ROBO CHEF FOR HOME COOKING

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Abstract

Nowadays preparation or cooking of food has become a hectic, boring and time consuming task for most of the people especially for women. Hence, there is a strong need for automating food industry. In this paper, the design of automatic Maggie maker has been described which consists of an oven which acts as a heater, conveyor belt which has vessels placed on it that contain the ingredients and arms that pick the ingredients from vessels and for stirring purpose. The objective of the project is to satisfy the criteria of fast production, stable, moderate cost and less time.

Keywords: Robo Chef, Chef, Robo

I. INTRODUCTION

The main motto of this project is to design and implement a device that is capable of preparing the recipe. The implementation of this project will serve as a great achievement because this device will tremendously reduce the cost of preparing the recipe as well as the time required will be reduced. The device is surely going to eliminate the manual power as it is completely automatic and will replace most of the human work, time and energy.

The working of the device is very simple. It consists of a controller and several sensors like weight, level and a heater. It consists of motor and driver circuit. Power supply given to the controller as well as all the sensors. All the ingredients are stored in a pan and then made to fall on the weight sensor which checks the weight and the amount of all the ingredients required and made to fall on a bowl. From the bowl the mixture is given to the controller and next to the driver circuit and then to the motor and finally to the heater.

The mixture is then stirred to form uniform mixture using an arm and then it is heated through heater and then after preparing the product is dropped into the eating bowls and now the product is ready for consumption.

II. METHODOLOGY

Need Analysis*:*

Design an automatic machine that prepare food according to recipe. Relax humans from tedious jobs. In public places (temples, schools, etc.)large amount of food has to be prepared. Prepare food within precise amount of time. Maintain consistency in taste. As the quantity of food increases it requires more manual power. It requires continuous monitoring of human. In huge quantity proper mixing of ingredients may not take place. Maintaining cleanliness at the place is also the difficult task. External factors such as dust may spoil the quality of food. Reduce the labor cost by implementing automated device. Develop a tool that prepares maggi automatically thereby reducing the human effort. □

Attribute list:

Device should prepare the food. Should be used in homes and food industries. It should be of low cost. It should reduce human efforts. Prepare the food in less time. Device must continuously monitor the status of food being cooked The utensils must be washed automatically once the dish has been cooked.It must properly mix the ingredients. Less power consumption. Must be flexible with different

recipe Must be marketable and create trend. It has to be portable. Must intimate to user once the dish has cooked completely.Must be safe to use.The food must not be overheated. Provide different concentration of ingredients according to user need. Reduce wastage of food. It must also be employed in preparing large amount of food. It must also be usable by nontechnical users. It has to be durable. It has to be stable. It depends on the efficiency of laborers and in most of the situations it consumes more time to complete the task.

Objective list:

- Device should prepare the food automatically.
- It should be low cost.
- Prepare the food in less time.
- It can sense the weight of raw materials.
- Reduce wastage of food.
- It maintains same taste consistency
- It is flexible for different types of recipe.
- Device should be marketability.
- It should be durable.
- This device has more efficiency.
- Must intimate to user once the dish has been cooked completely.
- Must be safe to use.
- The food must not be overheated.
- It must also be usable by non technical users.

Constraints:

- The device cost in the range of 10,000-15,000.
- Proper mixing of ingredients in fixed ratio.
- Food has to be prepared within twenty to twenty five minutes.
- Preparation of food is maintained clean.

Taste has to be consistent up to 90%.

Product has to be strong and stable.

Pair-wise comparison chart:

*****	Cost	Taste	Durable	Time
Cost	---	1	1	1
Taste	0	---	0	1
Durable	0	1	---	1
Time	0	0	0	---
TOTAL	0	2	1	3

Table 1:Pair wise comparison chart.

From the above chart we can conclude that our devices gives highest priority to the time followed by taste.

Functional analysis:

- Once the power is on the machine has to cook the food automatically.
- The ingredients should be dropped into vessel sequentially.
- Weight of Ingredients has been sensed by weight sensor.
- Some mechanism has to be employed to facilitate the mixing action.
- Sufficient heat has to be supplied to cook the food.
- The status of food must be monitored continuously.
- After food has prepared lifting mechanism is done.
- Limited amount of food is prepared.
- Device must get off automatically.
- The user interface should be made graphical for ease of use especially for non technical users.

TRANSPARENT BOX:

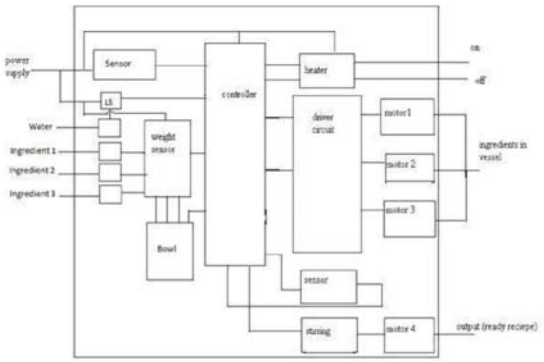

Fig 1:Transparent box.

From the transparent box different mean of achieving function can be predicted by morphological chart. The morph chart gives different alternatives for design implementation. The morph chart is as shown in below fig

FUNCTIONS	OPTION 1	OPTION 2	OPTION 3	OPTION 4	OPTION 5
Material	Iron	Aluminium	stainless Steel	Mild steel	Wood
Stirring	Vibration	Arm	Manually	----	----
Movement of arm	Vertical	Horizontal	Sideways	Diagonal	----
Type of motor	Johnson	DC	Stepper	AC	----
Operation of device	Push buttons	Touch screen	Switch	----	----
Power	AC mains	Coal	Solar	Gobar gas	
Supply of food	Manually	Lifting	Slope	----	----
Type of arm	Spoon type	Robot arm	Manually	----	----
Belt system	Conveyor system	Chain system	-----	-----	-----
Cooking	electrical	Gas	Solar	----	----

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Table 2**:** Morphological chart.

By table 2 The morph chart gives different alternatives for design implementation. The morph chart is as shown in above.

OPTION 1: Iron material, vibration for stirring , vertical movement of arm, stepper motor, touch screen operation, solar supply for induction cooker, manual lifting, robot arm, chain system, Arduino controller and electrical cooking .

OPTION 2: Aluminium material, arm for stirring , horizontal movement of arm, DC and stepper motor, switch operation, power from battery, AC mains for induction cooker, manual lifting, robot arm, conveyor, Arduino controller and electrical cooking .

OPTION 3: mild steel material, manual movement, horizontal movement of arm, Johnson and stepper motor, push button operation, spoon type arm with conveyor system.

As the second alternative meets most of user requirements hence the design with those specification is chosen for implementing automatic Maggie making machine.

III. IMPLEMENTATION

The implementation of this project will serve as a great achievement because this device will tremendously reduce the cost of imprinting designs as well as the time required will be reduced. The device eliminates the manual efforts as well as the productivity is increased thereby replacing most of the human work, time and energy.

The working of the device is very simple. It consists of moving conveyor belt on which bowls are placed that contain required ingredients needed to prepare specified recipe. The ingredients are put in vessel by pick and place robotic arm. another robotic arm is employed for stirring action. whenever the power is switched on water is poured into vessel simultaneously heater is set on .once water has reached preset temperature the other ingredients are put into vessel, once all the ingredients are inside vessel stirring action is performed by another robotic arm, after certain span of time once food is cooked heater gets off automatically.

We are using two conveyor belt which are running simultaneously. One conveyor belt will initially have vessels with ingredients and the other will be empty. There is a mechanism of LED and photodiode.LED emits light and photodiode receives it continuously. When the vessels come in-between these, This mechanism is disturbed and then the robotic arm picks the bowl and places it on the other conveyor belt. This mechanism continues. From the above working we can see that this device is going to be completely automatic and will serve the purpose efficiently.

IV. SYSTEM REQUIREMENTS

- The device consists of two robotic arm one for stirring and another for pick and place of the ingredients.
- Consist of conveyor belt and four pulleys with DC motor for facilitate the conveyor action.
- On the conveyor belt the different bowl is placed.
- The bowls consist of different ingredients which we needed to prepare recipe.
- The heater is provided for to heating the food.

The conveyor belt is moving continuously on which few bowl is placed .the bowl consist of different ingredients. There are two robotic arms, for pick and place the bowl and another one for stirring action 1st water is poured in to vessel by the water pump limited amount of water is poured into vessel. after that all the ingredients are put into the vessel, When all ingredients are put into the vessel that is placed on the heater vessel has been sensed by the sensor then heater get turned on automatically this device required less time to cook the food and this is more stable device with consuming less power.

- The system requirements and specifications can be summed up as follows, the device should Induction heater :The heater sets on automatically once the water is poured inside the vessel the temperature of heater is monitored by microcontroller
- Conveyor belt has to be moved which is facilitated by motor and pulleys.
- The pick and place robot for put required ingredients into the vessel.
- Effective graphical users interface so that common man can handle the device.
- Once the food is prepared it should automatically turn off the heater.
- Be simple in operation so that it can used if any problem occurs while cooking the device indicates to user.
- Be of affordable price so that it can reduce the labor cost.

V. SOFTWARE IMPEMENTATION

An aurdino board consists of an Atmel 8-bit microcontroller with complementary components that facilitates programming.

Aurdino has its standard connectors, which are used by user to interchangeable add on modules called as shields.

Summary

Microcontroller	ATmega168
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	16 KB (ATmega168) or 32 KB (ATmega328) of which 2 KB used by boot loader
SRAM	1 KB (ATmega168) or 2 KB (ATmega328)
EEPROM	512 bytes (ATmega168) or 1 KB (ATmega328)
Clock Speed	16 MHz

Each of the 14 digital pins on the Duemilanove can be used as an input or output, using Pinmode, Digital write, and, Digital Read functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor of 20-50 kOhms.

- Serial: 0 and 1.Used to receive and transmit TTL serial data. These pins are connected to the corresponding pins of the FTDI USB-to-TTL Serial chip.
- External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attach Interrupt function for details. PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analogWrite function. SPI: 10, 11, 12, 13. These pins support SPI communication using the SPI library.
- LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

This has 6 analog inputs, each of which provide 10 bits of resolution. By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference function. Additionally, some pins have specialized functionality:

- I^2C: analog input pins A4 and A5. Support I^2C communication using the Wire library.

There are a couple of other pins on the board:

- AREF. Reference voltage for the analog inputs. Used with analog Reference.
- Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

The mapping between Arduino pins and ATmega168 ports.

Shield are communicates with Aurdino board directly over various pins. many shields are individually addressable via an I²C serial bus.

Official Arduinos have used the mega AVR series of chips, specifically the ATmega8,ATmega 168, ATmega328, ATmega1280, and ATmega2560. highlighting, brace matching, and automatic indentation, and is also capable of compiling and uploading programs.

VI. CONCEPTUAL SYSTEM DESIGN

At this stage we discuss about different modules that are involved in building the system. The system modules are as shown in figure.

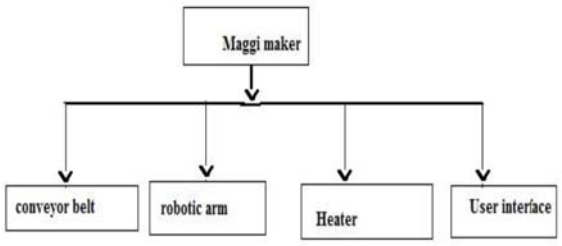

Fig 2: Module of magi making device**.**

Our conceptual frame work mainly consists of four modules:

a) Conveyor belt
b) Robotic arms
c) Heater

a) Conveyor belt:

We are using two conveyor belt which are running simultaneously. One conveyor belt will initially have vessels with ingredients and the other will be empty. There is a mechanism of LED and photodiode.LED emits light and photodiode receives it continuously. When the vessels come in- between these, this mechanism is disturbed and then the robotic

arm picks the bowl and places it on the other conveyor belt. This mechanism continues.

b) Robotic Arm:

There are two robotic arm used one which picks the ingredient from the conveyor belt and other one for stirring purpose. Both the arms have sensor and the action of those is controlled by the microcontroller.

c) Heater:

Heater is most important apparatus used in this project.the heater is responsible for providing heat energy for preparing particular recipe. We have induction heater for this purpose.

The intimation to the user that the food is cooked.

VII. WORKING

Whenever the power is switched on, heater sets on and simultaneously water is poured into vessel and the temperature of water is monitored by microcontroller and after specified time conveyor belt moves and pick and place robot arm puts the material into vessel. Once all the ingredients are placed stirring arm stirs for some time and once the food is cooked heater gets off automatically.

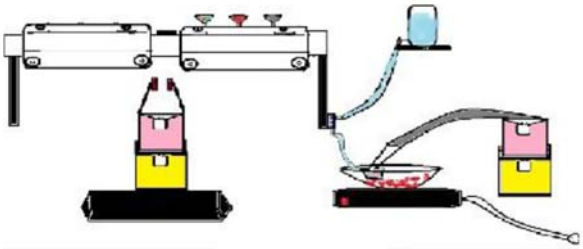

Fig 3: DESIGN OF MAGGI MAKING DEVICE

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