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ABSTRACT

The "Automatic Wet Grinder" project presents a technological advancement in the domain of kitchen appliances, focusing on enhancing user convenience and efficiency in the preparation of food. This project introduces an innovative approach to the conventional wet grinding process used for preparing batter and pastes in various cuisines.

The core objective of the project is to design and develop an automated wet grinder system that reduces the manual intervention required during the grinding process. The proposed system incorporates advanced sensors and control mechanisms to achieve optimal grinding outcomes while ensuring user safety.

Key benefits of the "Automatic Wet Grinder" project include consistent and uniform grinding results, minimized user effort, and the ability to multitask while the grinder operates autonomously. Furthermore, the incorporation of safety features ensures that the device halts operation in case of any anomalies, preventing accidents and damage.

CHAPTER 1
INTRODUCTION

In the world of cooking, making delicious food involves a mix of old traditions and new ideas. One important part of cooking is grinding, especially when we need to make smooth pastes and mixtures. The "Automatic Wet Grinder" project aims to bring this traditional grinding method into the modern age by using new technology.

Usually, grinding involves a lot of manual work, where we have to grind ingredients bit by bit to make them just right for cooking. But as our lives get busier, we need kitchen tools that can help us cook without spending too much time. This project wants to help with that by creating a smart grinder that can work on its own and make grinding easier and faster.

The main goal of this project is to design and build a grinder that can work by itself, so we don't have to watch it all the time. It will clever controls to make sure the grinding is perfect and safe.

This report will explain everything about the "Automatic Wet Grinder" project – how the idea came about, how we made it, and why it's important. We'll talk about the technical details, like the sensors we used and the smart computer part that controls the grinder. And we'll also talk about how this project can change cooking by making it simpler and faster, while still keeping the good parts of traditional cooking alive.

As we read through this report, we'll learn more about the "Automatic Wet Grinder" project and how it's like a mix of old and new, making cooking easier and more enjoyable.

1.1 Existing system:

In most kitchens, when we need to grind something like rice or lentils to make batter or paste, we use a manual wet grinder. This grinder has a big stone that spins around and crushes the ingredients. But there's a catch – someone needs to keep an eye on it the whole time. We have to make sure the grinding is just right, which means it can take up a lot of time and effort.

This way of grinding has been around for a long time, and it works, but it's not the easiest or fastest. It's like using an old-fashioned phone when we have smartphones now. It gets the job done, but there's a better and smarter way.

The manual wet grinder can sometimes be a bit tricky to handle. We need to know when to stop grinding, and sometimes it might not turn out exactly how we want. Also, we can't really do other things while it's grinding because we need to watch it all the time.

1.2 Proposed methodology:

The automatic grinder machine is designed to efficiently manage the grinding process with minimal user intervention. It has the ability to autonomously handle the grinding task while also intelligently dispensing water as required to achieve optimal results. One of its notable safety features is the incorporation of a motor temperature monitoring system. In cases where the motor's temperature rises to potentially unsafe levels, the machine is programmed to automatically shut off as a precautionary measure. This not only prevents overheating but also ensures the well-being of the device and its surroundings.

Once the motor's temperature has cooled down to a safe level, the grinder seamlessly resumes its operation, allowing users to continue their grinding tasks without any disruption. To enhance user convenience, the machine is equipped with an audible buzzer that signals the completion of a task. This audio indicator serves as an alert, letting users know that their grinding job has been successfully accomplished.

Furthermore, the automatic grinder machine has been ingeniously designed to promote energy efficiency. After completing its designated tasks, the machine is programmed to switch itself off, contributing to energy conservation and minimizing unnecessary power consumption. This feature aligns with contemporary concerns about sustainability and responsible resource usage.

1.3 Objective

The project aims to achieve the following:

1. The **automatic grinder machine** can autonomously handle the grinding process while **intelligently adding water** as needed
2. Additionally, it features **motor temperature monitoring system**, automatically shutting OFF if it becomes too hot to ensure safety. Once the motor temperature returns to a normal heat, it resumes operation
3. Also provides an **audible buzzer sound** to indicate task completion
4. Finally, **switch off** the wet grinder by itself.

CHAPTER 2

LITERATURE REVIEW

Title: IOT BASED SMART WET GRINDER
Author: R Kishore, Shini Gupta, Abhishek Kishor, Arshad Iqbal and Sriramalakshmi P

Description: A wet grinder is one of the common household appliances used in India for preparing the batter, Rice and dhal are the main raw materials used in the preparation of the batter. According to the "Diagnostic Study of the wet grinder at Coimbatore " By the Ministry of Micro, Small and Medium Enterprises, about 100,000 Wet Grinders are produced in India. In the era where technology and human interacts and where every technology is rapidly enhancing, it is necessary to update the Wet Grinder which is a basic appliance and incorporate this with IoT. Ponmani Power Table Top Tilting Wet Grinder is used and it houses 180W single phase Induction motor and operates at 180-240V, 50HZ AC power supply. Complementing the Wet grinder with IoT features, such as users can remotely control the power of the Wet Grinder, a water pump is used to add the necessary volume of water for the grinding process, the motor temperature is constantly monitored and if the temperature rises beyond the safe limit, power is cut off automatically. The timer feature is provided to the Wet grinder, setting automatic power on/off control and the user can control the amount of water pumped into the wet grinder. To incorporate the above features, 2 Channel relay is used to control the wet grinder and water pump which is connected to NodeMCU ESP8266, LM35 is used to measure the motor's temperature. Smart Wet Grinder will empower the homemakers and will give them the freedom to multitask and it will also improve society by reducing food waste.

Title: MICROCONTROLLER BASED WET GRINDER SYSTEM FOR DOMESTIC APPLICATIONS
Author: T. Porselvi, J. S. Priya, M. Hemalatha, C. Jeeva, K. Aishwarya and B. Suruthi

Description: Grinder is kitchen equipment which is used to mix and grind various food items. This appliance makes our work easy. Now-a-days, mostly in every south Indian's house, grinder is mandatory. It not only reduces human efforts but also speeds up the process. The present grinder days is operated manual operation. So as to reduce the workload and time utilization, an automatic wet grinder is needed. This paper aims at implementing the automatic wet blending system. Automatic wet grinder is used for both domestic and commercial purposes. Here the soaking process and grinding process is done automatically without the help of humans which makes the machine unique.

Title: SMART WET GRINDER
Author: G.S.Molly Irine, V.Sathasivam, L.T.Thirunivedhan

Description: Smart wet grinder is developed for domestic and commercial purpose. It collects batter and clean the grinder without human involvement. This smart grinder is interfaced with an embedded system based on Arduino. For grinding process Ac induction motor with mechanical arrangement is used. In this project timer, microcontroller, water pump, solenoid valve were used. Timer is used to start the line and end session of the working of wet grinder. In order to reduce human involvement soaking and draining waste water from container, this will be processed automatically. After few minutes of soaking the soaked rice is fed into the grinder. Then the grinder is turned on with the help of Arduino. This system converts the rice into the batter. After grinding is completed, the batter is collected and the grinder is cleaned automatically. When grinding and cleaning is finished the Arduino turns off the system automatically.

Title: AUTOMATED INDUCTION MOTOR MONITORING SYSTEM USING IOT
Author: N. Subhashini, M. Mouli, J. Mugunthan, R. P. Kumar, M. Revanth and M. Tejaa

Description: the induction motors play a vital role in many applications. The protection of electrical machines especially induction motors are very much essential for any industries, factories etc. This project proposes a system which protects and monitors the single-phase induction motor using IOT. It comprises an IoT (Internet of Things) network to gather the essential information such as voltage, current, speed, temperature of the induction motor and presents the essential details to the user through IoT mobile application. Using this, the designed architecture reads and sends the parameters of the induction motor to the microcontroller. It also protects the induction motor at any abnormal conditions like over voltage, low voltage, high speed, high current and high temperature with the help of microcontroller in addition, to this if any of these faults occurs it changes the motor connection to another supply circuit which step-up or step-down the voltage according to the fault for uninterrupted working or turns off the motor automatically.

Title: AUTOMATIC POWER MANAGEMENT SYSTEM BY INTEGRATION OF CONVENTIONAL AND NON-CONVENTIONAL ENERGY RESOURCES
Author: A. Kumar, S. K. Gupta, A. Kumar, S. Singh and N. Kumar

Description: With speedy alteration and evolution in the practical applications of science to commerce or industry and a variation in stream of human lifestyle enhances the use of electrical appliances. That's why we are learning more toward the electrical energy consumption and their generation. In country like India mostly power generation are done by the thermal plants and hydro power plants. But our coal reserves are the brink of extinction and entire world facing for water conservation because of shortage of fresh water. That means energy conservation is a global concern. The research based on 'Automatic Power Management System' has been designed in concept of optimum utilization of energy at small scale. This project scheme uses with module (Node MCU) for transmitting data and data connectivity for communication with external devices. This project scheme and algorithm was tested and monitored successfully, and we found 17% of energy saving.

CHAPTER 3

PROPOSED METHOD

3.1 Block Diagram

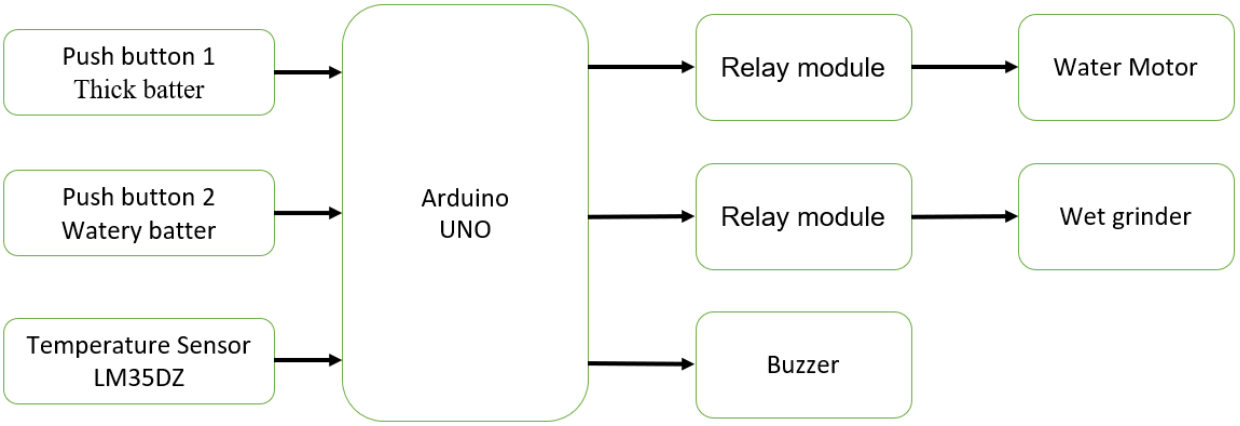


Figure 3.1.1: Block Diagram of automatic wet grinder

3.2 Block Diagram Explanation

3.2.1 PUSH BUTTON

A push button switch, classified as a mechanical apparatus, serves the pivotal purpose of managing an electrical circuit. Operating on a manual basis, the operator engages the switch by physically pressing a button, thus triggering an internal switching mechanism that orchestrates the circuit's behavior. The realm of push button switches is notably diverse, encompassing an array of shapes, sizes, and configurations. This inherent variety caters directly to the specific design prerequisites of different applications, underscoring the adaptability and versatility inherent in this category of switch mechanisms.

3.2.2 WATER PUMP

A water pump is a mechanical device designed to move water from one location to another. It is commonly used to transfer water from a lower elevation to a higher elevation, to circulate water within a closed system, or to extract water from a source such as a well, river, or reservoir for various purposes. Water pumps are essential components in a wide range of applications, including residential, commercial, industrial, and agricultural settings.

Water pumps operate by creating a pressure difference that forces water to move through pipes or channels. They utilize various mechanisms to achieve this, such as centrifugal force, displacement, or reciprocating motion. Centrifugal pumps are among the most common types of water pumps and work by using a rotating impeller to impart kinetic energy to the water, thereby pushing it outward and creating a flow.

3.2.3 WET GRINDER

A wet grinder is a kitchen appliance used for grinding soaked grains, lentils, and other ingredients to make various food items like dosa batter, idle batter, and various types of chutneys and pastes. It is a crucial tool in traditional South Indian cuisine and has gained popularity in various parts of the world due to its versatility and effectiveness in preparing certain dishes.

The wet grinder consists of a drum or container made of stainless steel or stone, which is usually cylindrical in shape. Inside the drum, there are grinding stones that rotate and crush the ingredients placed in the drum. The stones can be made of different materials, with the most common being granite. The rotation of the stones in the wet grinder helps in grinding the ingredients to a smooth consistency without generating excessive heat, which is important for retaining the flavor and nutritional value of the ingredients.

3.2.4 BUZZER

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren. The pin configuration of the buzzer is shown below. It includes two pins namely positive and negative. The positive terminal of this is represented with the ‘+’ symbol or a longer terminal. This terminal is powered through 6Volts whereas the negative terminal is represented with the ‘- ‘symbol or short terminal and it is connected to the GND terminal.

3.2.5 TEMPERATURE SENSOR - LM35DZ

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range. Lower cost is assured by trimming and calibration at the wafer level. The low-output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy. The device is used with single power supplies, or with plus and minus supplies. As the LM35 device draws only 60 µA from the supply, it has very low self-heating of less than 0.1°C in still air. The LM35 device is rated to operate over a −55°C to 150°C temperature range.

3.2.6 5V RELAY

A relay is an electrically operated switch. It consists of a set of input terminals for a singleor multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof. Relays are used where it is necessary to control a circuit by an independent low-power signal, or where several circuits must be controlled by one signal.

Relay working:

Relays consist of three pins normally open pin, normally closed pin, common pin and coil. When coil powered on magnetic field is generated the contacts connected to each other.

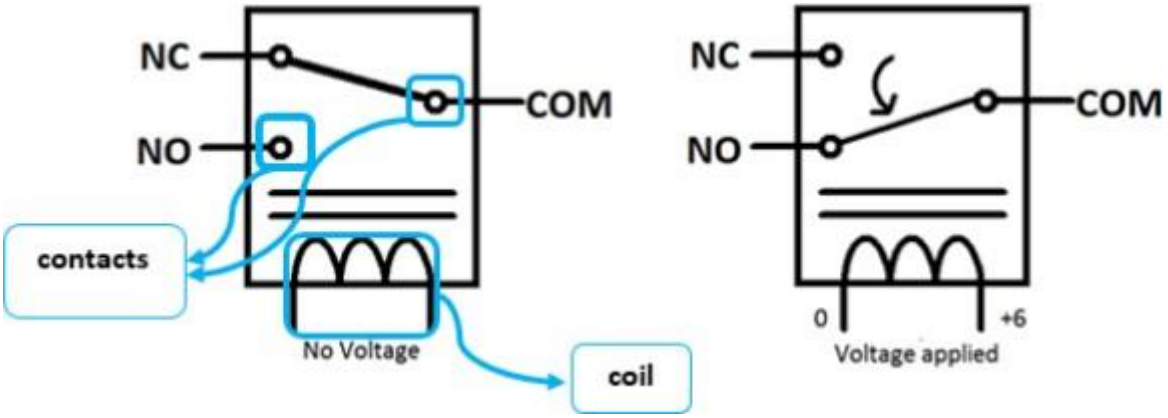


Figure 3.1.2 : Relay Circuit

Relay modules 1-channel features

• Contact current 10A and 250V AC or 30V DC.

• Each channel has indication LED.

• Coil voltage 12V per channel.

• Kit operating voltage 5-12 V

• Input signal 3-5 V for each channel.

Three pins for normally open and closed for each channel

3.2.7 Arduino UNO

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller (MCU) and developed by Arduino.cc and initially released in 2010.The microcontroller board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by a USB cable or a barrel connector that accepts voltages between 7 and 20 volts, such as a rectangular 9-volt battery.

The hardware structure of Arduino Uno

- Microcontroller
- 14 Digital Pin
- 6 Analog Pins
- Power Supply
- Power Jack
- USB Port
- Reset Button

Microcontroller: Microcontroller is the central processing unit of Arduino Uno.

Digital Pins: There are 14 digital pins on Arduino Uno which can be connected to components like LED, LCD, etc.

Analog Pins: There are 6 analog pins on the Uno. These pins are generally used to connect sensors because all the sensors generally have analog values. Most of the input components are connected here.

Power Supply: The power supply pins are IOREF, GND, 3.3V, 5V, Vin are used to connecting sensors because all the sensors generally have analog values. Most of the input components are connected here.

USB Port: This port function is to program the board or to upload the program. The program can be uploaded to the board with the help of Arduino IDE and USB cable.

Reset Button: This is used to restart the uploaded program.

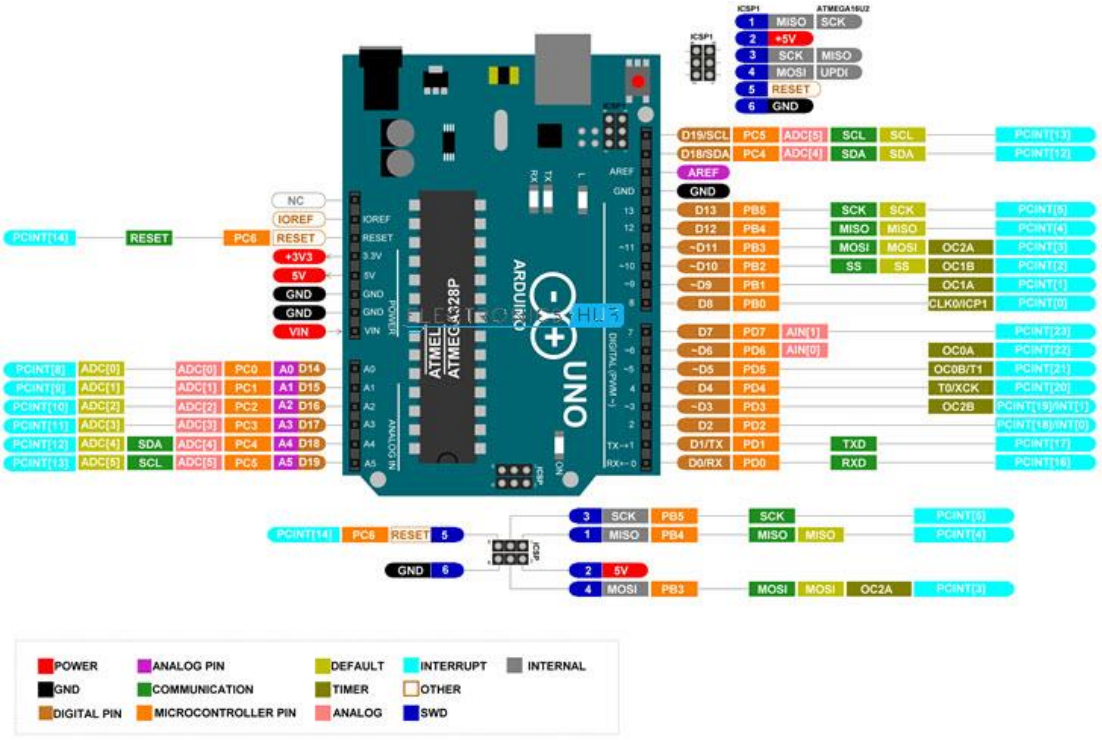


Figure 3.1.3 : Arduino uno

Pin Number	Pin Name	Description	Alternative Functions
1	RX / D0	Digital IO Pin 0 Serial RX Pin	Generally used as RX
2	TX / D1	Digital IO Pin 1 Serial TX Pin	Generally used as TX
3	D2	Digital IO Pin 2	
4	D3	Digital IO Pin 3	Timer (OC2B)
5	D4	Digital IO Pin 4	Timer (T0/XCK)
6	D5	Digital IO Pin 5	Timer (OC0B/T1)
7	D6	Digital IO Pin 6	
8	D7	Digital IO Pin 7	
9	D8	Digital IO Pin 8	Timer (CLK0/ICP1)
10	D9	Digital IO Pin 9	Timer (OC1A)
11	D10	Digital IO Pin 10	Timer (OC1B)

12	D11	Digital IO Pin 11	SPI (MOSI) Timer (OC2A)
13	D12	Digital IO Pin 12	SPI (MISO)
14	D13	Digital IO Pin 13	SPI (SCK)
15	GND	Ground	
16	AREF	Analog Reference	
17	SDA / D18	Digital IO Pin 18	I2C Data Pin
18	SCL / D19	Digital IO Pin 19	I2C Clock Pin
19	NC	Not Connected	
20	IOREF	Voltage Reference	
21	RESET	Reset (Active LOW)	
22	3V3	Power	
23	5V	+5V Output from regulator or +5V regulated Input	
24	GND	Ground	
25	GND	Ground	
26	VIN	Unregulated Supply	
27	A0	Analog Input 0	Digital IO Pin 14
28	A1	Analog Input 1	Digital IO Pin 15
29	A2	Analog Input 2	Digital IO Pin 16
30	A3	Analog Input 3	Digital IO Pin 17
31	A4	Analog Input 4	Digital IO Pin 18 I2C (SDA)
32	A5	Analog Input 5	Digital IO Pin 19 I2C (SCL)

CHAPTER 4

IMPLEMENTATION AND WORKING

4.1 Circuit Diagram

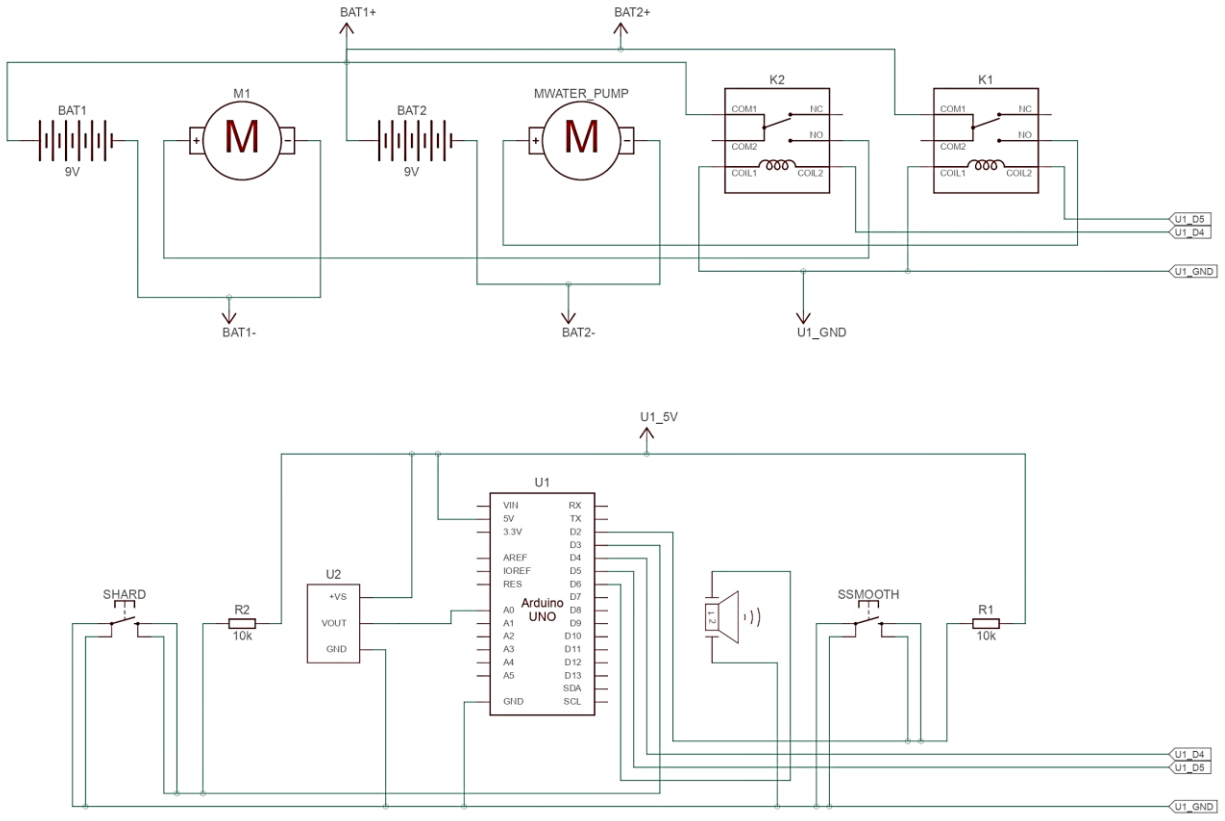


Figure 4.1(a): Circuit diagram of automatic wet grinder

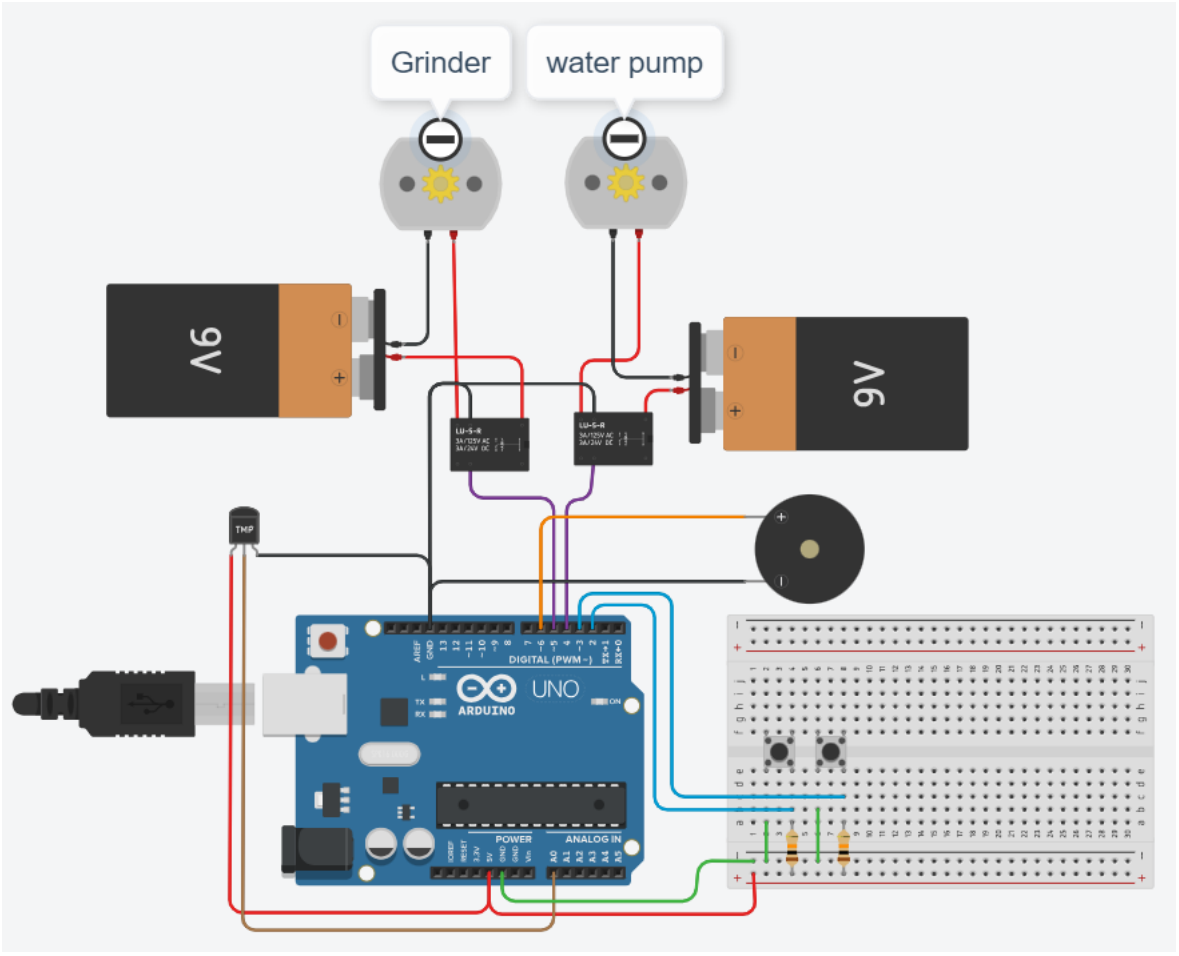


Figure 4.1(b): Circuit diagram of automatic wet grinder

4.2 Working

1. **Autonomous Grinding Process Handling:** The automatic grinder machine operates independently to manage the grinding process without requiring constant user intervention.

2. **Intelligent Water Addition:** The machine intelligently adds water as required during the grinding process, ensuring the optimal consistency of the ingredients being ground.

3. **Motor Temperature Monitoring System:** The grinder is equipped with a motor temperature monitoring system that continuously checks the temperature of the motor during operation.

4. **Automatic Safety:** The machine is equipped with a motor temperature monitoring system that automatically shuts off if the motor becomes too hot to ensure safety. Once the motor temperature returns to a normal heat, it resumes operation seamlessly.

5. **Audible Buzzer for Task Completion:** The machine enhances user convenience by emitting an audible buzzer sound upon the completion of a grinding task, notifying users that their job has been successfully accomplished.

6. **Self-Switch Off Functionality:** After completing its designated tasks, the wet grinder takes the initiative to switch itself off, contributing to energy conservation and minimizing unnecessary power consumption.

4.3 Software implementation

```
const int consistencyButtonThickPin = 2;
const int consistencyButtonWateryPin = 4;
const int waterPumpRelayPin = 7;
const int wetGrinderMotorRelayPin = 8;
const int temperatureSensorPin = A0;
const int buzzerPin = 13;
int consisThick = 0;
int consisWatery = 0;
const int temperatureThreshold = 48;
bool isConsistencySelected = false;
bool isMotorOverheated = false;

void setup() {
  pinMode(consistencyButtonThickPin, INPUT_PULLUP);
  pinMode(consistencyButtonWateryPin, INPUT_PULLUP);
  pinMode(waterPumpRelayPin, OUTPUT);
  pinMode(wetGrinderMotorRelayPin, OUTPUT);
  pinMode(buzzerPin, OUTPUT);
  Serial.begin(9600);
}

void loop() {
  digitalWrite(waterPumpRelayPin, HIGH);
  digitalWrite(wetGrinderMotorRelayPin, HIGH);
  if (!isConsistencySelected) {
    int consistencySelection = checkConsistencySelection();
    if (consistencySelection != 0) {
      isConsistencySelected = true;
      Serial.println("Consistency selected: " + String(consistencySelection));
    }
  }
```

```
  if (isConsistencySelected) {
     checkMotorTemperature();


     startGrindingTask();
     delay(1000);

     digitalWrite(buzzerPin, HIGH);
  delay(500);
  digitalWrite(buzzerPin, LOW);
  delay(100);
  digitalWrite(buzzerPin, HIGH);
  delay(100);
  digitalWrite(buzzerPin, LOW);
  delay(100);
  digitalWrite(buzzerPin, HIGH);
  delay(100);
  digitalWrite(buzzerPin, LOW);
     isConsistencySelected = false;
     consisThick=0;
     consisWatery = 0;
    }
  }

int checkConsistencySelection() {
  if (digitalRead(consistencyButtonThickPin) == LOW) {
    consisThick++;
    return 1;
  } else if (digitalRead(consistencyButtonWateryPin) == LOW) {
    consisWatery++;
    return 2;
  }
  return 0;
}

void startGrindingTask() {
  if(consisThick>0){
    digitalWrite(wetGrinderMotorRelayPin, LOW);
    for(int i=0;i<3;i++){
      checkMotorTemperature();
      digitalWrite(waterPumpRelayPin, LOW);
      delay(1000);
```

```
      digitalWrite(waterPumpRelayPin, HIGH);
      checkMotorTemperature();
      delay(7000);
    }
    digitalWrite(wetGrinderMotorRelayPin, HIGH);
    }
  else if(consisWatery>0){
    digitalWrite(wetGrinderMotorRelayPin, LOW);
    for(int i=0;i<5;i++){
      checkMotorTemperature();
      digitalWrite(waterPumpRelayPin, LOW);
      delay(1000);
      digitalWrite(waterPumpRelayPin, HIGH);
      checkMotorTemperature();
      delay(7000);
    }
    digitalWrite(wetGrinderMotorRelayPin, HIGH);
  }
}

void checkMotorTemperature() {
  int motorTemperature = readMotorTemperature();
  if(motorTemperature <= 38){
  while (motorTemperature < temperatureThreshold) {
    // Stop the motor
    digitalWrite(wetGrinderMotorRelayPin, LOW);
    Serial.println("Motor overheated! Waiting for it to cool down...");
    Serial.println("Motor temperature: " + String(motorTemperature) + " °C");
    motorTemperature = readMotorTemperature();
  }
  digitalWrite(wetGrinderMotorRelayPin, HIGH);
  }
}

int readMotorTemperature() {
  int sensorValue = analogRead(A0);
  float voltage = sensorValue * (5.0 / 1023.0);
  float temperature = voltage*100;
  Serial.println(temperature);
  return temperature;
}
```

4.4 Components

S No	Components	Quantity
1.	Push button	2
2.	Temperature Sensor LM35DZ	1
3.	Arduino UNO	1
4.	5V Relay	2
5.	Buzzer	1
6.	Water Motor	1
7.	Wet grinder	1

CHAPTER 5

RESULTS AND OUTPUT

The successful operation of the module was guaranteed in order to thoroughly test the LM35DZ TEMPERATURE SENSOR we provided.

Output of LM35DZ temperature sensor

The LM35DZ series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35DZ device has an advantage over linear temperature sensors calibrated in Kelvin, the binary data from the LM35DZ is successfully sent to the encoder.

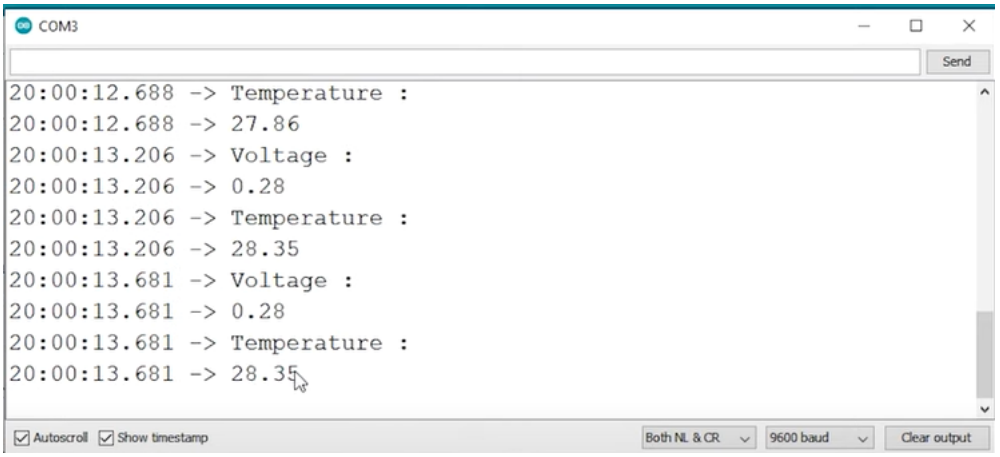
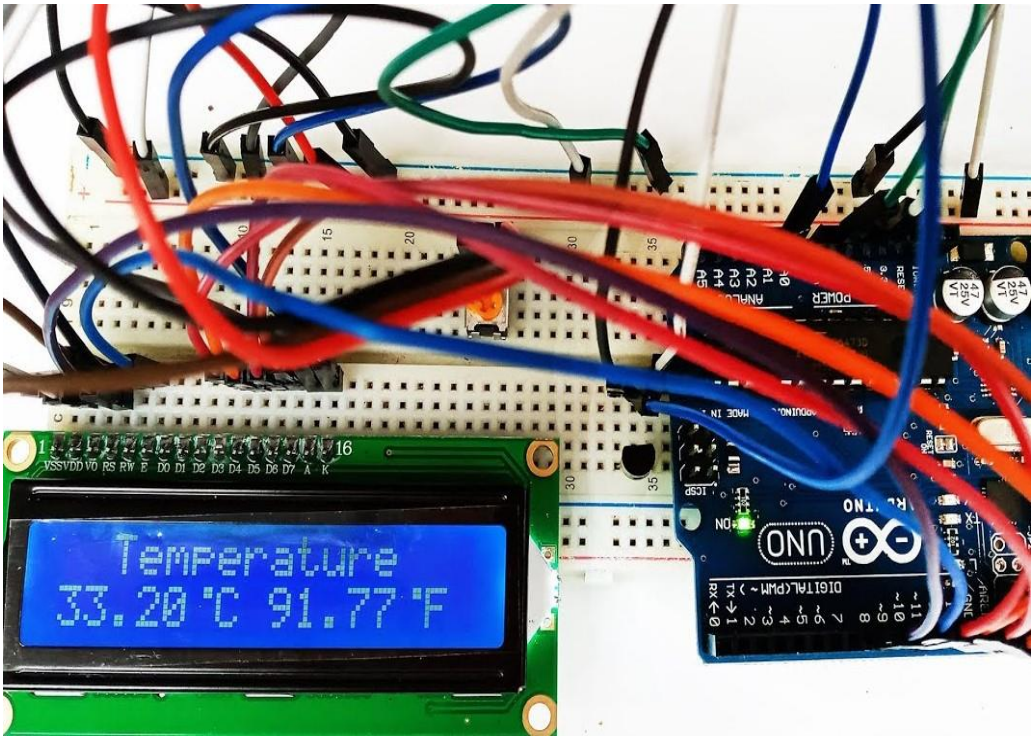


Figure 5.1: Output of LM35DZ

Hardware Output:



CHAPTER 6
CONCLUSION AND FUTURE SCOPE

6.1 Conclusion

The "Automatic Wet Grinder" project offers a promising solution to make our kitchen lives easier. It's like having a smart helper in the kitchen, ensuring our grinding tasks are done efficiently. With its automated features and user-friendly controls, it simplifies the cooking process, saving us time and effort. This project embodies the idea that blending traditional cooking methods with modern technology can enhance our culinary experiences.

6.2 Future Scope

Looking ahead, there are exciting possibilities to make the "Automatic Wet Grinder" even more amazing. One big idea is to connect it to the internet, with IoT, we can control the grinder using our phones or computers, even if we're not in the kitchen. Imagine starting the grinder from the living room while you're getting ready to cook! We could also get notifications on our devices when the grinding is done, so we know when to come back. We could also make the grinder work with voice commands. Instead of pressing buttons, we could just tell it what to do. "Grind for dosa batter" or "Make a smooth paste," and it follows our orders.

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