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1 Introduction

"Baby food" is very important topic for the parents who have little babies. They always try to feed babies with nutritious and healthy foods as much as they can. Because babies must have good eating habits from the beginning of their journey. Otherwise, they should face many diseases in the future.

Also, parents are not going to buy the prepared foods for their babies because they are not sure about the quality of the foods and the nutritional facts those foods are consisting of. Therefore, most of the parents prepare babies' food in the homes their selves.

With the busy schedule of the modern parents, baby food preparing process has become more complex task. Parents have limited time to look after their babies and it is very difficult to spend more time on preparing foods for them. This situation causes many inconveniences to both parents and the babies. Therefore, parents are looking for an alternative way to overcome this problem.

Spotted on these kinds of considerable reasons we came up with a solution to design and develop an **automated baby-food making machine.**

2 Literature survey

There are some machines in the market to prepare the baby foods. All those machines are use almost the same technology to do the process. We did not find any similar projects match with our project in the internet. Therefore, here we have described about one machine

2.1 Smart Baby Food Maker

Table 1

Brand	Kiddale
Material	ABS
Color	Smart Digital Touch Screen Control: Blue
Wattage	300 Watts
Item Dimensions LxWxH	26 x 27 x 8 Centimeters
Item Weight	1887 Grams
Dishwasher safe	No
Number of Speeds	1

2.1.1 PROS

- User can sterilize baby bottle, spoons and other components before use.
- User can prepare the meal from giving some signals

2.1.2 CONS

1. User should follow 3 **manual steps** to prepare the meal, therefore user should look after the machine time to time when each step ends.
2. Pour the water into the bin
3. Put the vegetables in the steaming bin for steaming
4. Put the steamed food in the mashing bin for mashing
5. The machine costs above Rs.25,000.00

2.1.3 Conclusion

By considering the facts mentioned above, we realize the machine needs close supervision of the user. Because, user should pour water and after 15 minutes again user should put the vegetables into the bin. After another 15 minutes of time user should take the steamed vegetables out and put them into mashing bin.

This machine does the process automatically but, also user have to do some process during the process. It is time wasting thing and it will be good if we can implement this to give the instruction in the beginning of the process and the machine will do the process according to the given instructions automatically till the end.

Video - Kiddale 5 in 1 Smart Baby Food Maker

3 Problem in brief

The main problem in baby food making process is that it **takes a considerable amount of time** so that it is very inconvenient and exhaustive procedure specially when considering about the busy schedules of modern parents.

Also, if we use an existing machine for the food preparing process, it **needs a close supervision of the user.**

4 Aim and objectives

4.1 Aim

- ✓ Design and develop an automated baby food making machine with a minimum hassle to mothers.

4.2 Objectives

- ✓ To prepare a complete nutritional meal according to user's choice such as vegetable and rice puree, fruit pulps etc. automatically.
- ✓ To prepare foods with a simple click of few buttons and less human interaction.
- ✓ To prepare meals healthily within a short time.
- ✓ To make a portable machine.

5 System description

This machine is fully automated baby food making machine which includes cutting, boiling, mashing and auto serving parts all in one.

5.1 Block Diagram

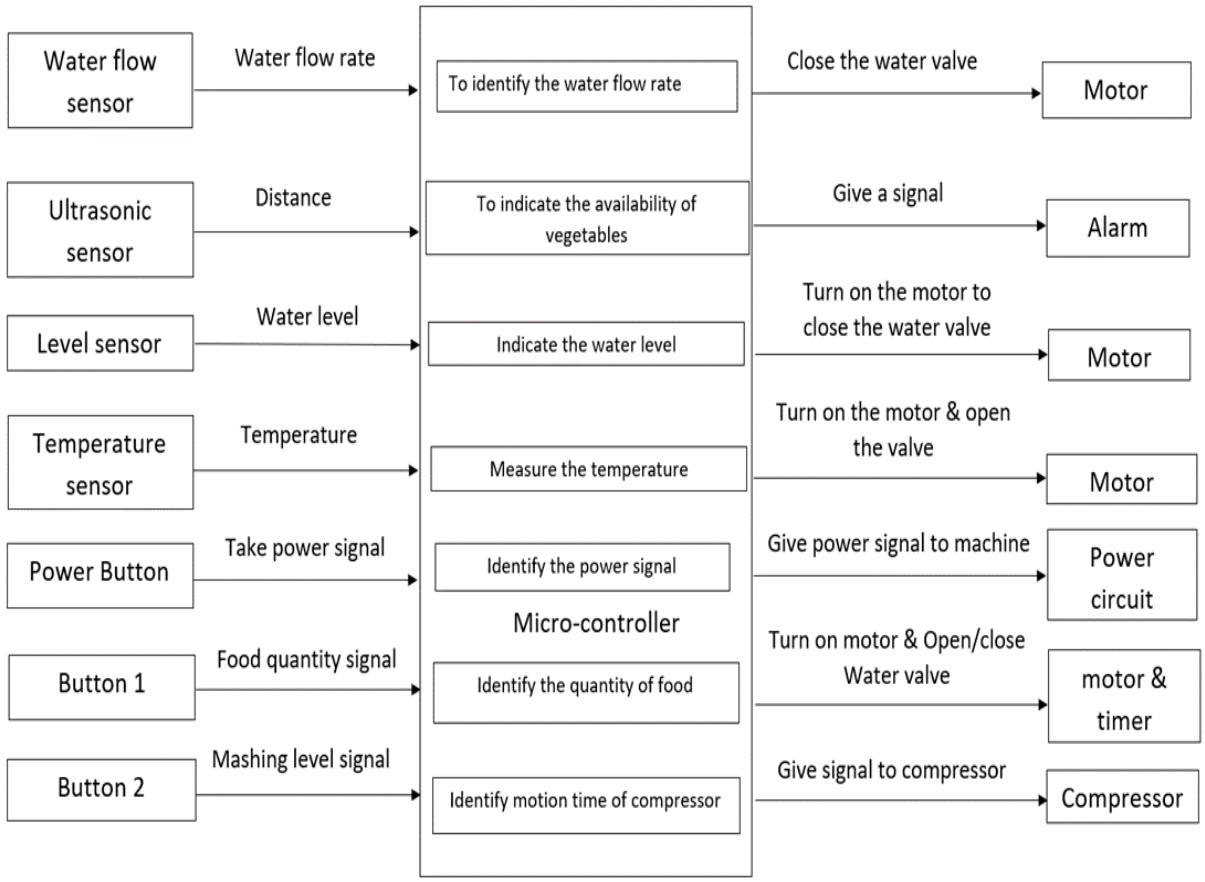

Figure 1:Block diagram

5.2 3D View

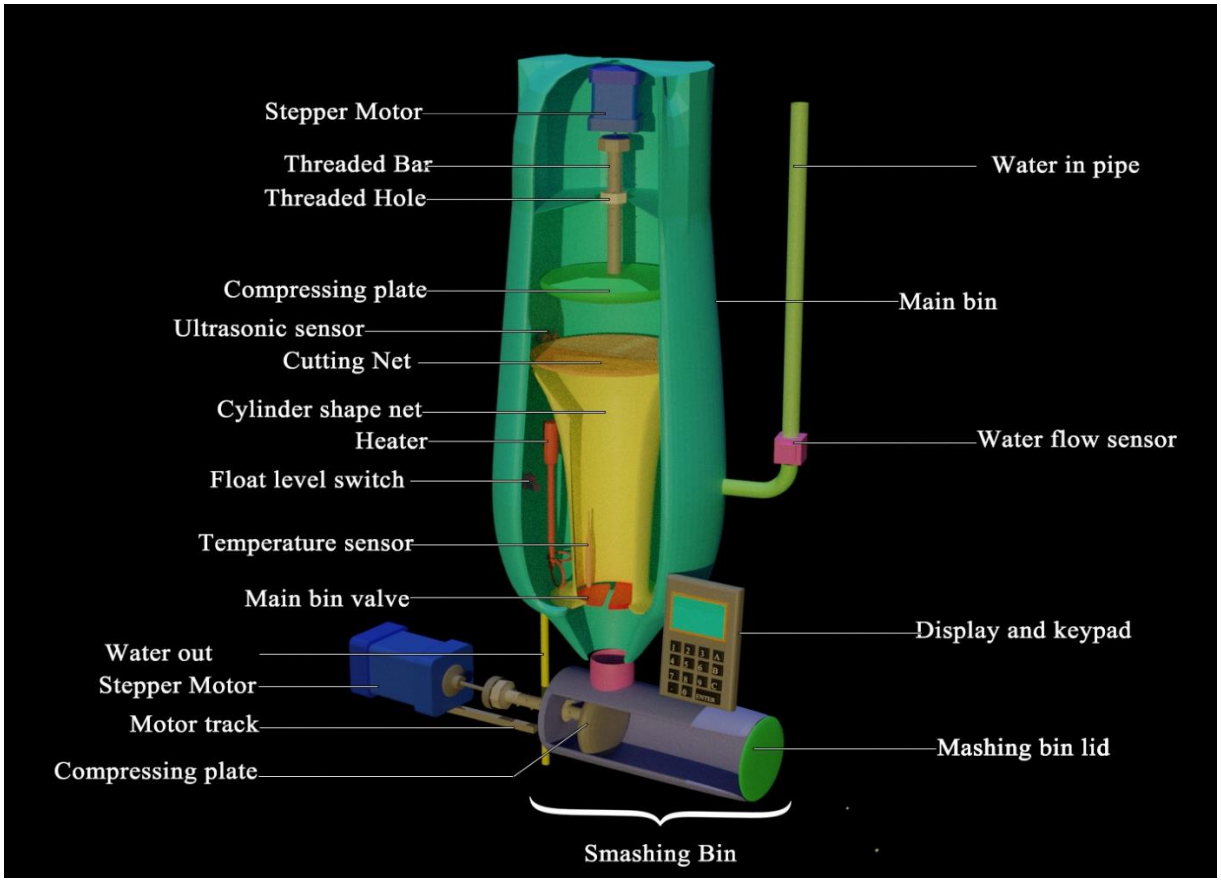

Figure 2:3D inside view

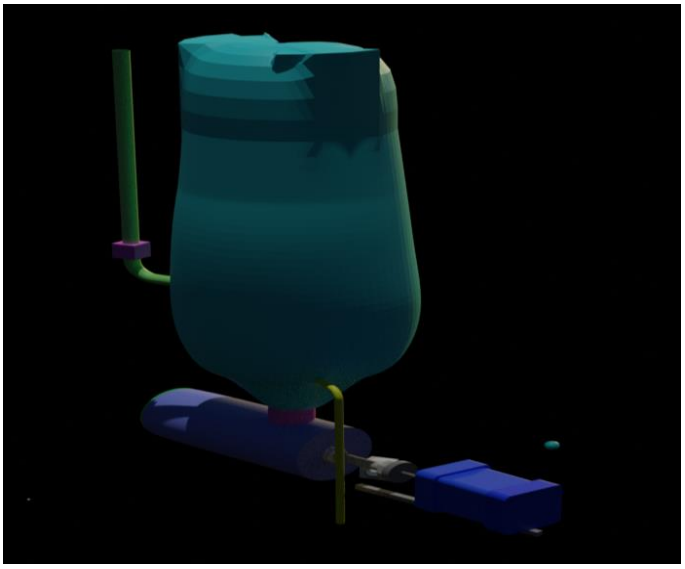

Figure 3:3D outside view

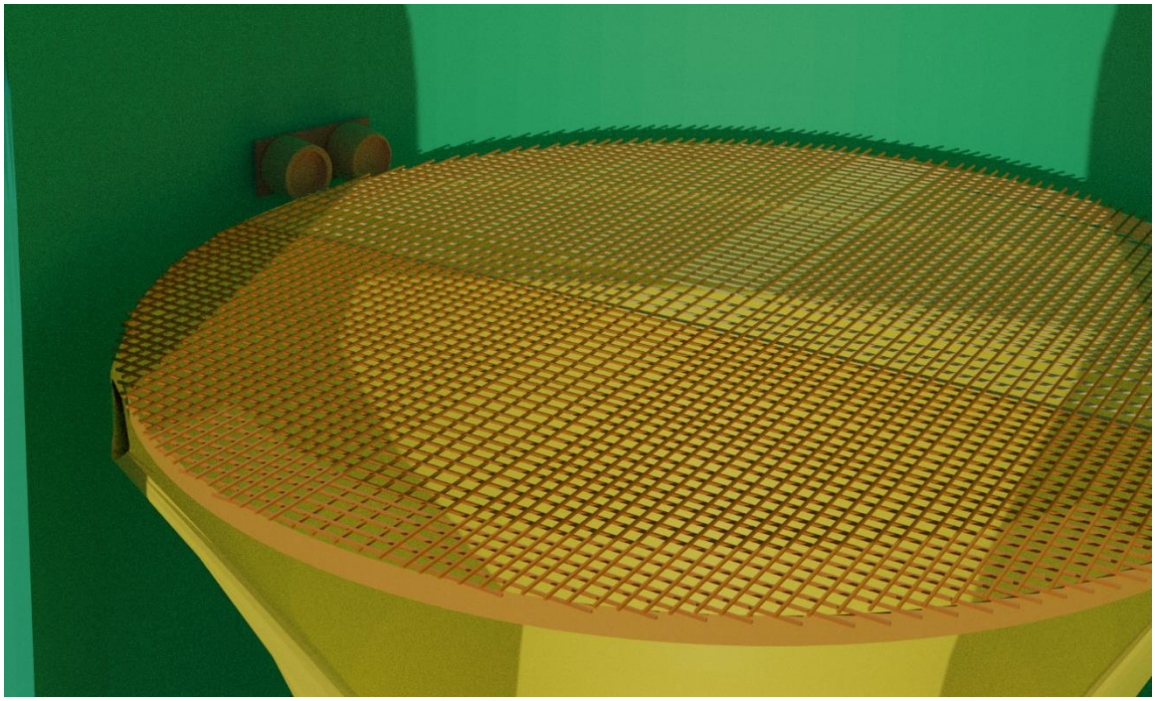

Figure 4:Cutting net

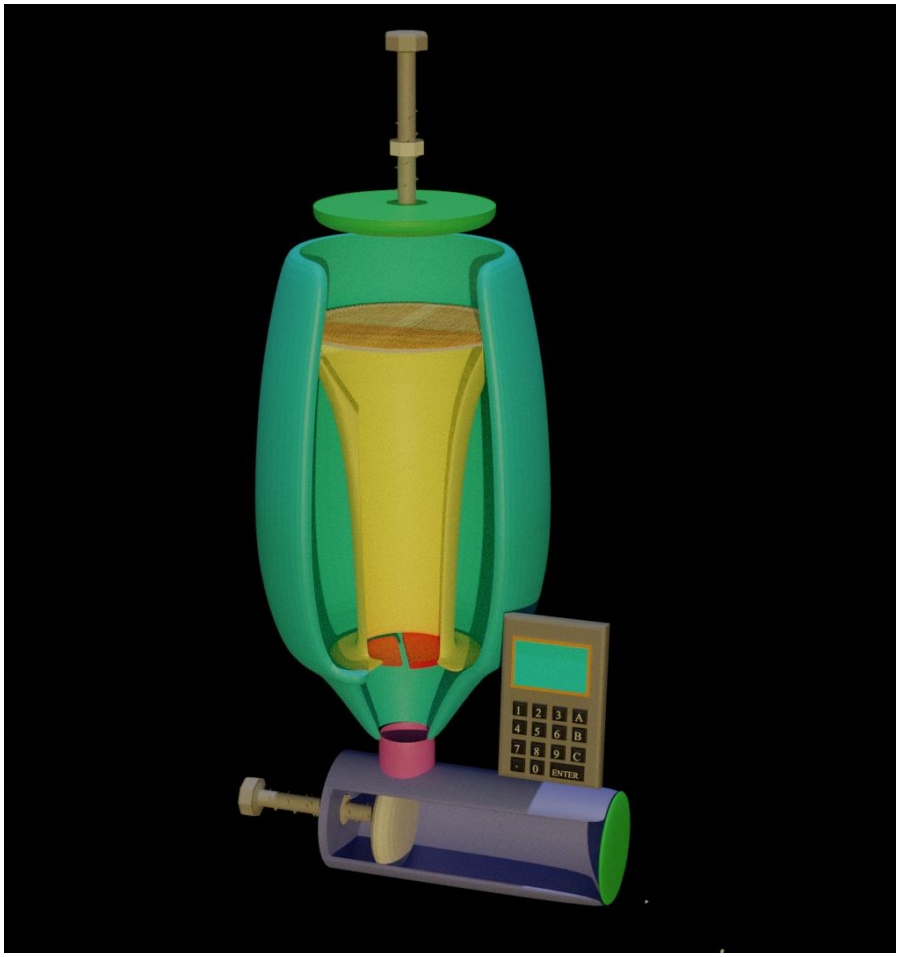

Figure 5:Main bin

Side view

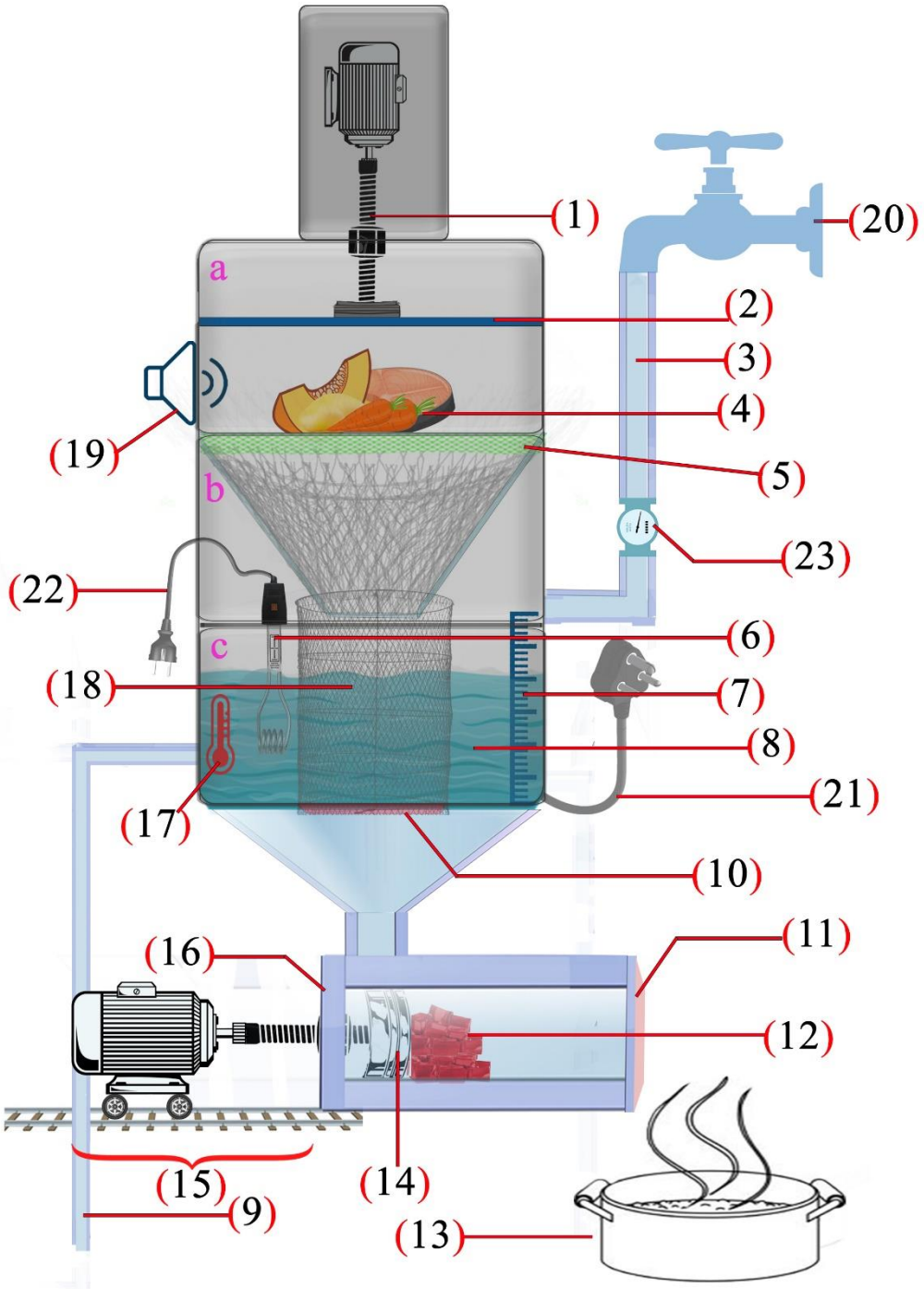

Figure 6:2D view

Parts

(01) Threded bar connected to the moter (compressor)
(02) Compressing plate
(03) Water (in) pipe
(04) Vegatables
(05) Cutting net
(06) Heater
(07) Water level sensor
(08) Water (main bin)
(09) Water out(drain pipe)
(10) Main bin Valve
(11) Automated compressor bin Valve
(12) Vegetable parts
(13) Food pot
(14) Compressing plate
(15) Threded bar Compressor
(16) Mashing Bin
(17) Temperature sensor
(18) Cylinder shape net
(19) Ultrasonic sensor
(20) Water tap
(21) Main plug
(22) Heater plug
(23) Water flow sensor

6 Testing and implementation

- **Sample Testing**

We have implemented a sample structure of the machine and tested for output. We used a large tin (diameter-20cm, height-40cm) that we assumed as the boiling bin of our machine. Then we put 200g of vegetable slices (carrots, potatoes and pumpkin), rice and about 1.5 liters of water into it. Next, we gave heat using a heater and measured the time taken for boiling. It was 30 minutes. Then we made a small sample piston and compressed the boiled stuff using it manually after removing the extra water.

Figure 7:Experiment

Circuit diagram

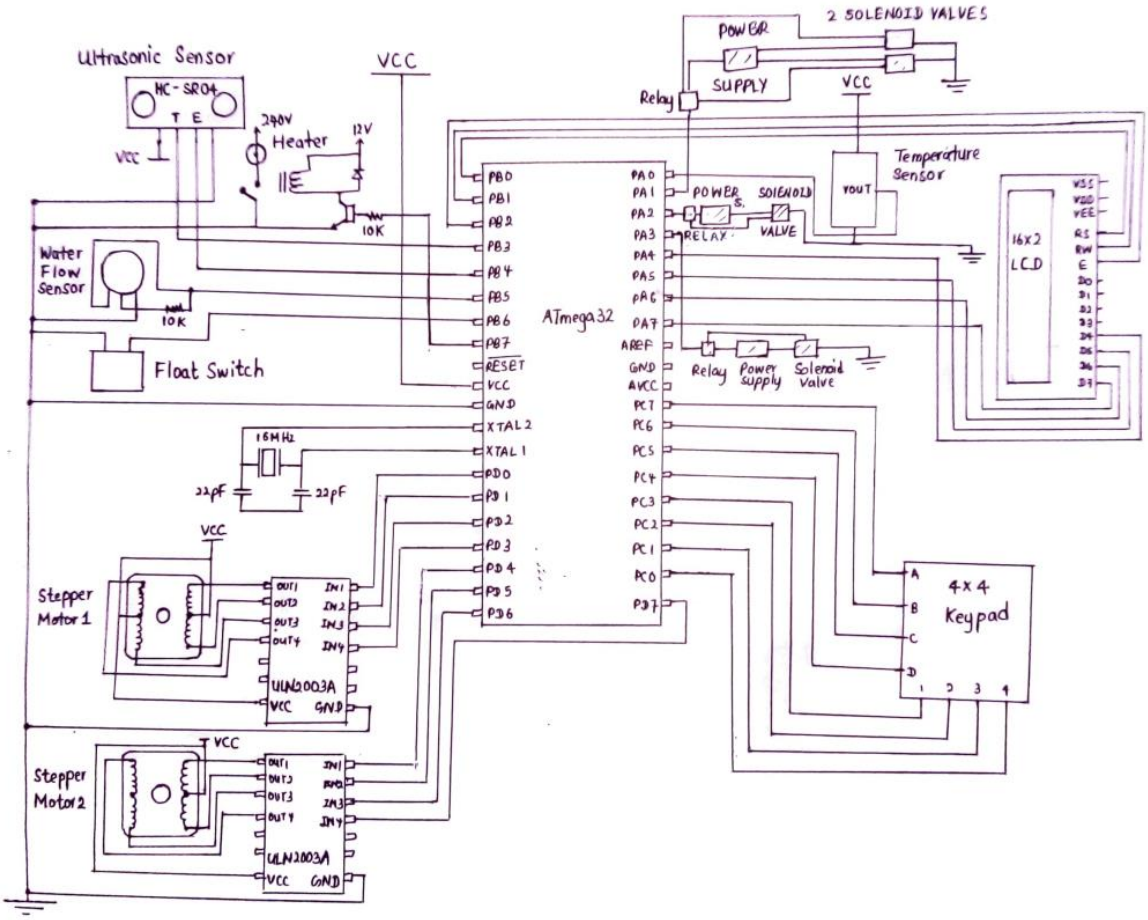

Figure 8:Final circuit

7 Action plan

we have divided all the parts of the machine equally among each and every member of the group. We have studied about our parts separately including sensors, lcd panel and keypad, and motors. We built codes for some of the modules so far using Atmel studio and we are still working on combining them to build the complete code.

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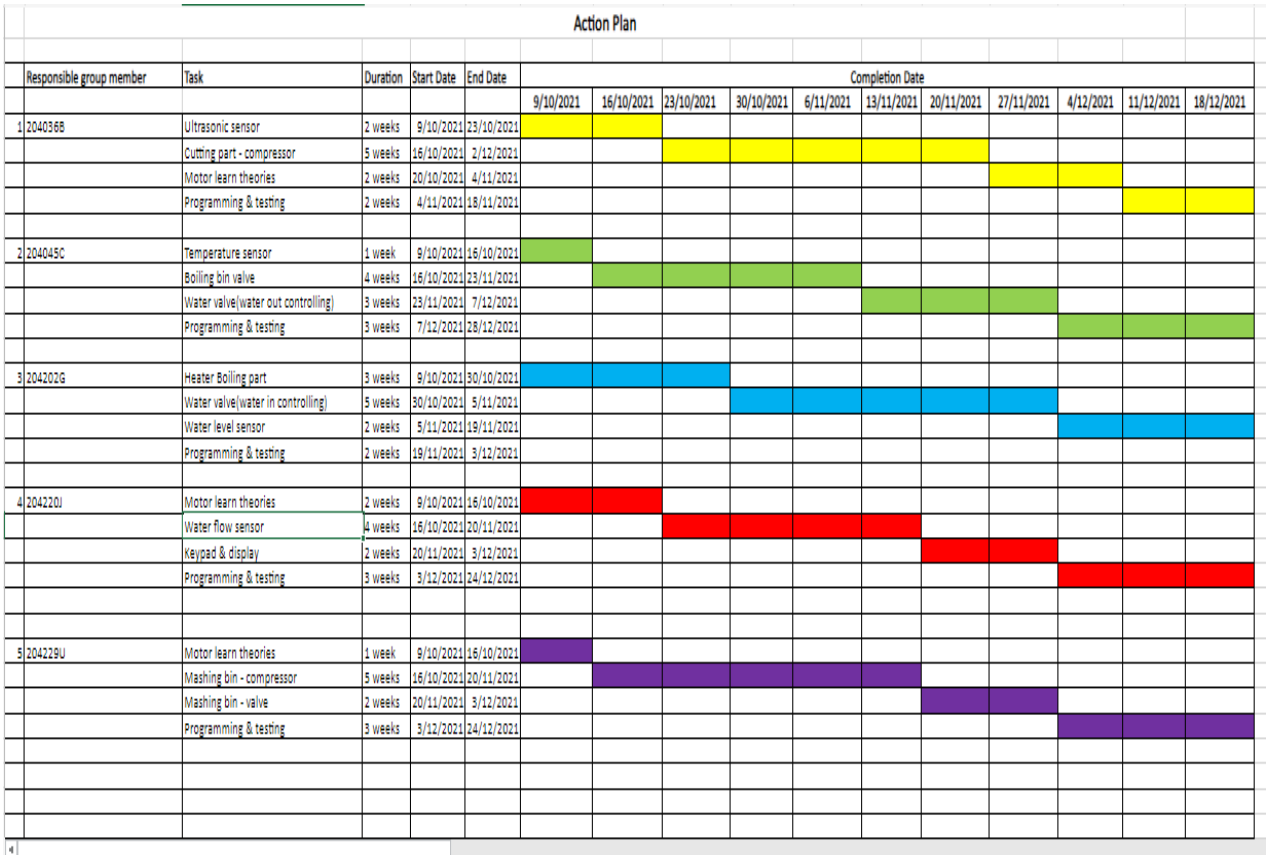

Action Plan

	Responsible group member	Task	Duration	Start Date	End Date	Completion Date										
						9/10/2021	16/10/2021	23/10/2021	30/10/2021	6/11/2021	13/11/2021	20/11/2021	27/11/2021	4/12/2021	11/12/2021	18/12/2021
1	204036B	Ultrasonic sensor	2 weeks	9/10/2021	23/10/2021											
		Cutting part - compressor	5 weeks	16/10/2021	2/12/2021											
		Motor learn theories	2 weeks	20/10/2021	4/11/2021											
		Programming & testing	2 weeks	4/11/2021	18/11/2021											
2	204045C	Temperature sensor	1 week	9/10/2021	16/10/2021											
		Boiling bin valve	4 weeks	16/10/2021	23/11/2021											
		Water valve(water out controlling)	3 weeks	23/11/2021	7/12/2021											
		Programming & testing	3 weeks	7/12/2021	28/12/2021											
3	204202G	Heater Boiling part	3 weeks	9/10/2021	30/10/2021											
		Water valve(water in controlling)	5 weeks	30/10/2021	5/11/2021											
		Water level sensor	2 weeks	5/11/2021	19/11/2021											
		Programming & testing	2 weeks	19/11/2021	3/12/2021											
4	204220J	Motor learn theories	2 weeks	9/10/2021	16/10/2021											
		Water flow sensor	4 weeks	16/10/2021	20/11/2021											
		Keypad & display	2 weeks	20/11/2021	3/12/2021											
		Programming & testing	3 weeks	3/12/2021	24/12/2021											
5	204229U	Motor learn theories	1 week	9/10/2021	16/10/2021											
		Mashing bin - compressor	5 weeks	16/10/2021	20/11/2021											
		Mashing bin - valve	2 weeks	20/11/2021	3/12/2021											
		Programming & testing	3 weeks	3/12/2021	24/12/2021											

Figure 9:Action plan

8 Cost estimation

Table 2:Cost list

Name	Unit price (Rs.)	Quantity	Amount (Rs.)
Microcontroller (Atmega32)	600.00	1	600.00
Stepper Motor	1900.00	2	3800.00
Ultrasonic sensor	300.00	1	300.00
Temperature sensor	290.00	1	290.00
Level sensor	265.00	1	265.00
Water Flow sensor	1600.00	1	1600.00
Heater	2830.00	1	2830.00
LCD display with keypad	650.00	1	650.00
Solenoid Valves	1000.00	3	3000.00
Other equipment			2500.00
TOTAL			Rs. 15,835.00

9 References

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13. Google.com. 2021. Before you continue to Google Search. [online] Available at: <https://www.google.com/search?q=water+flow+sensor+circuit+for+atmega32&oq=water+flow+&aqs=chrome.1.69i59l3j69i57j0i67j69i60l3.21580j0j7&sourceid=chrome&ie=UTF-8> [Accessed 30 November 2021].

10 Individual contribution

204036B Dharmasiri P.A.

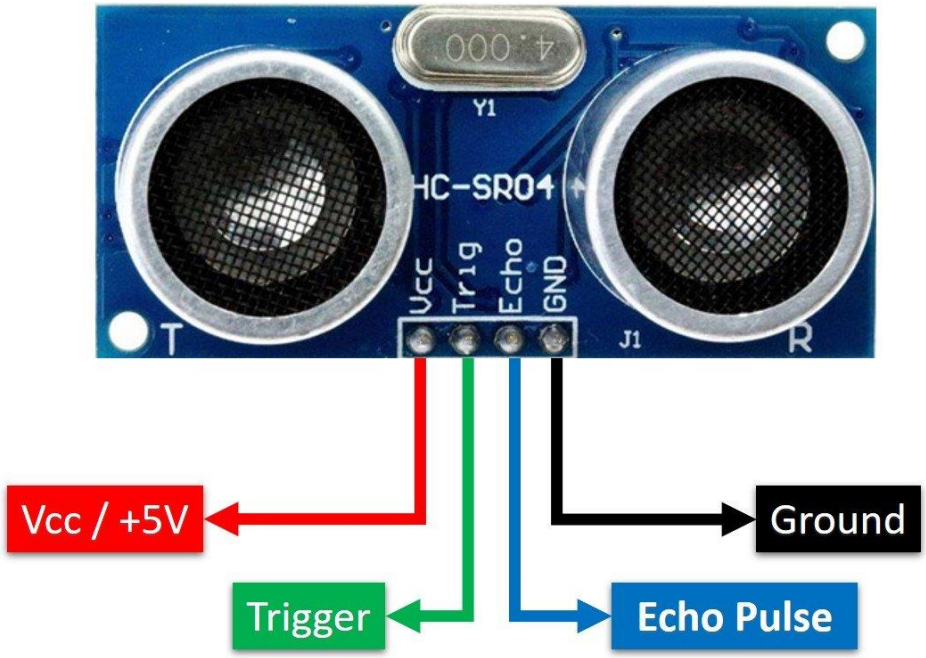

Figure 10:Ultrasonic sensor

The part given to me is Ultrasonic sensor part. I searched about the Ultrasonic sensor-HC-SR04 to clarify the internal parts and the features. Also, I went through the ATMEGA 32 datasheet to understand the coding parts. Then I built the coding part to make working that Ultrasonic sensor. I run the code using Microchip Studio. I drew the circuit diagram by connecting ultrasonic sensor and micro-controller. And I prepared the 3D design and the 3D animation using Blender software.

Circuit diagram

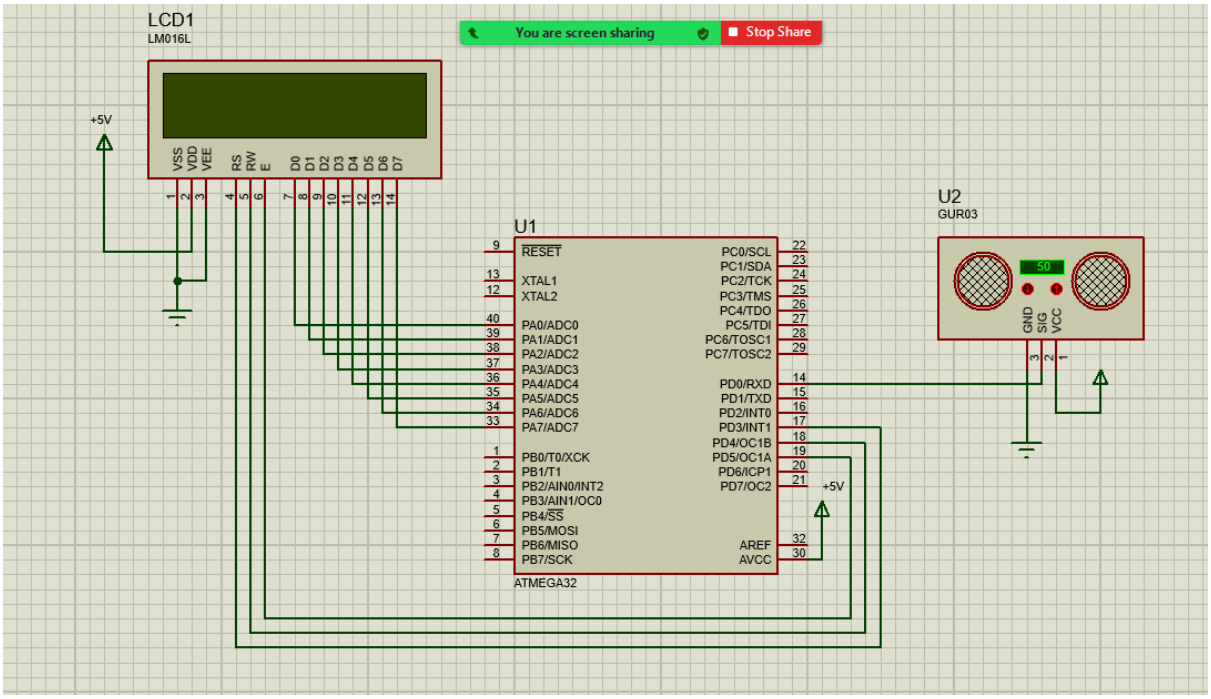

Figure 11:Ultrasonic sensor testing circuit

204045C Dissanayaka D.M.C.P

Figure 12:Temperature sensor

I had to design a circuit diagram for the temperature sensor and test it. I have selected the LM35C temperature sensor and found much more details about it by watching tutorials and reading the datasheet. Also had to study ATmega32 and go through ATmega32 datasheet because I have to know how to connect LM35CA to the ATmega32 microcontroller. Then I referred to some video clips and built a code with the help of that video to test my part on ATmega32. Also, I Built a circuit to check whether the circuit is working or not by using Porteous software. Also, I studied how to connect a solenoid valve for water out controlling and how it operates automatically by connecting to the atmega32.I prepared the power supply part that we use to give power to relays and solenoid valves.

Circuit diagram

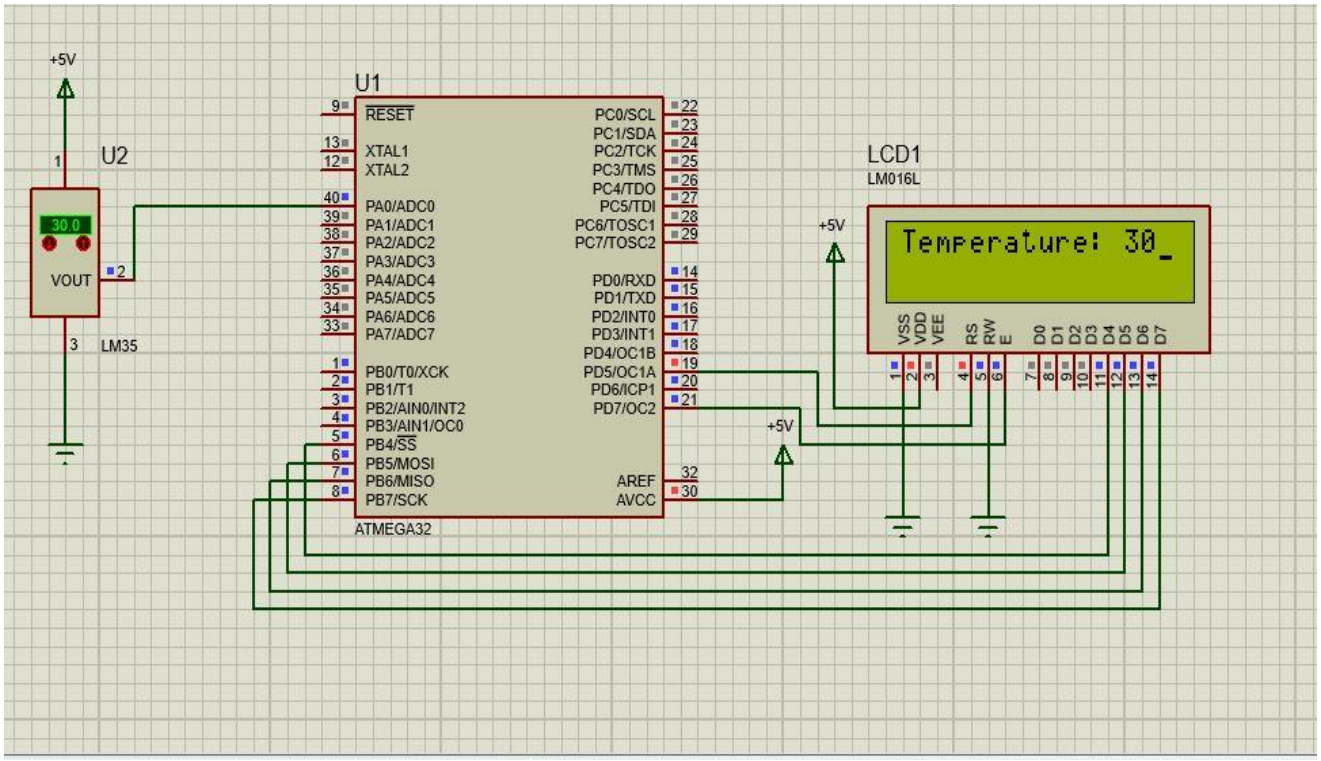

Figure 13:Temperature sensor testing circuit

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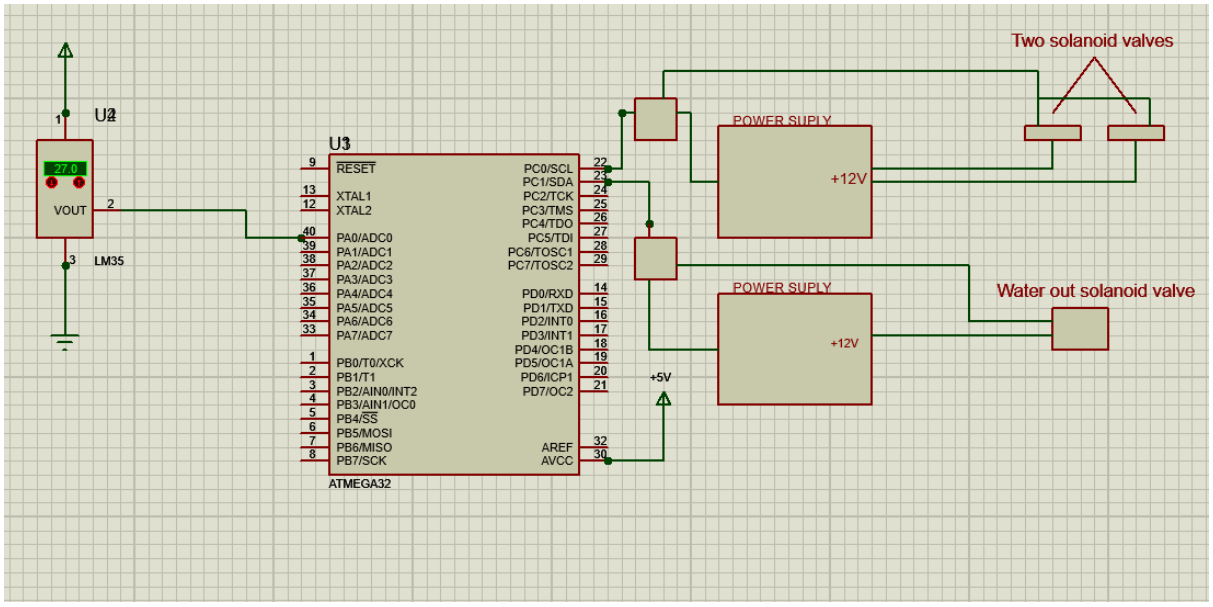

Figure 14:Temperature sensor with valves

204202G Silva W.H.I.

I was given the boiling part of the machine and the level sensor (float level switch). I studied the working procedure of float switch and features of it. I learnt how to on/off heater automatically by connecting to the microcontroller using relays. Also, I studied how to connect a solenoid valve for water in controlling and how to operate it automatically by connecting to the atmega32.I prepared the power supply part that we use to give power to relays and solenoid valves. After I designed the final circuit diagram in my part. And also, I went through the atmega32 data sheet to understand the coding parts. I was able to finish the coding part to a considerable extent.

Figure 15:Float level switch

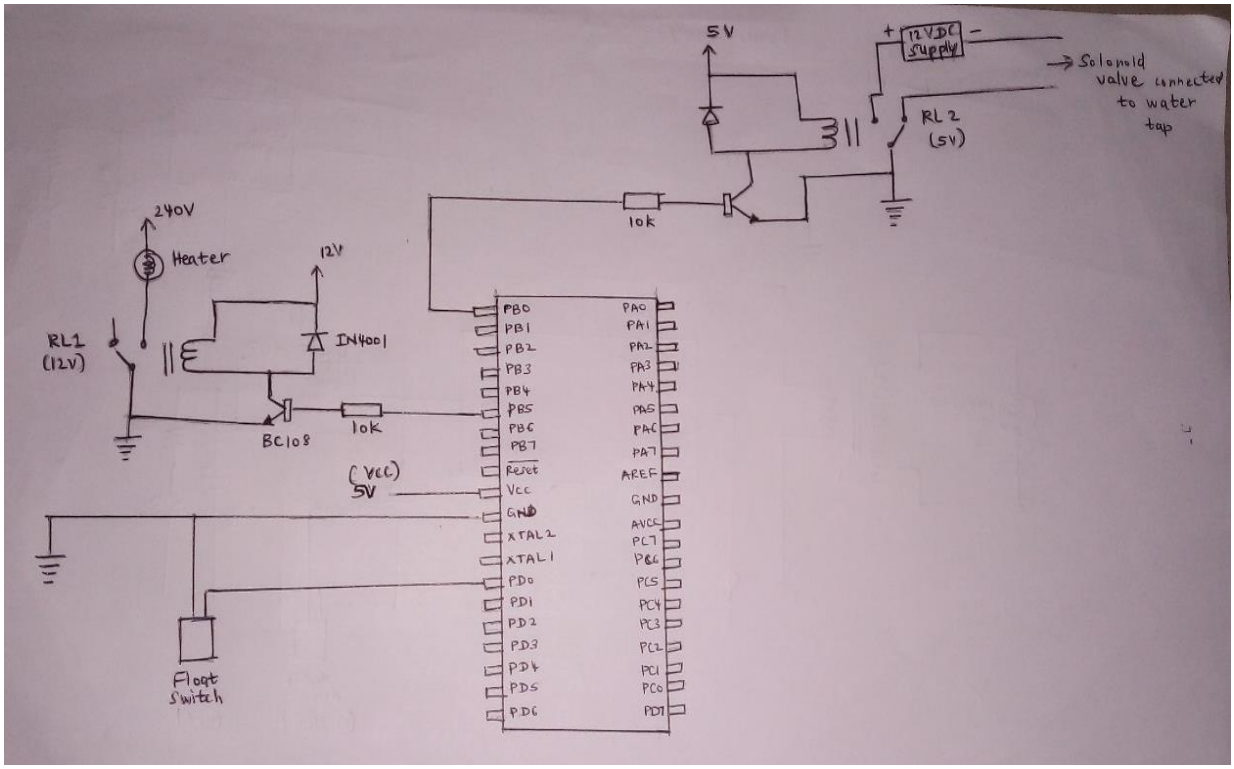

Figure 16:Float level switch and heater testing circuit

Power supply (5v and 12v)

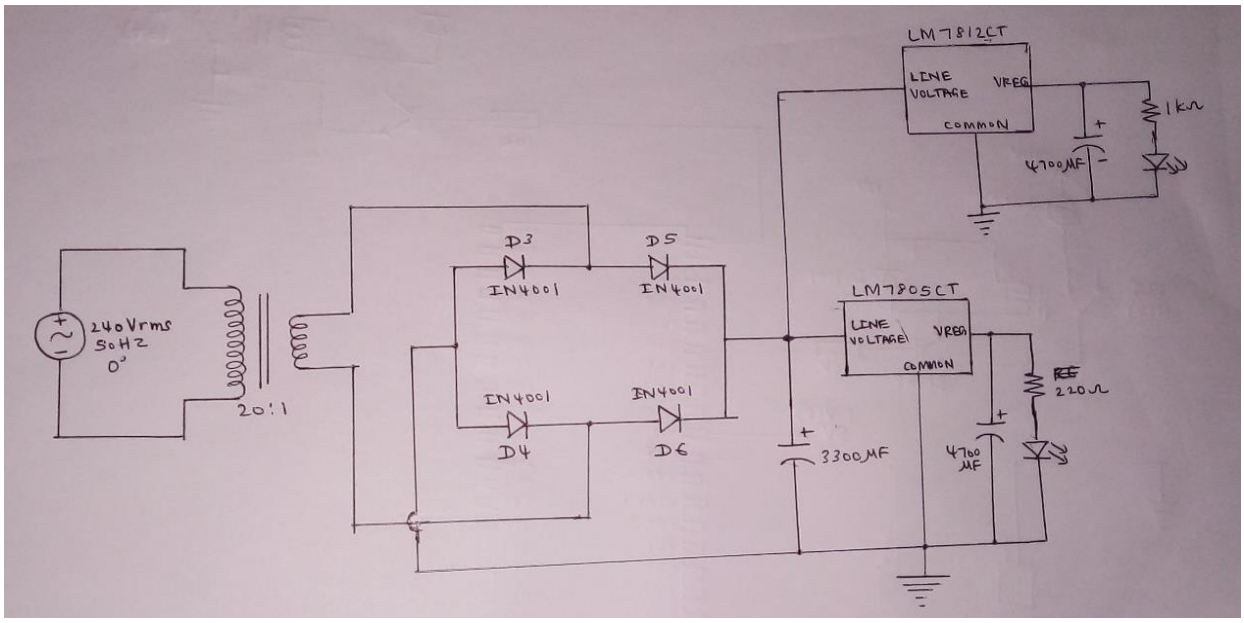

Figure 17:power supply

204220J Ulfath A.K.F

Keypad and display

Figure 18:LCD display and keypad

16 x 2 HD44780U LCD module part and 4 x 4 keypad part was given to me. I search about the modules to clarify the internal parts and features. And I went through the ATMEGA32 datasheet to understand the coding parts. Then I build the coding part. I run the code using Atmel studio. Then using proteus, I build the circuit diagram and simulated it.

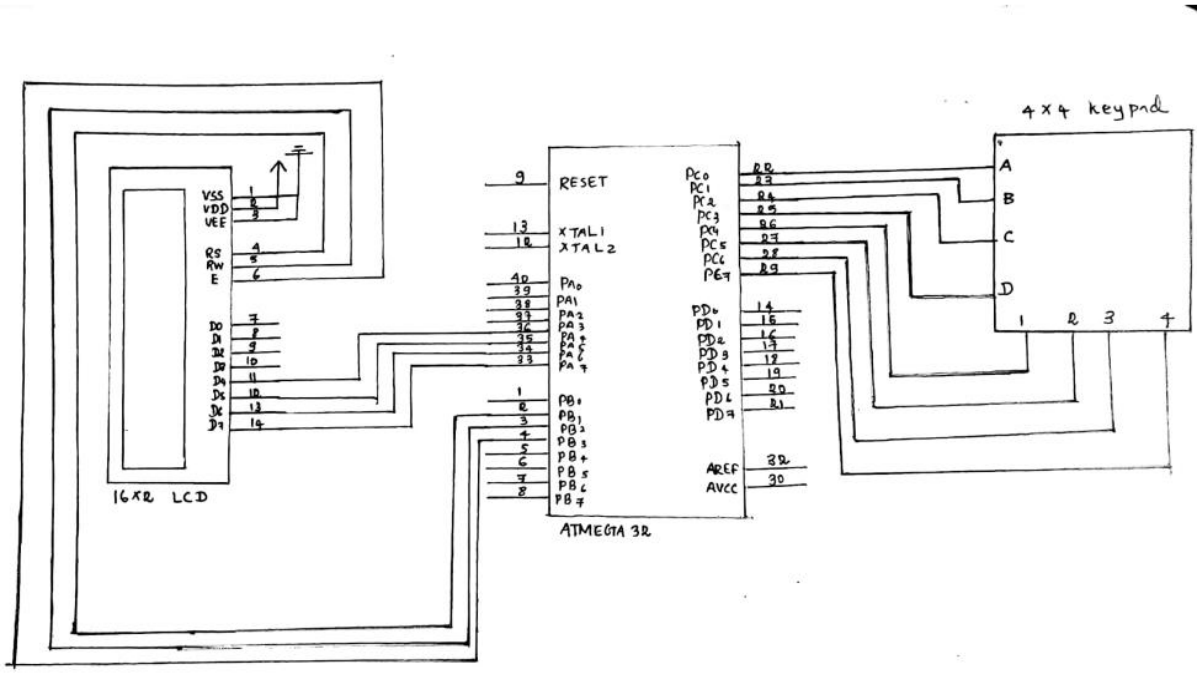

Figure 19:LCD display and keypad testing circuit

Water flow sensor

Figure 20:Water flow sensor

Water flow sensor part given to me. I searched about the YFS201 water flow sensor module to Clarify the internal parts and the features. And I went through the ATMEGA 32 datasheet to understand the coding parts. Then I build the coding part. I run the code using Atmel studio. Then using proteus, I build the circuit diagram and simulated it

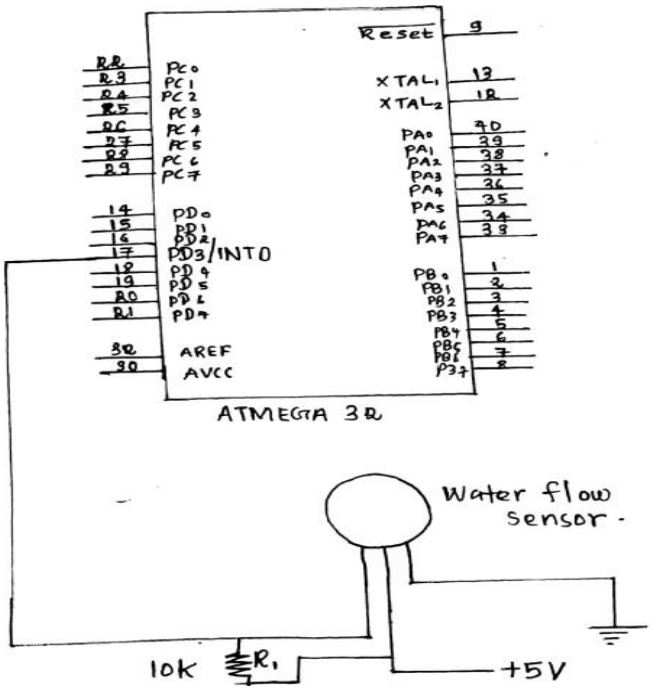

Figure 21:Water flow senser testing circuit

204229U Weerawardhana M.G.L.C.

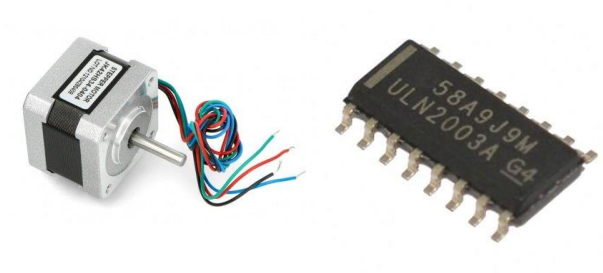

Figure 22:Stepper motor and driver IC

Mashing bin part of the machine was given to me. It is basically consisted of a system which works with a stepper motor. I searched about the 12V NEMA-17 Stepper Motor to clarify the internal parts and the features. I went through the video lessons about the stepper motors and understand the working principle. I searched about the ULN2003-stepper motor driver IC to

control the stepper motor. Also, I went through the ATMEGA 32 datasheet to understand the coding parts. I drew the circuit diagram to connect the Stepper motor to the Microcontroller using the ULN2003-stepper motor driver IC. Then I built the coding part to connect those 3 components together to work. I run the code using Microchip Studio.

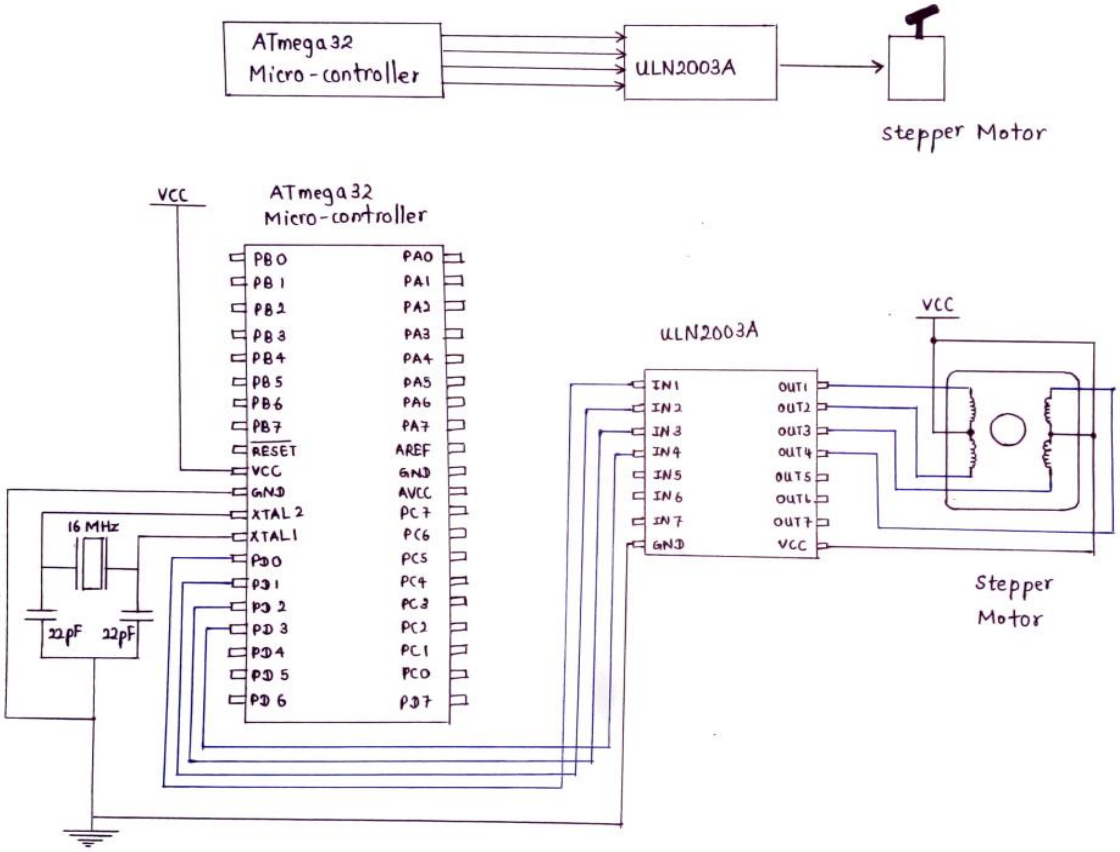

Figure 23:Stepper motor and driver IC testing circuit