Smart Wet Grinder

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Abstract

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.

Key words: Smart wet grinder, Arduino, Microcontroller, Solenoid valve, Motor driver

Introduction

A wet grinder alludes to an apparatus for abrasive cutting of arduous materials, or a food arrangement machine utilized especially in Indian cookery for crushing food grains to supply a paste or batter. Wet Grinder for abrasive cutting uses water for lubrication. though one for food arrangement utilizes water to blend in with ground grain to supply batter. Wet grinding is uncommon in western passage hostelry general in Indian cookery. Wet Grinder square measure make paste from grains and lentils, similar to those utilized all through cookery dosas and apathetically in South Indian cookery. These processors typically contain various rock stone plates that square measure moved against another stone plate with a thing to be ground between them. Wet Grinder have 2 advantages over electrical blenders. In the first place, the stone chopper creates less warmth than a blender; heat influences the kind of a food. Second, the stones stay sharp for a greater time than do metal sharp blades. Wet Grinder might be a machine utilized for preparing a Idly, dosa vada, etc., Wet Grinder square measure generally industrial facility made in Coimbatore because of stone is well available during this district. Some point processors, most tile saws and a couple of processors for honing sharp edges utilized in wood work. The water assists with lubrication of the grinding technique and with cooling to abstain from damaging or harming the grinding machine or the work things. The common motor being worn for this application to date might be an overall motor .The mixer grinder has become a certain homegrown piece of unit by all homes. General Motor is worn very much like the drive motor in extra or less the entire blender processors.

1.1 Scope of the project

The main scope of this project is to develop an efficient smart wet grinder which can do its all operations by its own without any human help. The only work by man is to switch on the grinder.

1.2 Ojective of the project

Wet grinder plays a major role in Indian family , especially in south Indian family the regular morning break fast is idly and dosa. The current wet grinder we used is semi automatic which need human interface to complete the full operation. So that we created a fully automatic smart wet grinder which don't need any human help. From the starting process to the ending process each intermediate work can be operated automatically with the help of Arduino program.

1.3 Report summary

The project report is4organized6as6follows: The chapter 2anarrates the6related work done in1wet grinder system, chapter 3 explains the proposed methodology, chapter 4 discuss the implementation of software and hardware requirements. Chapter 5 describes the result and validation. Chapter 6 details the performance of the wet grinder. Chapter 8 conclude about this project and the last section provides the references and appendix.

PROPOSED WORK

2.1Introduction

Wet grinder is significant for Indian family. So we proposed that the smart wet grinder which can grind the rice and dal automatically. We used the type of grinder where the drum is fixed and only the roller stones rotate over the fixed stone to give the batter. The proposed model of this smart wet grinder is worked by this method. The Rice is dropped in rice gulf physically and the load cell detects the heaviness of the rice at that point contrasts it preset weight and sends data to controller prompting switch ON the water pump to take care of water to rice delta for to soak the rice through the solenoid valve. On arriving at the certain level of water the motor turns off consequently by methods for water level sensor associated on the rice gulf. The rice will splash for 4hours by arrangement of Delay circuit and later the Drain valve opens for 3minutes of time and water is emptied out. Giving Delay circuit to 2 minutes and afterward fundamental valve opens to drop the drenched rice into processor for Grinding. The Grinder starts consequently after 2minutes of dropping the rice. Concerning grinding the rice, some water is required so water is provided to Grinder by water pump through the solenoid valve for 3sec and processor works for the time span of 20 minutes for better granulated rice. Subsequent to granulating period the motor turns off consequently. The operational status of the framework showed on LCD and equals the status is shared to users.

2.2 Grinder modification

In normal wet grinder the cylindrical or conical stone which is placed inside the drum is stationary, and the drum rotates for grinding the ingredients. But in our wet grinder we modify the design where the cylindrical drum is stationary, but the roller stone which can be rolled over the bottom fixed stone in the drum to grind ingredients. The main reason for our grinder modification is to simplify the batter removal process and we can clean this grinder easily without using hand. We placed a cap at the bottom of the fixed drum which can be opened either automatically or manually. We designed this proposed model with automatic opening for self batter removal process. We placed a whole at the top closer for water passing operation. Water tubes are fixed through this hole for passing water simultaneously.

Figure 1 Wet grinder

2.3 Hopper design

Hopper is used for feeding the material. Here the hopper the is used for soaking the raw materials and feed them into the grinder. It sifts the small organism or food stir particles from water. We stir the ingredients with stirrer in the hopper. The raw material is first fed into a hopper then it supplied to the grinder. We designed this hopper with two partitions. One partition is for contain rice and the other for containing urad dal. This hopper contain four valves at the bottom. Two drain valve and two gate valve is used. Drain valve is used for drain the water from the hopper and the gate valve is used for fed the rice or urad dall to the grinder. Each partition contain one drain valve and gate valve. Water tubes are fixed with this hopper for passing water simultaneously.
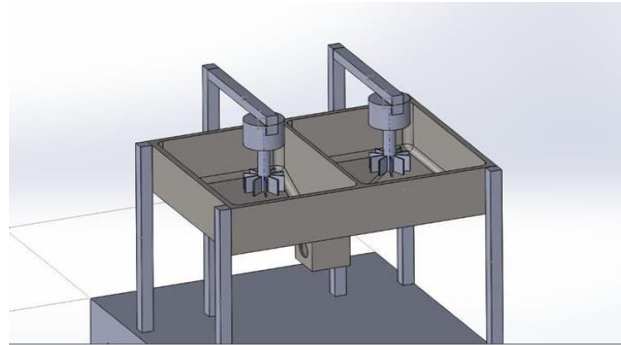

Figure 2 Hopper

2.4 Roller stone

The quality of the grinding stone plays a crucial role in grinders performance. This wet grinder comes with a pair of cylindrical stones. This design ensures that they do not generate heat and thus, helping in process fermentation, as a result we get softer idly and crispy dosas.

Figure 3 Roller stone

2.5 Electronic components

we2installed2in2this2grinder5for6smooth7running6operation. we installed some additional electronic gadgets in this project for quick and smooth self running operation. The main electronic component used in this project which control whole operation of wet grinder from the start to the end. The arduino is controlled by using arduino program. And some sensors are used in this project like water level sensor and load cell. We utilized relay in this project to give time defer capacities by open and close of contacts. Relay control high voltage with the assistance of low voltage signal.Driver circuit is also used here to regulate current flowing through a circuit. For controlling motor the motor driver IC is used. Motor driver IC is a type of chip which used to control the motor.

2.6 Flow chart

| Hopper |
| Water pumping |
| Soaking process (Rice & Dal) |
| Stirring process |
| Raw material fed to grinder |
| Grinding process |
| Water added 2-3 sec simultaneously |
| Sticky batter removel |
| Batter collector |

2.7 Circuit connection

This Circuit Diagram, Represents the Sequences and the flow of the operation of the Smart wet Grinder. Arduino UNO microcontroller is the key of this operational circuit. Because Arduino controls all other components in the whole system. This circuit diagram contains various components, which is explained further.

ABBREVATIONS

1. D1,1 D2,2 D3,2 D4,4 D53   -LEDs

2.R1,1R2,2R33   -Resistor(Ω)

3.RL1, RL2, RL4   -Relay

4.Q1, Q2, Q3   - Transistor
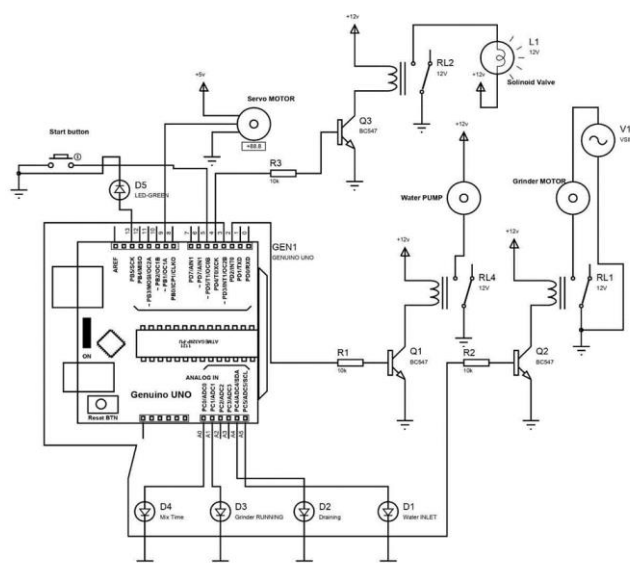
System Specification

3.1 Software requirement

S.NO	SOFTWARE USED	URL
1	Tinker CAD	https://www.tinkercad.com/things/bag0rJxjTvV
2	Arduino	http://www.arduino.cc/asciilogo.txt

3.1.1 Tinker CAD

It is a free online software which runs in all web browser. It is very simple and easy to use. In this project we use Tinker CAD for simulation process. In made any mistake in real circuit connection then the IC will blast or arduino board get damaged. So that first we use Tinker CAD for checking and correcting our programs. Arduino simulator is available in Tinker CAD. We developed a program code in the Tinker CAD for simulation. All the basic electronic components are available in the Tinker CAD. We assemble the required component with proper circuit connection and then run the code for simulation. Here we use Tinker CAD only for checking the circuit connection either right or wrong. After checking the program using tinkering the corrected program is to be installed in original Arduino board.
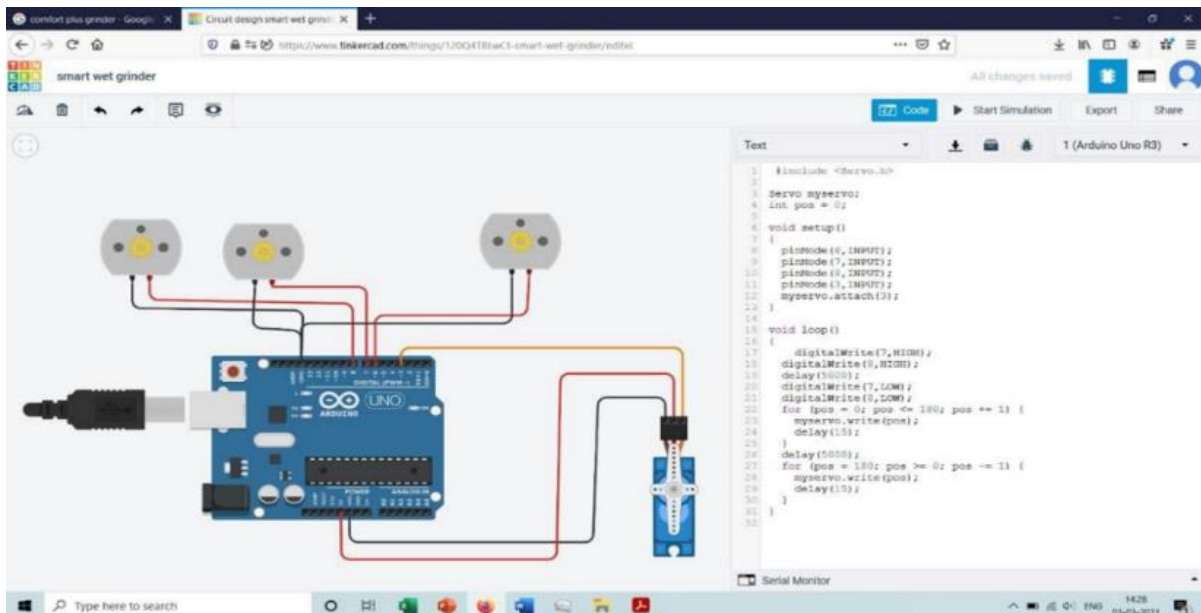

Figure 4 Tinker CAD software

3.1.2 Arduino

Arduino is an open source hardware and programming. It read inputs like sensors, finger on a catch and transform it into turning on a LED. The Integrated Development Environment(IDE) is the product utilized for Arduino. It is utilized to transfer projects to Arduino viable sheets. When Arduino IDE is introduced on the PC, associate the board utilizing USB link . Presently open the Arduino IDE and pick the right..board..by..choosing..Tools>Boards>Arduino UNO, and pick the right port by choosing Tools>port. Arduino is modified utilizing Arduino programming language for speak with a PC, another Arduino board or microcontrollers.

```
File Edit Sketch Tools Help

code

    {
        digitalWrite(Relay_Wpump,HIGH);
    digitalWrite(Led_water,HIGH);
    delay(10000);                    //mixing water
    digitalWrite(Led_water,LOW);
    digitalWrite(Relay_Wpump,LOW);
    digitalWrite(Led_Wmix,HIGH);
    oldtime1=millis();
    while(1)
    {
      if((millis()-oldtime1)>10000) //mixing time
      {
        digitalWrite(Led_Wmix,LOW);
        digitalWrite(Led_draining,HIGH);
        digitalWrite(Relay_Dvalve,HIGH);
        delay(10000);           //draining time
        digitalWrite(Led_draining,LOW);
        digitalWrite(Relay_Dvalve,LOW);

        for (pos = 0; pos <= 180; pos += 1) { // goes from 0 degrees to 180 degrees
      // in steps of 1 degree
      myservo.write(pos);            // tell servo to go to position in variable 'pos'
      delay(15);                     // waits 15ms for the servo to reach the position
    }

    delay(10000);   //putting time

    for (pos = 180; pos >= 0; pos -= 1) { // goes from 180 degrees to 0 degrees
      myservo.write(pos);            // tell servo to go to position in variable 'pos'
      delay(15);                     // waits 15ms for the servo to reach the position
    }

    digitalWrite(Relay_Gmotor,HIGH);
        while(1)
        {
```

Figure 5 Arduino IDE Software

3.2 Hardware requirement

The implantation is the target capacities required some significant hardware which are completely recorded with its determination and its portrayals.

S.NO	COMPONENTS
1	Arduino UNO
2	Load cell
3	Pump
4	Water level sensor
5	Solenoid valve
6	Relay
7	Motor driver circuit

3.2.1 Arduino UNO

Arduino Uno has computerized info and yield pins, a USB association, and a reset button. It tends to be as one or the other info or yield pins by utilizing pinMode(), digitalRead() and digitalWrite().works.in.arduino.programmig. Pins utilized in Arduino will work at 5V and can get a greatest current of 40 mA, and has an inner draw up resistor of 20-50 KOhms which are separated as a matter of course.
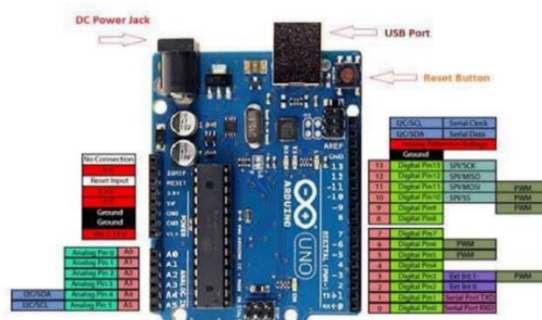
Figure 6 Arduino UNO

3.2.2 Load cell

Load cell is used to detect the heaviness of the rice and imparts the signal to Arduino. A load cell is a sort of power transducer. It changes over power applied on the load cell, for example, strain, pressure, or compression, into an electrical signal. The strength of the signal is straightforwardly corresponding to the power applied. Strain gauge load cells are the most regularly utilized Load cell in mechanical applications.
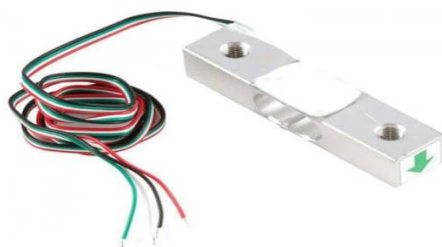

Figure 7 Load cell

3.2.3 Pump

Pumps have powers of nature to move a fluid. As the moving part starts to move, water is pushed far removed. The development of water makes an incomplete vacuum (low pressing factor) which can be topped off by more water. In this task pump is utilized to pass the water from the water tank to the container and the processor.

Figure 8 Pump

3.2.4 Water level sensor

Water level sensor work by demonstrate water levels in a water tank. These tests send data back to the controller to naturally turn pump to top off the water once more. Water level sensors can see the presence of water level in the rice channel. In this undertaking, these water sensors are used particularly to identify the water level which is related with Arduino to turns off the pimp.
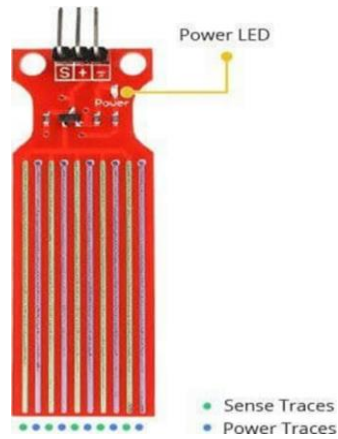
Figure 9 Water level sensor

3.2.5 Solenoid valve

Solenoid valves will control the flow or direction of air or liquid in fluid power systems. Solenoid Valves open or close based on Timer , water level etc. Water level sensor activates and operates Valve to open and close hence water to a tank can be filled remotely. The solenoid valve gets the signal from the microcontroller through relay. In the event that the valve is electrically stimulated or de-stimulated, at that point the valve either shut off or permits water flow.

Figure 10 Solenoid valve

3.2.6 Relay

Relays are used to convert small electrical current into larger currents. Relays open and close circuits electromechanically or electronically. Electrical circuit are controlled by opening and closing contacts. In this project arduino is used, it supply only 5v so that relay is used to convert the lower supply into higher supply.

Figure 11 Relay

3.2.7 Motor driver circuit

The motor driver IC is an integrated circuit chip used as a motor controlling device in embedded circuits. In this project it is used to regulate current flowing a to control other components, some devices in the circuit. The driver circuit which controls the activity of the particular segments. Driver circuit comprises of relay which is associated as typically open, whenever Arduino imparts signal to driver circuit, the relay coil moves to ordinarily close to give supply to the device to be controlled.
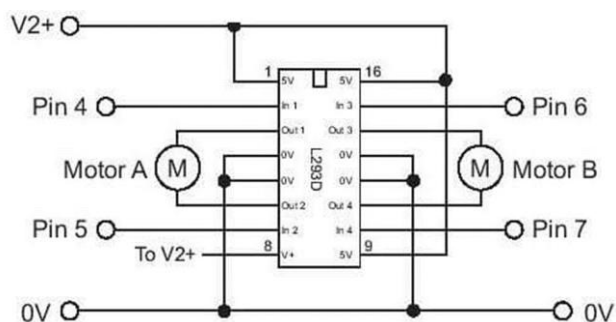

Figure 12 Motor driver circuit

Result

Circuit connections are made with proposed model. When the grinder switch is turned on , all the major process are run automatically with the help of Arduino. First the weight is checked with the help of load cell. The water is pumped from the water tank to the hopper for soaking. After attaining certain level the water level sensor sense the level and send signal to the arduino. Then the pump will turned off by arduino. The driver circuit provide delay for 4 hours for soaking and arduino send signal to relay to activate the driver circuit. Then the drain valve will drain the water completely within 3 minutes. Then the gate valve is opens for dropping soaked rice into the grinder drum. Then the grinder is turned on by the arduino. After 20 minutes of operation the grained batter will passed onto the container. After grainding completed the water is pumped for cleaning process. Then the grinder will turned of automatically.
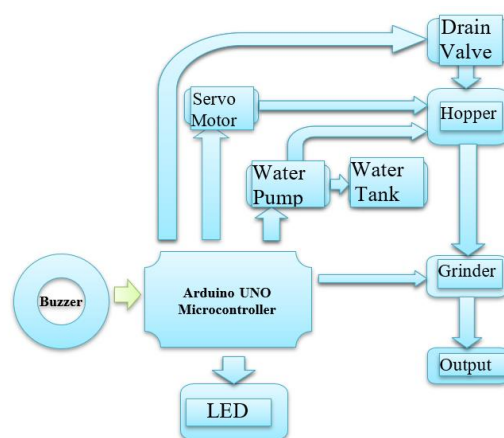
Conclusion

Grinding gets basic, simpler and efficient device. It will be valuable in family unit troubles in accomplishing more work in Grinding. The troubles in manual activity of soaking and manual switching OFF Grinder can overcome. The programmed automatic turning ON and OFF of Grinder with status of activity can be known through message while user away from home. The Proposed configuration gives programmed pouring of water and soaking raw rice and makes utilize the Grinding the rice automatically and cleaning and negligible time utilization better than the regular Conventional grinding process by utilizing inlet and outlet valve. It is

seen that the proposed configuration gives the ideal result sensible expense and in generally speaking aides in the great cleanliness of individuals without human mediation.

Future Scope

In future this smart grinder will developed further. Ready made idly and dosa maker will attached with this grinder for reduced our cooking time. Further we added it with dry grinder which is compact and easy to use. our smart wet grinder is more applicable to the purchasers like joined family, hotels, cafes and commercial use too

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