods. Some of these methods are using an espresso machine, aeropress, and many people are using french press [2]. Some of these methods are manual and some of these are automatic. Automatic ones adjust everything for us but manual ones such as french press and chemex could not. So, there are some specific attentions for a well-brewed coffee.

The amount of water, coffee and temperature of the water need to be adjusted. When coffee is obtained through french press, the temperature of the water is primordial. When the water is not used at the correct temperature, the coffee could be burned and the taste of coffee will be bitter. In this case, the temperature of the water is cared too much, if the coffee is wanted to drink non-burned. Filter coffee is one of the most preferred coffee types in the world. Suitable temperatures for filter coffee are between 87-93 celsius [3].

In this study, making the process of brewing coffee using a french press easier is considered. The thing that created the project idea is to do not burn the coffee. The purpose of the study is to measure the temperature of the water which is important to brew correctly. While the stand is working, there is no need an extra action from the human. The steps are to place a french press with hot water in it, adding coffee to the receptacle and pushing the start button. In the second part of the study, the methodology of the project, components list and their definitions are given, application details are explained in the third part. In the last part of the study, the results and future studies about the project are given.

2. METHODOLOGY

While using a french press to make a coffee, it is challenging to wait for the water to cool down. The main point that will make the process of making coffee easier is considered in this project. The program is starting with a constant button. When the program start, a cooler fan is activated to be supported to cool. After that, a liquid temperature sensor that connected a servo motor will be carried into the french press and will be measuring the heat of the water. After the water become to the wanted temperature, a receptacle that is connected to a servo motor will pull the coffee into the french press. End of the process, a buzzer will give an alert sound. The flowchart of the study is given in Figure 1.

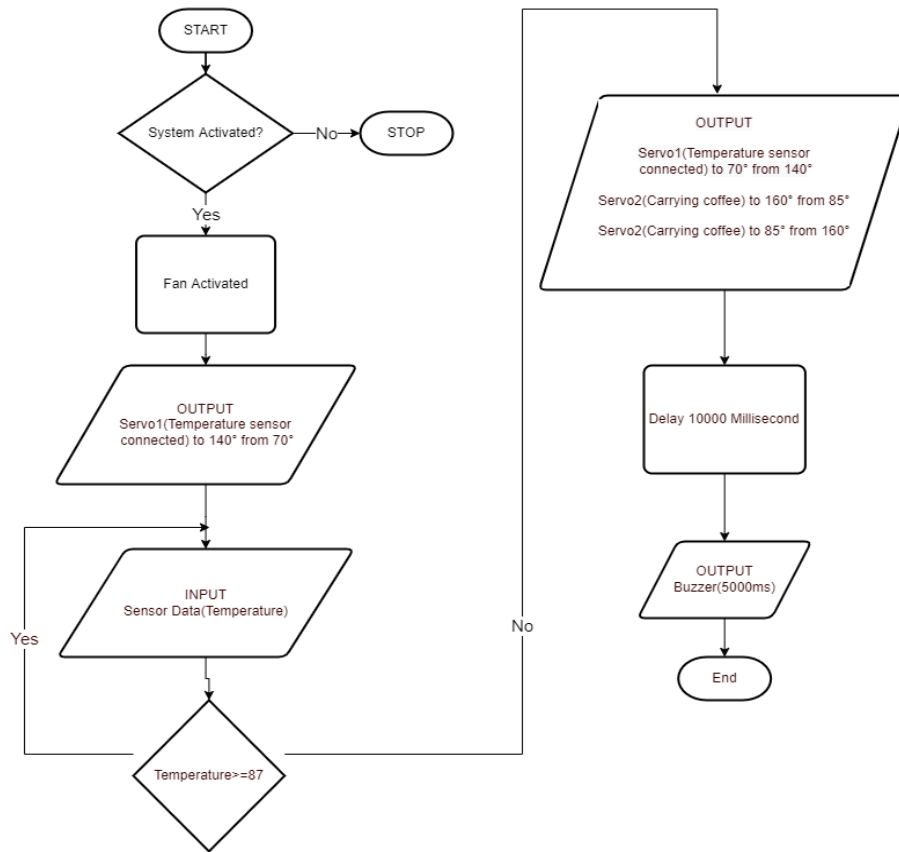


Figure 1. Flowchart of the project

Also, the block diagram of the system is given in Figure 2.

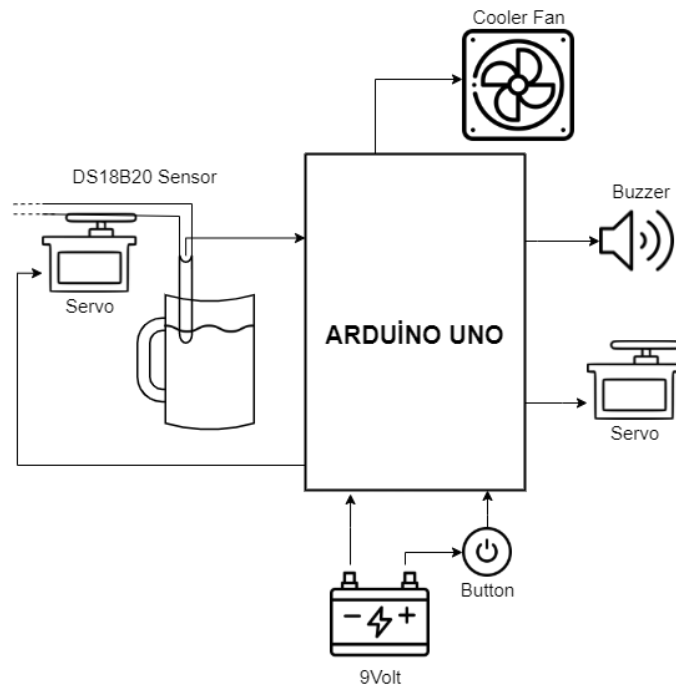


Figure 2. Block Diagram of the project

Information about the components such as sensors and motors used in the project is given in the following subsections.

2.1.Arduino Uno

Arduino is an open-source platform and it has been created for everyone to improve prototypes and projects easily. Arduino Uno is a microcontroller board. It is based on Atmega 328P microcontroller and this version of clon Arduino has CH340 USB-Serial converter [4]. The board that is used in this project is given in Figure 3.



Figure 3. Arduino Uno

Some features of the Arduino Uno are given in Table 1.

Table 1. Features of Arduino Uno [4]

| | | | |
|---------------------------------------|---------------|--------------------------|------------|
| Microcontroller | Atmega328P | Digital I/O Pins | 14(6 PWM) |
| Operating Voltage | 5V | Analog Input Pins | 6 |
| Input Values(Recomended/Limit) | 7-12V / 6-20V | Size | 68 x 53 mm |
| Clock Speed | 16 MHz | Weight | 25 g |

2.2. DS18B20 Digital Thermometer

The DS18B20 sensor is a waterproof temperature sensor. The sensor sends the information data over a 1-Wire interface. So, it needs to be connected one wire to a central microprocessor. The sensor provides 9 to 12-bit (configurable) data readings. The limits of measurable temperature values are from -55° C, which is equal to -67°F, to +125°C which is equal to 257°F [5]. The DS18B20 Digital Thermometer used in the project is given in Figure 4 and Figure 5.



Figure 4. DS18B20 Digital Thermometer

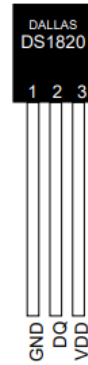


Figure 5. Pin Assignment

2.3. SG90 RC Servo Motor

The SG90 RC Servo Motor is the same as other huge servo motors but it is tiny. The servo can rotate 180 degrees, this rotation consists of 90 degrees in each direction [6]. The servo is given in Figure 6. And Figure 7.



Figure 6. SG90 RC Servo Motor



Figure 7. Pin Assignment

Some of the features of the servo motor are given in Table 2.

Table 2. Some Features of SG90 Rc Servo Motor [6]

| | | | |
|-----------------------|-----|----------------|----------|
| Speed (sec) | 0.1 | Voltage | 4.8 - 6V |
| Torque (kg-cm) | 2.5 | Weight | 14.7 g |

2.4. Other Basic Components

There are a few components used in the project such as a cooler fan, battery, button and buzzer. They are given in Figures 8, 9,10 and 11.



Figure 8. Cooler Fan



Figure 9. 9V Battery



Figure 10. Buzzer



Figure 11. Button

3. EXPERIMENTAL RESULTS

The DS18B20 Digital Thermometer will be used to measure the temperature of the water and according to this temperature data servos will be taken actions. So, at the starting point of the project, the sensor and servos were tested separately and checked their workings together. A receptacle for filter coffee is designed. After that, servos connections with the DS18B20 sensor and receptacle that holds coffee in it is made. Also, their synergy was checked. When the servo motor moves, the thermometer sensor moves into the french press. After the heat of the water comes to 87 degrees, the designed receptacle moves down to pull in it. After the main circuit and model were finished, the fan and button were added. To get an alert sound for the ending of the process, a buzzer was added. After the successful tryings are completed, the model of the project is designed as 17x17x32 cm sizes as shown in Figure 12.



Figure 12. System Design

The reference [7] can be visited for the source code of the project.

Also, the reference [8] can be visited for presentation and demo video.

4. CONCLUSION

After the coffee machine, the french press is one of the most used methods. Also, the heat of water is really important for a non-burned and well-brewed filter coffee. In this case, a stand that can measure the heat of the water in the french press and complete the process of brewing filter coffee is considered and designed. In the study, the DS18B20 thermometer and a designed receptacle are connected to 2 servo motors. While their workings are searched, one wire communication interface and movement of servo motors are learned. Also, buttons such as two-wire, four-wire and constant ones are tried and the difference between them are learned. Aspects of the project are can be added 2 different colour LEDs for indicating the working status of the stand like working, finished. An LCD screen can be added for showing the temperature on the screen. Finally, a Bluetooth module can be added to send a notification to indicate the coffee is ready.

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