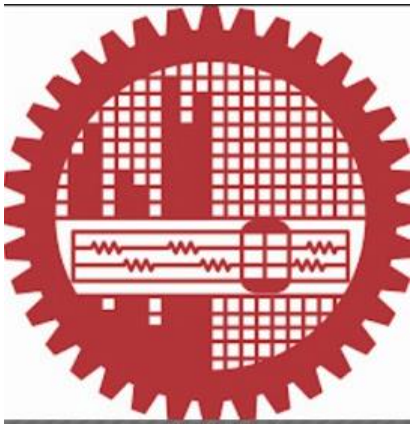

Automatic Roti Maker

Group No:C24

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ABSTRACT

This project was intended to work as a daily life helping hand and reduce the hassle of making rotis faced in regular life.It is a prototype project.But if the ideas were refined and implemented in a much more sophisticated way it has the potential to bring massive changes.

The main theme of the project was automation and we tried to develop something that once started doesn't require the touch of hand and can make rotis in a predetermined rate.

This project is a blend of electrical control and mechanized operation.

Servo controlled stock,DC controlled mixer and arduino mega control unit serves as the base of the project.

Components

1.DC Motor(12 V)
2.Servo Motor(mg 995 -13kg torque)
3.Motor Driver(L293N)
4.Arduino Mega(2560)
5.Metal frame Body
6.Commercial Heating Unit

MECHANICAL CONSTRUCTION

BODY FRAME

We use box angle for the main body frame. It's 2.5 feet in height, 1.5 feet in length and 1 feet in width. Around 23 feet angle bar was used for making body frame and mechanical parts. They were cut in right angle and welded very carefully.

PARTS

It has mainly three parts:

1. Input part

2.Mixing part

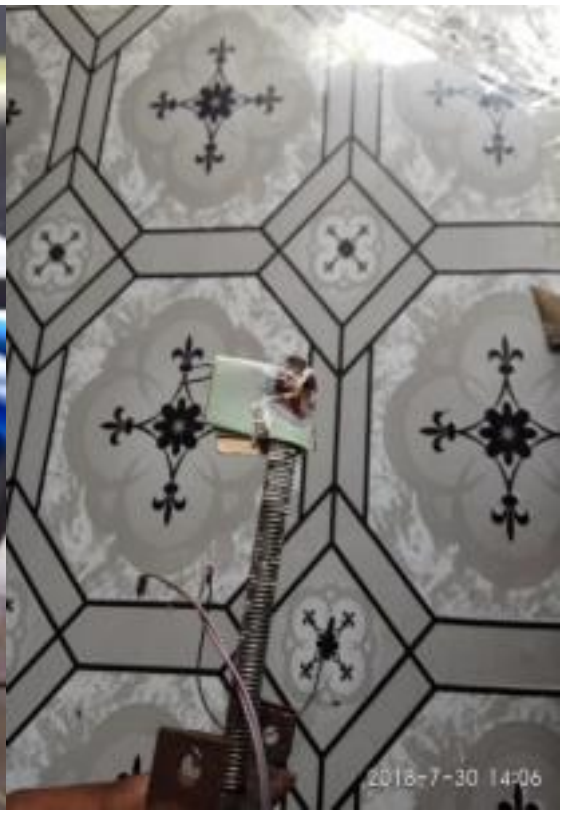
3.Shaping and heating part

Input part

The input part is a combination of two parts, one is for flour input and another is for water input.

Flour input part

This part is made of a pvc pipe . It's diameter is 2.5 inch and height is 6 inch.We used a rotating shaft and a DC motor for flour measuring operation. The shaft is helical in shape .It can suck flour from the cylinder and put it out in a controlled way.Thus we can ensure an exact amount of flour in the mixer.This rotating shaft is powered by a DC motor of 12 volts at 500rpm.



A DC motor is any of a class of rotary electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields.Nearly all types of DC motors have some internal mechanism, either electro mechanical or electronics, to periodically change the direction of current flow in part of the motor.

DC motors were the first type widely used ,since they could be powered from existing direct current lighting power distribution systems. A DC motor's speed can be controlled over a wide range , using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools,toys and appliances.The universal motor can operate on direct current but its light weight motor used for portable power tools and appliances.Large DC motors are used in propulsion of electric vehicles,elevators and hoists or in drives for steel rolling mills.The advent of power electronics has made replacement of DC motors with AC motors possible in many applications

WATER INPUT PART

This part consists of a solenoid valve and a water bottle. Water comes from the bottle to the valve through a pipe . Amount of water is controlled by the solenoid valve.

It is a 20 volt solenoid valve. It takes water from the tank and input it into a mixture by pipe. By measuring the flow rate we can easily input the exact amount of water.

A solenoid valve is an electromechanically operated valve.The valve is controlled by an electric current through a solenoid , in the case of a two port valve the flow is switched on or off ; in the case of three port valves ,the overflow is switched between the two outlet ports. Multiple solenoid valves can be placed together on a manifold.

Solenoids valves are the most frequently used control elements in fluidics. Their tasks are to shut off, release,distribute or mix fluids. They are found in many application areas. Solenoids offer fast and safe switching, high reliability ,long service life ,good medium compatibility of the materials used, low control power and compact design.

Besides the plunger type actuator which is used most frequently, pivoted armature actuators and rocker actuators are also used.

We used a relay for time counting. It works perfectly and easily with arduino.

MIXING PART

It consists of 2 parts
1 mixing pot of 4" dia and 2" depth. It can rotate by a servo motor. All the water and flour are put in this pot.

Mixing blade is powered by a DC motor of heavy torque . It's a typical 12 volt DC motor with 100 rpm only. The motor with a blade is mounted with a shaft and works like a pulley. A servo motor is placed in a higher position to control its upward and downward movement

SERVO

Servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servo motors.Servo Motors are not a specific class of motor although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system.Servo Motors are used in applications such as robotics, CNC machinery or automated manufacturing.

A servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is a signal (either analogue or digital) representing the position commanded for the output shaft.
The motor is paired with some type of encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller. If the output position differs from that required, an error signal is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. As the positions approach, the error signal reduces to zero and the motor stops.

The very simplest servo motors use position-only sensing via a potentiometer and bang-bang control of their motor; the motor always rotates at full speed (or is stopped). This type of servomotor is not widely used in industrial motion control, but it forms the basis of the simple and cheap servos used for radio-controlled models.

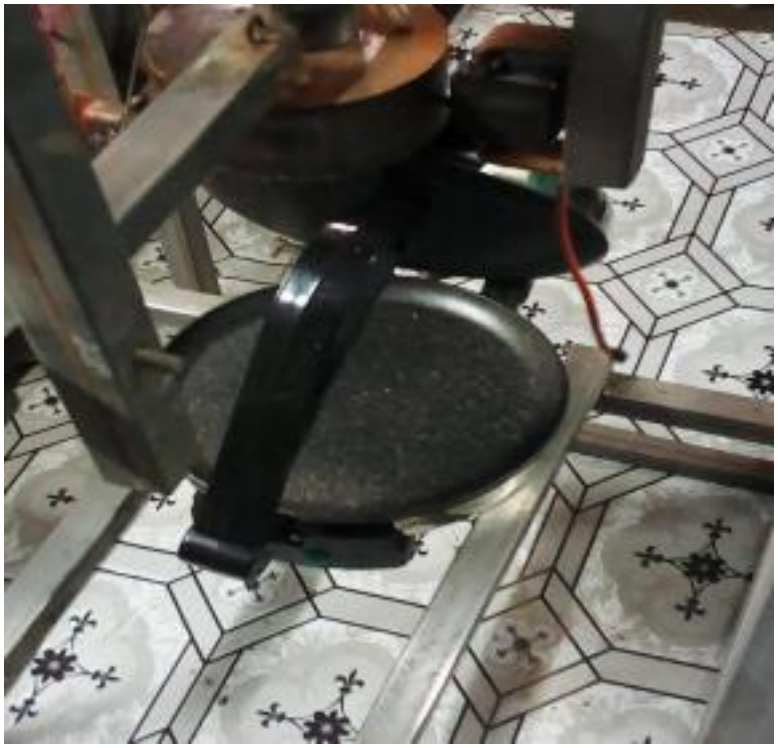
More sophisticated servo motors use optical rotary encoders to measure the speed of the output shaft and a variable-speed drive to control the motor speed. Both of these enhancements, usually in combination with a PID control algorithm, allow the servo motor to be brought to its commanded position more quickly and more precisely, with less overshooting.

The LM2596 series of regulators are monolithic integrated circuits that provide all the active functions for a step-down (buck) switching regulator, capable of driving a 3-A load with excellent line and load regulation. These devices are available in fixed output voltages of 3.3 V, 5 V, 12 V, and an adjustable output version.

Requiring a minimum number of external components, these regulators are simple to use and include internal frequency compensation, and a fixed-frequency oscillator.

SHAPING AND HEATING PART

We have used automatic roti shaper and heater machines for this operation. When the dough is prepared in the mixing part ,the mixing part flips 180 and the dough falls into the shaper machine. Then the maker presses this dough. We have used high torque servo motors for pressing mechanism . After pressing and heating we can get ruti.



MECHANISM

The machine is operated by 2 DC motors , 6 servo motors , 1 solenoid valve and a heater.

At first the shaft in the flour pot rotates for 1 minute, then the blade remains in a vertical position, within this time the exact amount of flour drops on the pot. After 60 seconds the blade head goes down. Then the solenoid valve opens , it opens for only 3 seconds to supply the exact amount of water in the mixing pot.

Then the mixing motor rotates and after 90 seconds the dough is prepared. After that the mixing pot rotates and the dough goes to the heater . Then by pressing it and heating it we can get ruti.

CIRCUIT DESIGN

To operate the Ruti maker we had to design and complete a circuit. To complete the circuit we used Arduino mega, relay module, motor driver, jumper wire, breadboard, transformer, IC, capacitor and buck module.

ARDUINO

The Arduino Mega is a microcontroller board based on the ATmega1280 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila.

The Arduino Mega can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

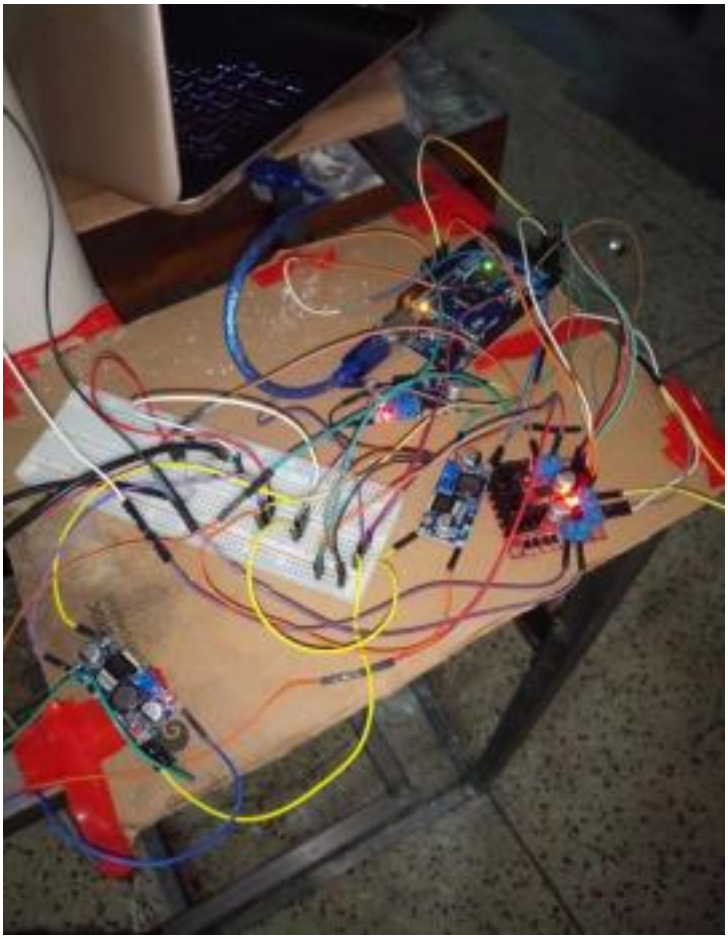
The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

LM2596 BUCK MODULE

The LM2596 series operates at a switching frequency of 150 kHz, thus allowing smaller sized filter components than what would be required with lower frequency switching regulators. Available in a standard 7-pin TO-220 package with several different lead bend options, and a 7-pin TO-263 surface mount package.

A standard series of inductors are available from several different manufacturers optimized for use with the LM2596 series. This feature greatly simplifies the design of switch-mode power supplies.

Other features include a ±4% tolerance on output voltage under specified input voltage and output load conditions, and ±15% on the oscillator frequency. External shutdown is included, featuring typically 80 µA standby current. Self-protection features include a two stage frequency reducing current limit for the output switch and an over temperature shutdown for complete protection under fault conditions.



ARDUINO CODE

```
#include <Servo.h>
Servo sA,sP; // create servo object to control a servo

//Motor-1

int dir1PinA = 50;

int dir2PinA =48 ;

int speedPinA = 4;

//Motor-2

int dir1PinB = 51;

int dir2PinB =53;

int speedPinB = 5;

int pos = 0; // variable to store the servo position


void setup() {

  Serial.begin(9600);

   pinMode(dir1PinA,OUTPUT);

pinMode(dir2PinA,OUTPUT);

pinMode(speedPinA,OUTPUT);

pinMode(dir1PinB,OUTPUT);

pinMode(dir2PinB,OUTPUT);

pinMode(speedPinB,OUTPUT);

 sA.attach(10);

 sP.attach(9);

}
```

```
void loop()

{
//Arm rise

 for (pos = 0; pos <=180; pos += 1) { // goes from 0 degrees to 180 degrees

// in steps of 1 degree

 sA.write(pos); // tell servo to go to position in variable 'pos'  delay(15); // waits 15ms for the

servo to reach the position  }

delay(10000);


//Stock Dc

analogWrite(speedPinA, 255);//Sets speed variable via PWM

digitalWrite(dir1PinA, LOW);

digitalWrite(dir2PinA, HIGH);

delay(10000);

analogWrite(speedPinA, 0);

digitalWrite(dir1PinA, LOW);

digitalWrite(dir2PinA, HIGH);

delay(2000);


analogWrite(speedPinB, 255);//Sets speed variable via PWM

digitalWrite(dir1PinB, LOW);

digitalWrite(dir2PinB, HIGH);

delay(10000);

analogWrite(speedPinB, 0);

digitalWrite(dir1PinB, LOW);
```

```
digitalWrite(dir2PinB, HIGH);
delay(2000);


//pot turn

pos=0;

 for (pos = 0; pos <=180; pos += 1) { // goes from 0 degrees to 180 degrees

 // in steps of 1 degree

 sP.write(pos); // tell servo to go to position in variable 'pos'  delay(15); // waits 15ms for the

servo to reach the position  }

 for (pos = 180; pos >= 0; pos -= 1) { // goes from 180 degrees to 0 degrees

 sP.write(pos); // tell servo to go to position in variable 'pos'  delay(15); // waits 15ms for the

servo to reach the position  }

 delay(2000);



}
```

LIMITATIONS AND FUTURE OF THIS PROJECT

We tried to make the full machine automated. Our initial plan was to press and heat the dough with the help of a servo motor. But the servo motor had not enough power to pull down the heavy pressing hand of the ruti maker. On the other hand, our mixing chamber became very sticky after mixing the dough two or three times. Using a non-sticky chamber and shaft can solve this problem.

We think that there is a bright future for this project throughout the world, especially in South Asia. In South Asia maximum families have their breakfast with roti and with the help of this machine it can be both time and energy consuming. This machine can be very handy especially for the purpose of mass production of ruti like restaurants or army camps or hospitals.

RECOMMENDATION

We think that this project has a very bright future if it can be made commercially and can bring a massive change in the kitchen. From our personal experience we can say that this project has a huge demand to the housewives of our country and can be easily assumed that the scenario is the same all over South Asia.

This project was a prototype. So we did not think about the size of the product. But for commercial purposes this machine can be resized and can easily be transformed into a shape suitable for daily use.