International Journal of Scientific Engineering and Science
Volume 3, Issue 3, pp. 79-80, 2019. ISSN (Online): 2456-7361

Smart Tea – Coffee Maker

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***Abstract*—** *Tea and Coffee are the most preferred beverages in the world, but even if sipping on them looks trivial, it isn't. Carefully monitoring the amount by standing near the dispenser, waiting for beverage to brew, etc. are well observed facts. But the Time spent while doing the fore-mentioned is also accompanied by the wastage of Energy as no one accounts for the time it is heated and also the no. of times it is heated. The latter is responsible for neutralizing the important minerals from Milk/ Water. This project uses important Instrumentation to take care of both Level as well as Temperature Control, thus minimizing the Time and Energy spent on such a trivial stuff and also preventing the reheat problem. Also to minimize Human efforts, the beverage will be prepared via a few Remote Key presses along with the above Instrumentation and the status of the beverage on the LCD display. One significant feature is the no. of cups dispensed at once! All these will be executed by an Arduino program.*

***Keywords*—** *Dispenser, Instrumentation, Remote, LCD, Arduino.*

I. INTRODUCTION

'What if we could get our cup with us not even present near the dispenser..?' Well the answer to this is Automation, which would Engineer the SMART TEA-COFFEE MAKER. As per conventional dispenser systems, the user has to manually control the dispensing via pushing the tapping continuously unless he gets his cup filled with the desired level; also he is not in the state to control the temperature of his drink. To formulate the problem statement we have the following points:

- Level control is Manual
- There is no control over the Temperature of the beverage.
- Hygiene is the biggest Conundrum
- Right from the making of the beverage to the number of cups dispensed, everything is Manual.

II. METHODOLOGY

Referring to the above mentioned problem statement; this project is thus modeled to give just the right measures to combat the fore-mentioned. The purpose here is to provide:

- Smart level control achieved by magnetic float level sensor coupled with reed switch control.
- Smart temperature control achieved by thermal switch(s) with a target of 90˚C.
- No. of cups dispensed by controlled motion of a DC motor.
- Solenoid valves to dispense (actuating even at 0 kg/cm²).
- Making starts with a key press of a remote.
- Arduino would be the brain of the system.

An Android application to introduce the IOT-Home /Office Automation concept can be considered as advancement to this project.

Referring to the below schematic, the Smart Tea-Coffee Maker would, when switched ON would operate by asking the user the choice of the beverage (Tea-Coffee ?) and the no. of cups to be dispensed. With this information the premix would be selected appropriately. Next depending on the no. of cups accounted for, the appropriate level of liquid (here Water) will be drawn from the reservoir by actuating the Cold Water Solenoid valve. Next only this amount will be heated in the maker by switching ON the heater. Once the Temperature reaches the target, the heating is cut-off. The brewing is done simultaneously. Now, this is dispensed via the Hot Water Solenoid Valve into the cups supported by a disk mounted on the motor shaft. The level going into each cup is pre-programmed as per standard cup size(approx. 180 ml each). The cup placed right below the nozzle is sensed by the Proximity Sensor enabling the Arduino in the actuation of the Solenoid Valve.

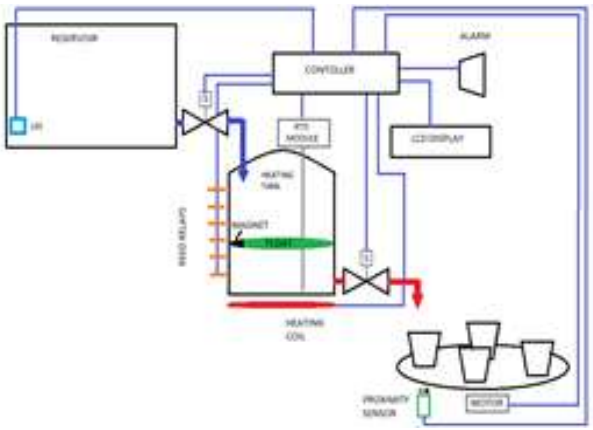

Fig. 1. Schematic

A. Level Control

The method used here is the Measurement of Level using Reed Switches [7]. The reed switch is an electrical switch operated by an applied magnetic field. It consists of a pair of contacts on ferromagnetic metal reeds in a hermetically sealed glass envelope. The contacts may be normally open, closing when a magnetic field is present, or normally closed and opening when a magnetic field is applied. The switch may be actuated by a coil, making a reed relay,[1] or by bringing a magnet near to the switch. Once the magnet is pulled away from the switch, the reed switch will go back to its original position.

Fig. 2. Reed Switch Contacts

B. Temperature Control

The method used here is Temperature Control using the W1209 module [6]. The W1209 is an incredibly low cost yet highly functional thermostat controller. With this module you can intelligently control power to most types of electrical device based on the temperature sensed by the included high accuracy NTC temperature sensor. Although this module has an embedded microcontroller no programming knowledge is required. 3 tactile switches allow for configuring various parameters including on & off trigger temperatures. The on board relay can switch up to a maximum of 240V AC at 5A or 14V DC at 10A. The current temperature is displayed in degrees Centigrade via its 3 digit seven segment display and the current relay state by an on board LED.

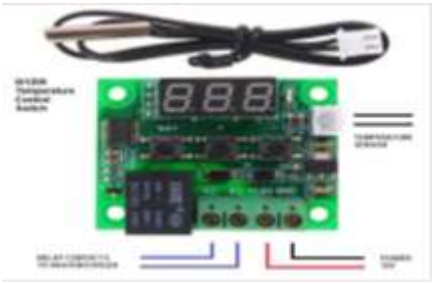

Fig. 3. Temperature Control Switch

C. DC Motor Control

The Controlled Motion of a DC motor is used to fill the cups supported by a disk. The interfacing is done via L298N bridge [4] to the Arduino. The rotation of the Motor is governed by status of the cup positioned w.r.t the nozzle signaled by the Proximity Sensor [8]. A proximity sensor often emits an electromagnetic field or a beam of electromagnetic radiation (infrared, for instance), and looks for changes in the field or return signal. The object being sensed is often referred to as the proximity sensor's target. Different proximity sensor targets demand different sensors. For example, a capacitive proximity sensor or photoelectric sensor might be suitable for a plastic target; an inductive proximity sensor always requires a metal target.

Fig. 4. IR based Proximity Sensor

D. Solenoid Valves

Two Solenoid Valves are used here. One Cold Water Solenoid Valve to draw water from reservoir to tank and One Hot Water Solenoid Valve to draw the beverage out; both operating at 0kg/cm^2 pressure [9]. 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 a three-port valve, the outflow is switched between the two outlet ports.

E. Arduino UNO

The Arduino UNO [4] is a microcontroller board based on the ATmega328. It has 14 digital input/output pins out of which, 6 analog inputs, 6 can be used as PWM outputs a 16 MHz ceramic resonator, a USB connection, a reset button , a power jack, and an ICSP header. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

Fig. 5. Arduino Uno Main board

III. CONCLUSION

The motive of Instrumentation viz. Level Control, Temperature Control, reservoir status etc. have been Spoken of in this project. These as of now ensure minimizing Human Intervention via Level control and saving of Time and Energy by avoiding overheating via. Temperature Control. Also a point to note, only the liquid that will be occupied by the beverage is heated, the rest stays in the tank. This prevents undue rather reheating of the liquid thus preventing loss of important minerals. The Concepts encapsulating the Premix disclosure, the hygiene and the medium of communication (Infrared/ Bluetooth) will be discussed later. The idea of an android app to achieve complete Home/Office Automation too will be spoken of as an Advancement to this project.

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