Design and Implementation of Juice Mixer Machine

Naing Kyaw Soe

Department of Electronic Engineering
Pyay Technological University

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Abstract- A juice mixer machine is generally agreed to be a machine that mixes the various kind of juice selected by the user. There are many juice mixer machine in commercial market, but most were complex and expensive. So, this paper focuses on the design and implementation of five channel juice mixer machine that is more accessible and on the hobbyist maker. This proposed system design has 5 different juice tanks, 5 channels, which are connected to water gear pump motors which are controlled by relays. The user can select the desired juice channel and juice content from keypad. The microcontroller calculates the corresponding juice content from user's desired percentage by using the weight sensor module. Moreover, the user has a favor to choose two options. First option is percentage based automated juice mixing and the second is the manual import.

Index Terms- Microcontroller, Weight sensor module, Relay module, LCD, Automation.

I. Introduction

Nowadays, automated machines are in demand for they make numerous activities not only easier but also efficiently. These machines require minimal human intervention to do its job. In most cold drink bars, the busiest person is usually bartender since he is the one who mixes and prepares drinks for customers who are eager to have a drink. Due to time pressure and demand from the customers, bartender is to making mistakes during the actual juice mixing process. The juice mixer machine minimizes the need for bartenders to carter to the needs of the customers. The machine is user friendly and is very simple to operate. The customers will only have to deal with marked label that indicate the kind of juice to be produced. With this, labor cost will be minimized and it will also give bar owners the opportunity to attract more customer with this innovation. Furthermore, with the use of juice mixer machine, accuracy is obtained. The machine prevents product loss by eliminating over pouring and spillage of liquor inventory as well as breakages due to bottle is handling. This will, in effect, lead to maximizing of the establishment's liquor inventory and increased profit. By means of automated machines, manual handling of the ingredients will be eliminated, there are existing automated juice mixer machine in the market but most of them are based on computer, such as Raspberry Pi. This paper shows how implementation of juice mixer machine is done through the use of Arduino.

II. Operation Principle

The operation of juice mixer machine involves six main components. They are Arduino Mega2560, HX711weight sensor module with load cell, five 12volt dc water gear pump motor,4 channel and single channel relay modules,20x4 LCD and 4x5 matrix keypad as shown in Figure(1).

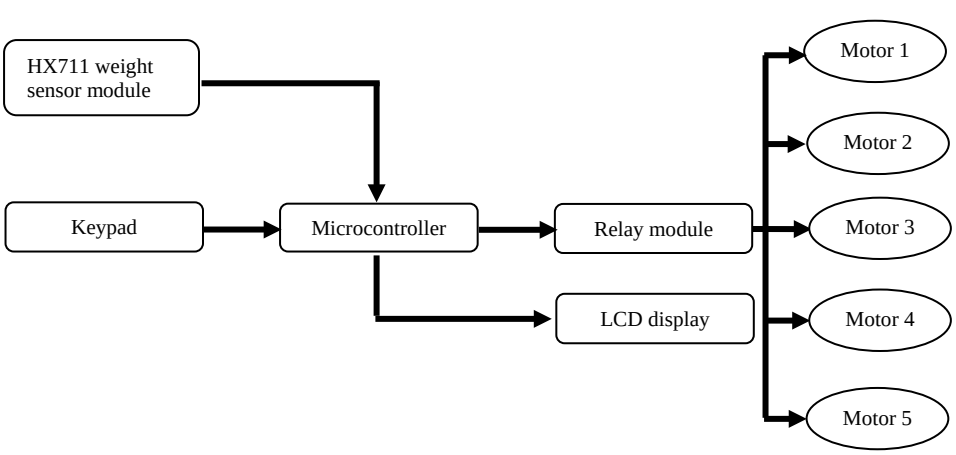

Figure (1) Block diagram of Juice Mixer Machine

Arduino Mega 2560 that functions as the brain of the system to which all the operating functions of each module, is chronologically programmed in it. It has predefined programs and instructions that are responsible for juice mixing process that the machine will perform as directed by the user via keypad. LCD display is used to interface with the user for monitoring the operating status. The weight sensor module that is used to get measurable data out from load cell sends the information to the microcontroller, the microcontroller knows and controls the pump motor through the relay if the juice reaches the desired percentage. If the user wants to mix juice automatically as his desired ingredients, he has to select the option 1 by pressing 1 from keypad. And then, the user must enter the juice content percentage of each channel. Otherwise, if the user selected option 2, he able to control the juice content and channel number. That is, if the user desires to drink juice from channel 2, he must enter number 2 from keypad. In this time, the pump motor connected to the channel 2 is processing and pouring the juice for tank2 to the glass until the user presses * key from keypad.The user guide operational flow diagram is shown in Figure (2).

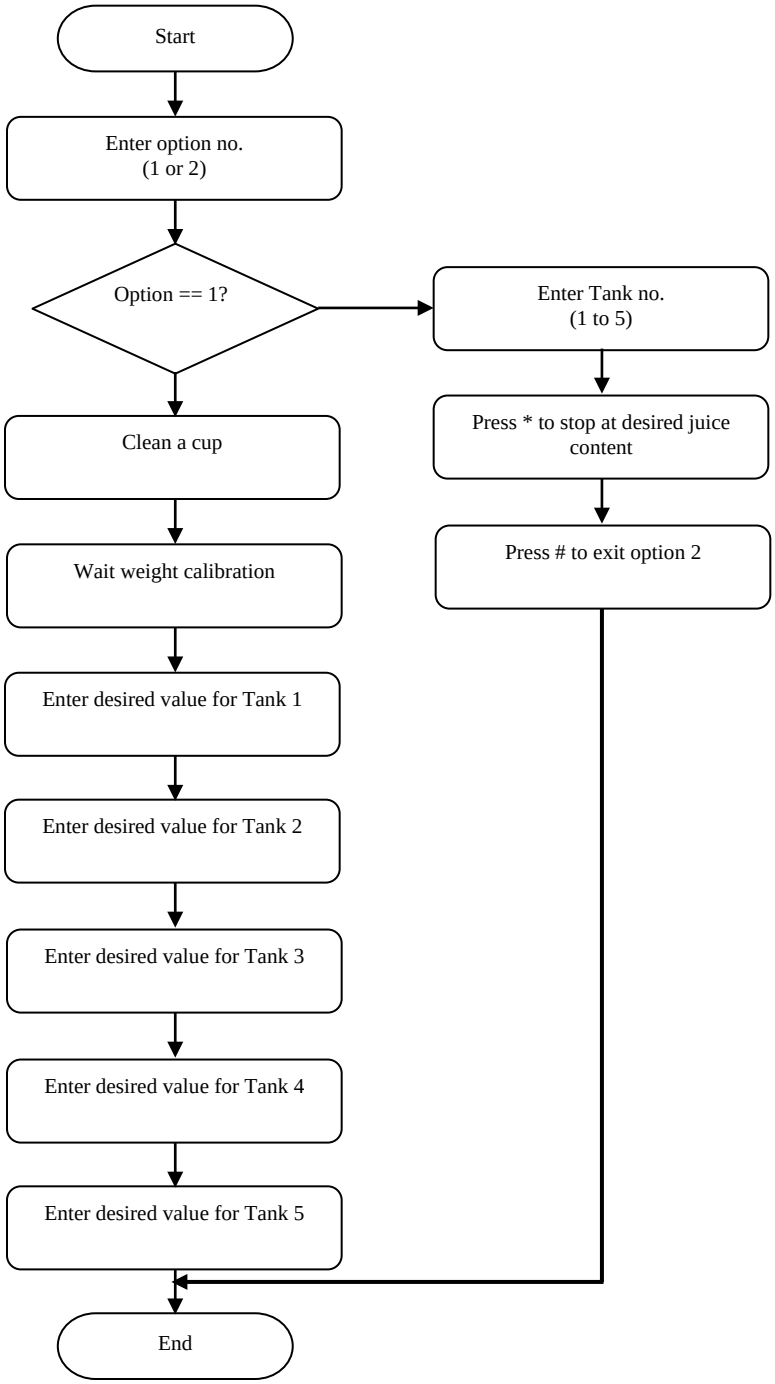

Figure (2) Operational flow diagram

III. HARDWARE AND SOFTWARE IMPLEMENTATION

In this section, hardware implementations of proposed system are described in actual connection diagrams. The main unit of the system is Microcontroller Arduino Mgea2560 that is to control the water pump motor for juice mixing process. The microcontroller also calculates the corresponding juice content value for the user's desired value via keypad. The microcontroller plays a main role in this system as shown in Figure (3).

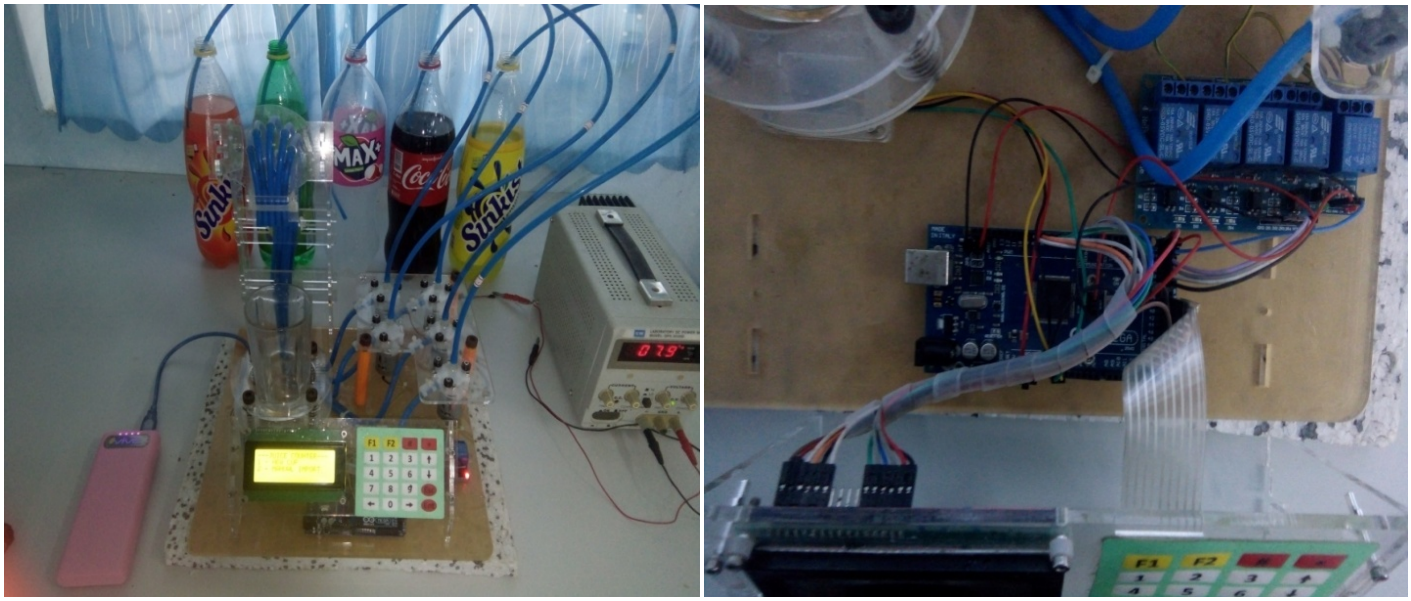

Figure (3) Overall hardware implementation

Figure (4) is construction diagram of load cell and HX711 weight sensor module that are used in this system. A0 and A1 pins of microcontroller are used as inputs for the digital output (DOUT) and serial clock (SCK) of HX711.In this system, 20x4 LCD module is used to display the juice mixing processing status. In this LCD implementation, pin 8 of microcontroller is used as analog output to eliminate the potentiometer that is used for the desired contrast by optimizing the contrast value in serial monitor.

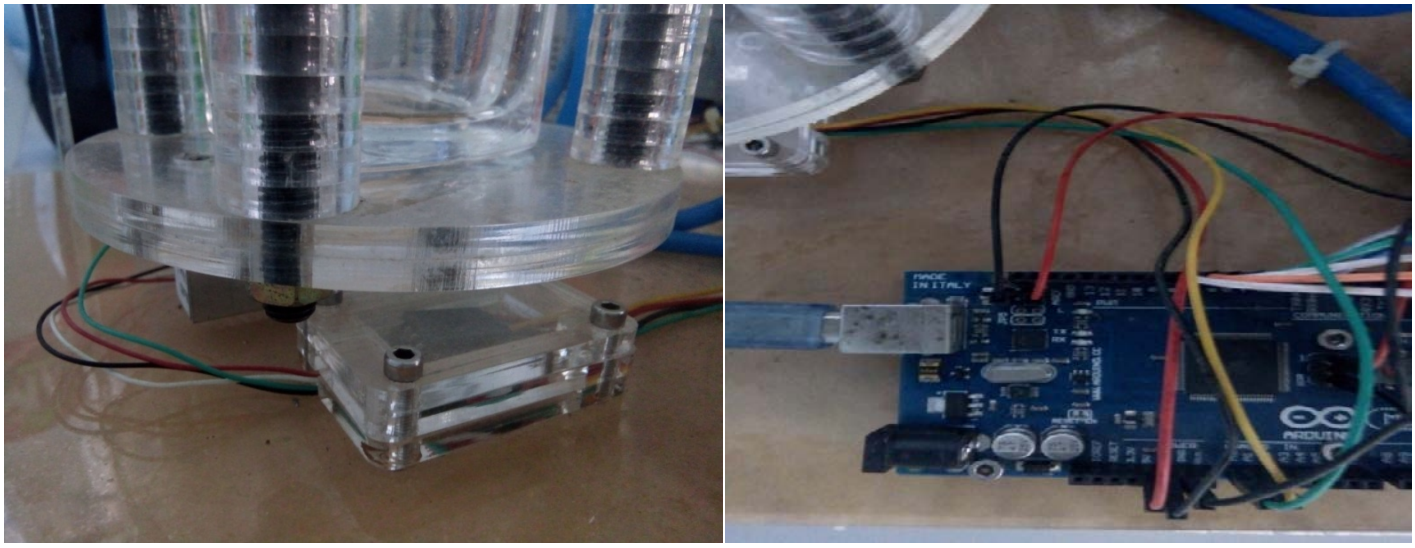

Figure (4) Weight sensor module with load cell

As the final implementation, 4 channel and single channel relay modules that are used as switches to control the water pump motor shown in Figure (5).In this portion, the pump motor is supplied from the dc power supply. The 12 volt dc water pump motor connected with pipe is only used to deliver the juice in tanks to glass. As the software implementation, weight calibration is mainly role in this system .For this implementation, HX711 weight sensor module library is added to the Arduino IDE. Figure (6) shows flow chart of the proposed system.

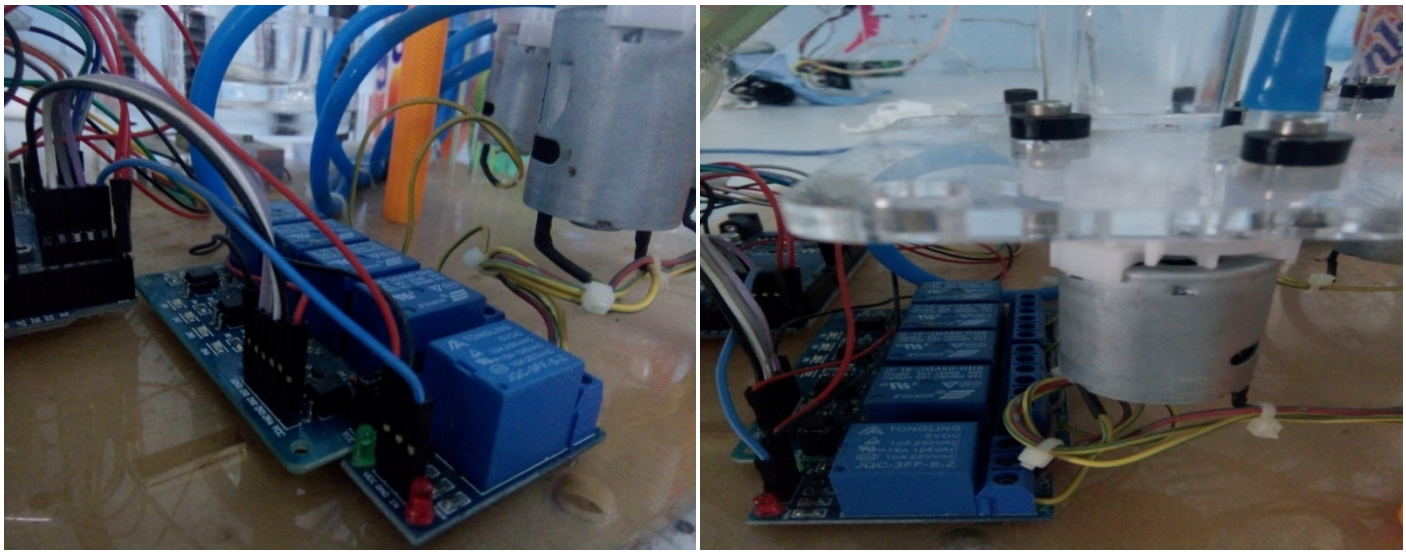

Figure (5) Relay module and water pump motor

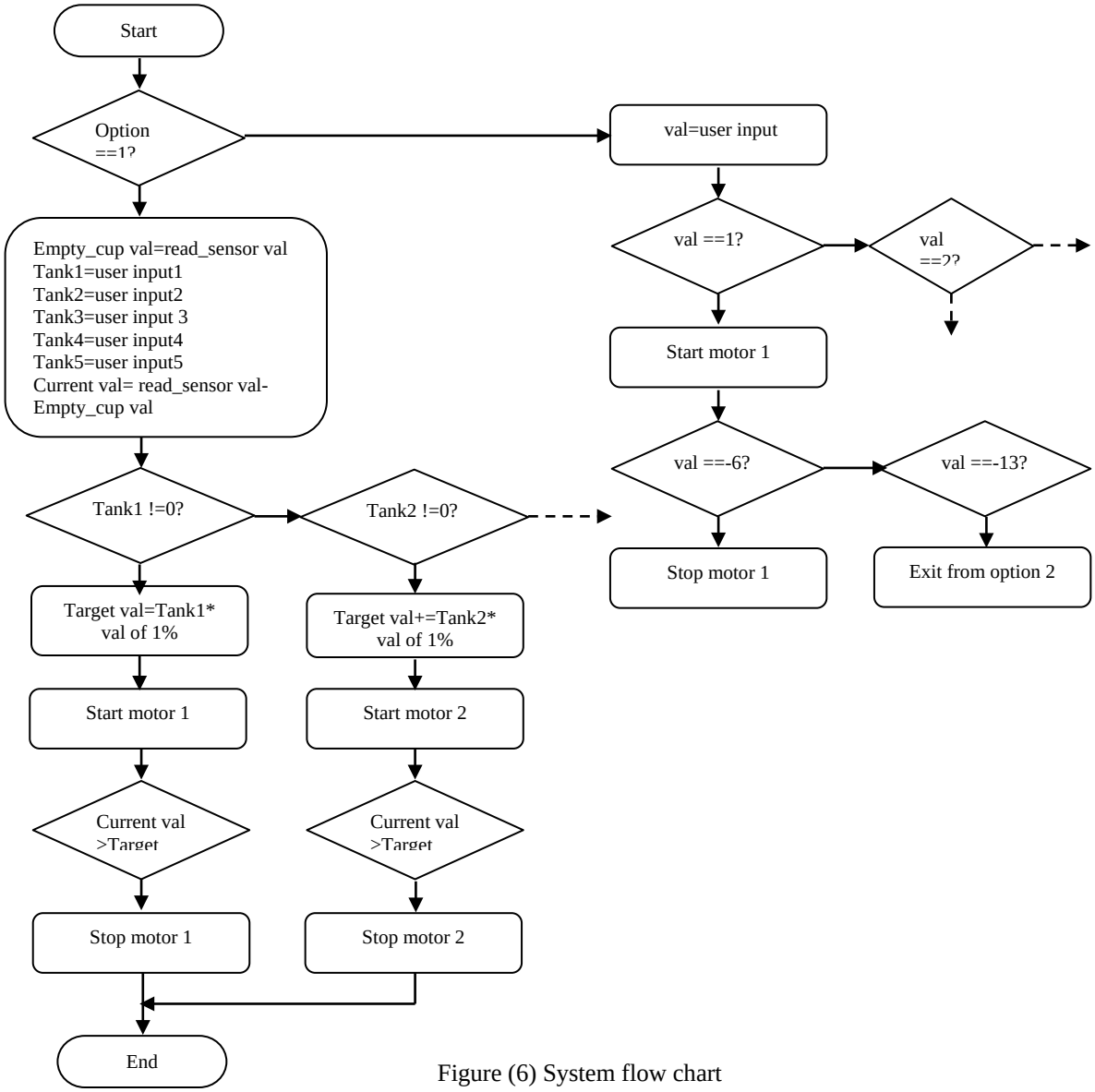

Figure (6) System flow chart

IV. TEST AND RESULT

In this section, the testing results of juice mixer machin are shown step by step. In this proposed system, the user has a favor to drink 5 channel ingredients such as lemon, coca cola, lychee, sparkling and orange juices. If the user selected the option 1 and desires to drink only 75% of lychee juice, he has to enter juice content number (75) of channel (tank) 3 from keypad. And then the machine will fill the desired amount of lychee juice in glass automatically. The step by step processing statements are shown in Figure (7).

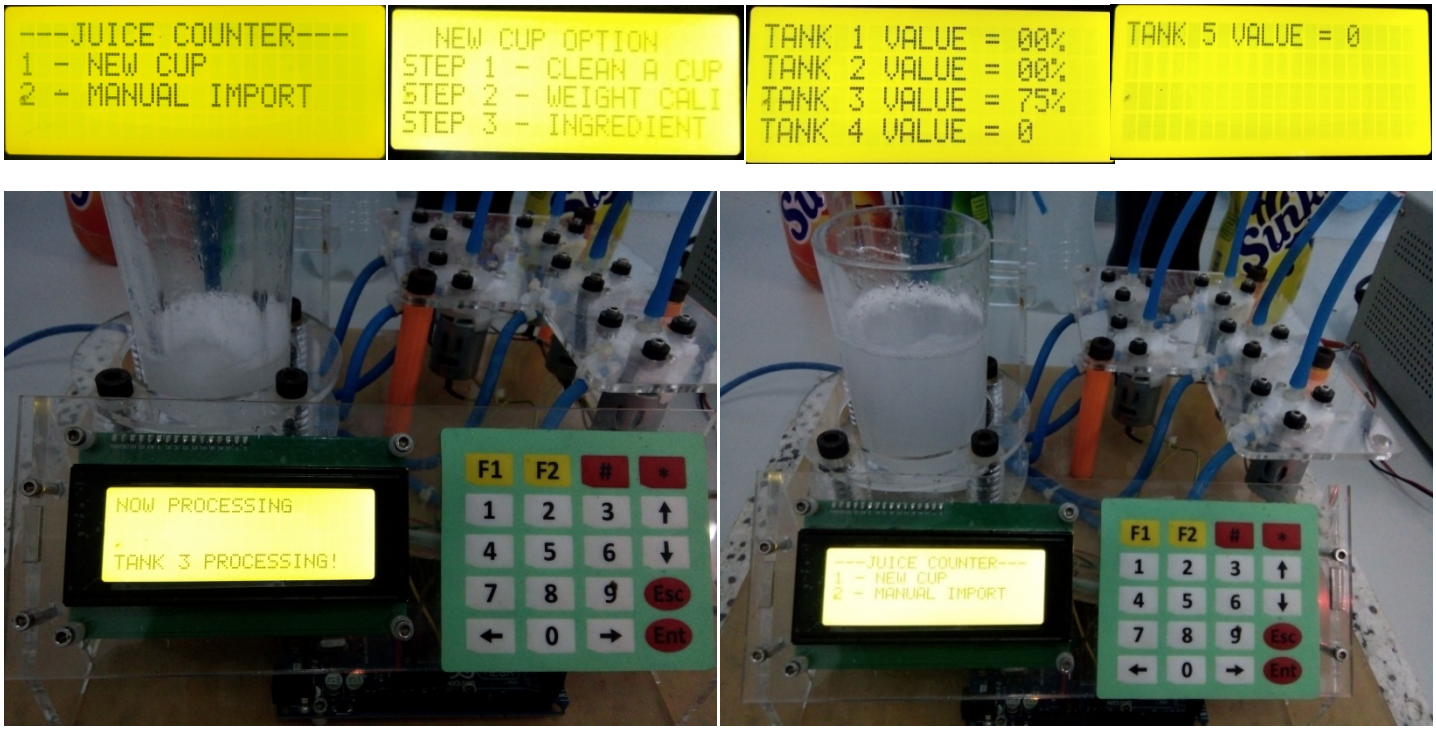

Figure (7) One channel juice filling process

If the user wants to mix the 15%of coca cola and 15% of lychee juice, he has to enter the desired channels and values from the keypad. The machine will stop the water pump motor at the 30% of ingredient in glass automatically as shown in Figure (8).

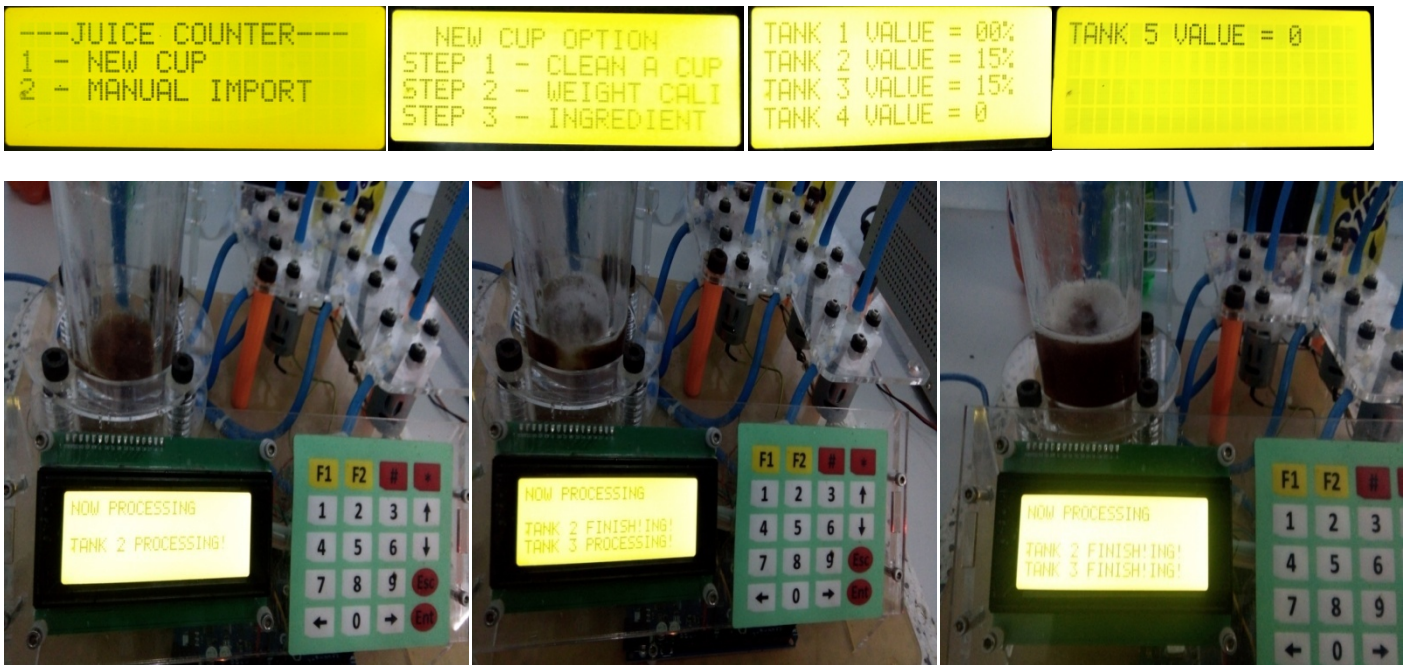

Figure (8) Two channel juice mixing process

Otherwise, if the user selected the option 2, he must control the juice content manually by pressing the * key from keypad. Figure (9) show channel 5 orange juice filling process manually. In this option, the user can also get mixed drink as the option 1 by entering desired channel number sequentially.

Figure (9) Manual import operation

V. CONCLUSION

The juice mixer machine provided a very satisfactory performance with a minimal percentage error. The utilization of a microcontroller has been accomplished in the form of Arduino Mega 2560.The decision to use the Arduino was based on the elimination of external programmer problem and optimization of the juice mixer machine. In addition to this, the utilization of the various proposed components such as weight sensor module, relay modules, dc pump motor, LCD and keypad. For future studies, I would like to recommend considering additional features that will maximize the use of microcontroller, such as increasing the channel, adding the ingredient menu, replacing the pump for juice with gas, eliminating the weight calibration based on a cup.

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AUTHOR

First Author – Naing Kyaw Soe, Lecturer, Pyay Technological University, naingkyawsoee@gmail.com.