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Faculty Of Engineering And Information Technology

Computer Engineering

Milky Moods Machine

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Abstract

This graduation project report presents the design and implementation of a multi-package machine for filling and closing bottles of milk that contains three flavors. There will be three tanks, each tank containing a specific flavor of milk. The milk will be filled according to the person's request, also according to the person's request, via the keyboard and LCD. The container will be lowered onto a moving place on a tape. It moves to the desired flavor, fills it, then close it and gives it to the person

1 Introduction

1.1 Problem

With the development of technology, machines have become more essential than relying on workers, and in our project we tried to integrate more than one feature and task into a single machine. We created a model of a production, filling, and closing line with the three features within a single machine

1.2 Objectives

The goal of the project is to develop a production, filling and sealing line that is easy to use, saves time and effort, and makes it easier for workers to manage things in factories. In addition, by making the machines easy to use and understand, individuals with limited knowledge can use and move the machine.

1.3 Scope of the work

The scope of this project includes the design, development, and implementation of a Milky Moods production line machine that will help the factories save time and effort by pressing a button on keypad that is connected to LCD that includes multiple flavors to choose from, depending on the worker choice the bottle move to the bumping spot and be filled with the chosen flavor then move again to the last spot where it will be closed and ready to be shipped and also you can choose the flavor using our app, The machine will also include sensors to monitor inventory levels and ensure that items are replenished as needed, The project will be completed within a specified timeline and budget and will include testing and maintenance to ensure that the machine functions reliably and efficiently.

1.4 Organization of the report

This report is organized into several sections to provide a comprehensive overview of the milky moods production line machine. The report begins with an introductory chapter that contains subsections such as Problem, Objective, Scope of Work, and Report

Organization. The second chapter is the Constraints section, followed by a Literature Review chapter.

The third chapter is the Methodology section, which describes the specific methods and approaches used in the project, including the design, development, and testing of the machine. The fourth chapter is the Results and Discussion section, which presents the findings from the testing and evaluation of the machine and discusses the implications of the results.

Finally, the report concludes with a Conclusion and Future Work section, which summarizes the key findings and recommendations from the project and discusses potential future improvements or extensions to the machine.

2 Constraints and Earlier coursework

2.1 Constraints and limitation

Here are some examples of the constraints we faced while working on our project:

- **Time limitation:** We found it very challenging to build this project during second semester, because it was the first time that we had to build such a machine that contains many electronic parts, needed a lot of power, and different levels of voltage (3.3v, 5v,12V), consisting of hardware components that we do not have sufficient knowledge about, we had to identify the components and know how to use them, and identify the connections, as well as get to know the Arduino and write codes for the hardware, and then build a complete system works properly. It was a little difficult because we did this under the pressure of a summer semester, where we had other commitments like subject projects and assignments.
- **Precision and accuracy:** Our project included some mechanisms to make sure the bottle closes correctly and also moving the bottle through the track and stopping at the right spot and filling the bottle with right amount of liquid and not to spill out. Many mechanisms require high levels of precision and accuracy to function properly. This means that the parts must be manufactured to tight tolerances.
- **Size and weight:** We struggled a bit with the design of our project because of the size and weight. Mechanisms must often fit within specific size and weight constraints. This may be due to space limitations in the device or machine, or because the mechanism needs to be lightweight to reduce energy consumption or increase portability.
- **Power distribution:** Power distribution: As mentioned before it was the first time we built such a machine that contained many components and every component needed a different amount of voltage level and power. For example, we used LC and the Keypad that needed 5v also the motor that move the bottle need 12volt and the air push that move the bottle to the closing spot need 220volt finally the closing bottle machine need 220volt.

2.2 Earlier coursework

We took some beneficial courses under our education phase in computer engineering, we took several courses such as digital design, microprocessors, electrical circuits, electronic circuits, and microcontrollers, which helped us build this system. Moreover, we have taken some online courses for our needs to get the work done and we learned several basics about Arduino and writing codes.

3 Literature Review

We reviewed several previous automated producing lines machines to take advantage of them in building our graduation project but the special about our project that our machine is specifically for milk flavors and it can fill up the bottle and close it automatically

in this part of the report, we will talk about some of the machines that we found.

- **MECHANICAL ENGINEERING DESIGN PROJECT CLASS:** The automatic bartender will hold 2 liquors and 2 mixers. When the user selects the option to make a drink, the device will pour out the required amounts of liquid into a container, via tubing that feeds into the container. The container has an internal stirrer to mix the components together, and then empties into a cup. The end result is a finished cocktail, and the machine is designed for residential use. [1]
- **Automatic Coffee Drink Mixing System Based on Total Dissolved Solid (TDS) Level:** Coffee is a beverage ingredient that is not only famous in Indonesia but also famous throughout the world. It is because ground coffee or brewed coffee has a distinctive aroma that other beverage ingredients do not have. Roasters, brewers, and baristas need data regarding coffee extraction to measure and control the coffee extraction level so that ordinary people who do not understand the coffee extraction process can also know. With an automatic coffee maker system, the TDS sensor will become a parameter tool for the accuracy of the extraction value. Arduino Uno is a microcontroller based on Atmega328. The DS18B20 temperature sensor has a function to measure the temperature of the water and the temperature of the coffee grounds. Moreover, the relay functions for the pump motor, heater, and stirrer motor and supports this automatic coffee system. [2]
- **DESIGN OF AN AUTOMATED MONITORING AND CONTROL SYSTEM FOR THE SOFT DRINK CAPPING MACHINE AND PROCESS MIXER Methodology:** This paper is based on bottling process optimization through continuous improvement. A case study was done at XYZ company. The Six Sigma Define, Measure, Analyze, Improve, and Control (DMAIC) methodology revealed that the bottling and capping processes were producing defects at 3 Sigma level. The 5 Whys, Pareto chart, fish bone diagram, and Suppliers, Inputs, Process, Outputs, Customers (SIPOC) model showed that loose-capped bottles (31.6%), under-fills (29.2%),

and empty bottles (28.9%) caused the highest cost through poor quality. The monitoring system was designed to monitor the applied torque value, the capping head status, and the beverage temperature upon leaving the heat exchanger. The cooling system on the mix processor was designed using the closed loop control strategy. If the beverage temperature is not within 1 or 2 degrees Celsius, it is directed to secondary cooling; otherwise, it proceeds. The glycol inlet valve is actuated such that the flow of the coolant is adjusted to ensure that the primary cooling is efficient. The results show that it is possible to operate production within the Six Sigma level. [3]

4 Methodology

4.1 Technical Choices

4.1.1 Arduino

The Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, 32k Flash Memory, 1 UART (hardware serial port), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. The Uno R3 also adds SDA and SCL pins next to the AREF. Additionally, there are two new pins placed near the RESET pin. One is the IOREF, which allows the shields to adapt to the voltage provided from the board, and the other is a not connected pin reserved for future use. The Uno R3 works with all existing shields but can adapt to new shields that use these additional pins.



Arduino 1

4.1.2 libraries

- LiquidCrystal_I2C: The library allows to control I2C displays with functions extremely similar to Liquid Crystal library.
- Keypad: We had included it to be able to use Keypad.

- ESP8266WiFi: We had used this library to make application which can send commands to the machine and receive data from it.
- SoftwareSerial: The SoftwareSerial library allows serial communication on other digital pins of an Arduino board, using software to replicate the functionality.

4.2 Methods and techniques

4.2.1 Electronic Components

- LCD with I2c and Keypad: we use as another way to order the drink.



Lcd with I2c and Keypad 1

- H-bridge: To control the DC motor



L298N Dual H-Bridge Motor Drive Module B 1

- At the first We use it with application to order from it, second we use it to send an notification if any of the item is finished to refill it and it's connected to the Arduino and it use serial communications.



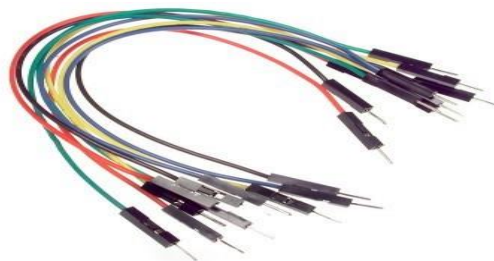
Esp8266 1

- power supplies: we use to give one voltage to more than one amperes divided as we explain before.



Power supply 1

Arduino wires: We used three types of Arduino wires which are male to male, male to female and female to female.



Male to Male 1



female to female 1



female to male 1

- USB A to USB B cable for Arduino Mega: This cable connects the Arduino with Laptop.



USB A to USB B cable for Arduino uno 1

- Relay: electrically operated switches that open and close the circuits(pump) by receiving electrical signals from Arduino,

when the main component finished ->close circuit ->pump on->re fill



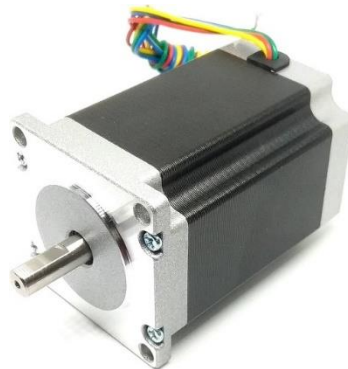
Relay 1

- Pump: three pumps to fill in the bottles



Pumps 1

- DC motor: to move the bottle to pumping spot.



DC motor 1

- Ultrasonic distance sensor: we use it if there is a good amount of main component and the flavor in the smaller tank to know when to re fill.



Ultrasonic distance sensor 1

- Air pressure regulator : we used it to divide the air pressure between the bottle pusher and the bottle closer



air presure controller 1

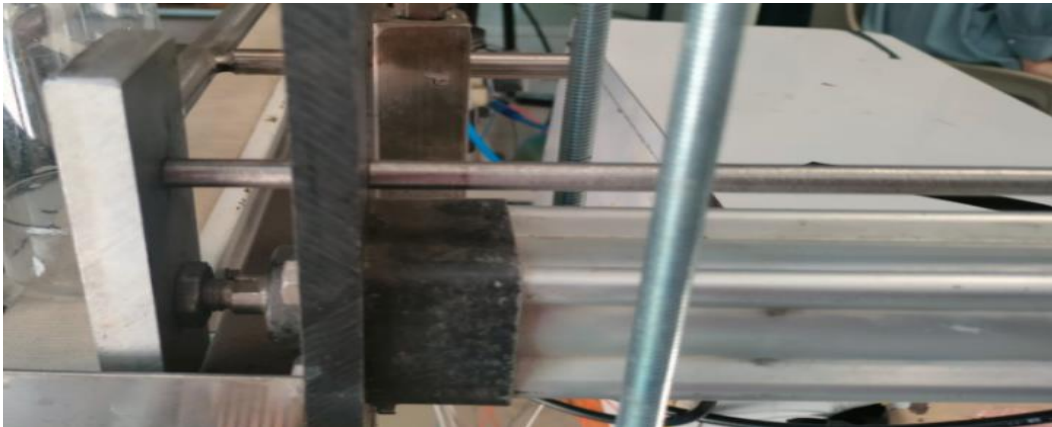
- Solenoid valve air: work as airflow control opens and closes the air path based on electrical signals, allowing or blocking airflow.



- Electric Cap Screwing Machine :to close the bottle in the end of process

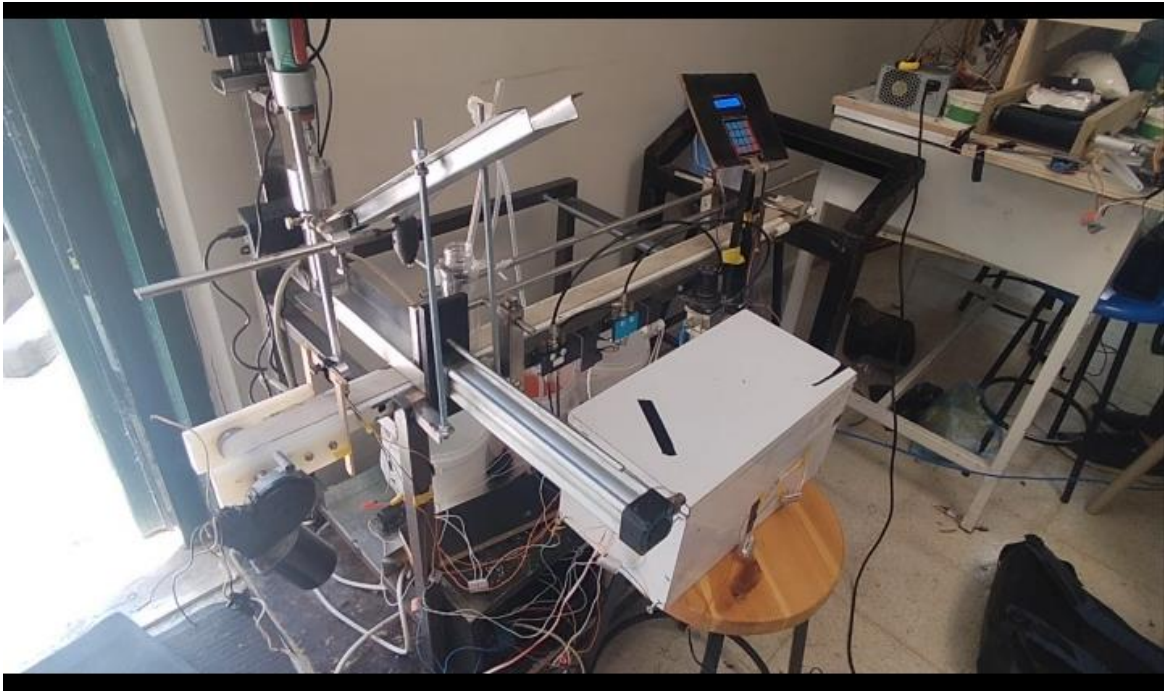


- Hydraulic Pusher: drive the bottle to the closing spot



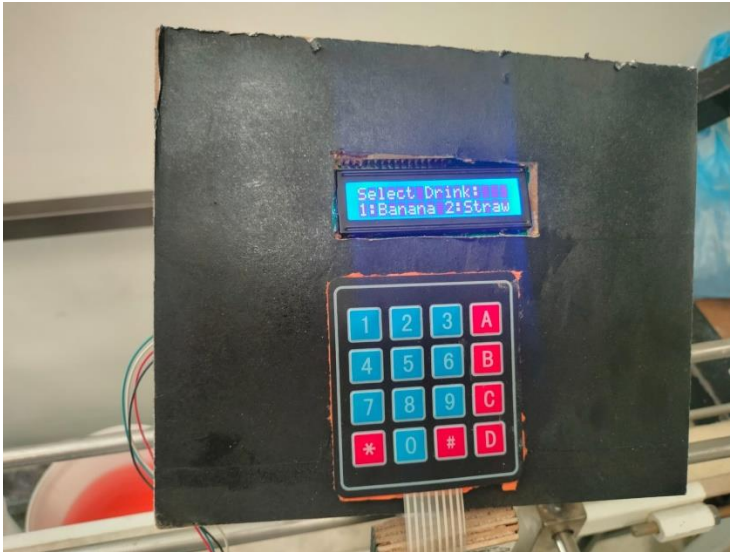
4.2.2 External design

The whole production line machine design is shown below at first we have 3 tanks fill with three milke flavour ultrasonic sensor to measure the item amount to know when to send an refill email to the admin. we also used a DC motor to move the bottles to the pumping spot ,also we have a hydraulic pusher to move the bottle from bombing spot to take a bottle cover Then continue to the closing spot, Finally in the clothing spot we used Electric Cap Screwing Machine To close the bottle.



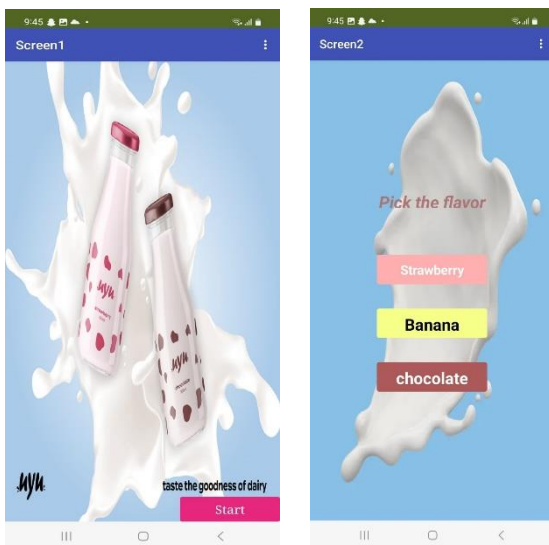
Fall Design 1

Front the machine we have the first way of order that's LCD-Keypad as we shown below:

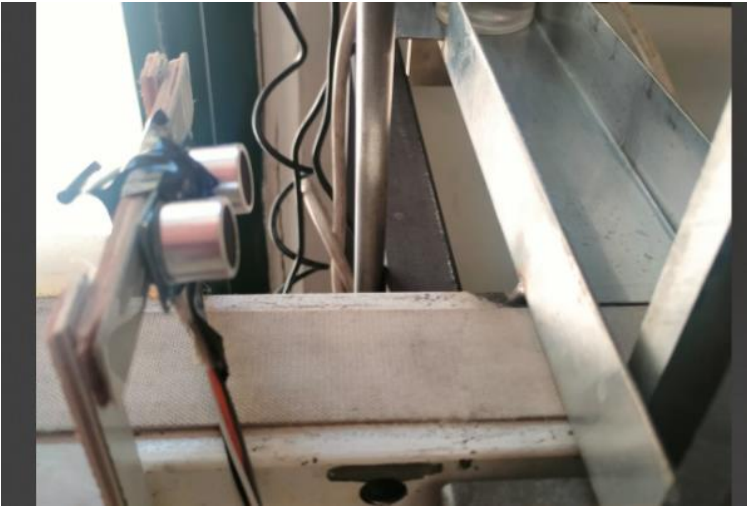


Keypad ordering 1

The application : it's the second way to order In our machine as the picture below



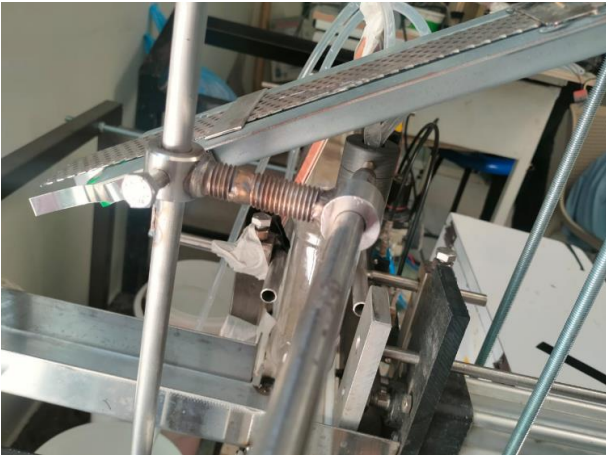
We put a sensor to feel the bottle when it arrived the pumping spot when it arrived the dc motor will stopped



We have three tank with three pump filled with three flavor of milk as seen below :



In this part we put the bottle cover when the bottle is moving by the hydraulic pusher to the closing spot it will take the bottle cover from this in the picture below :



Finally the closing spot the bottle will arrived it with the cover on it and the Electric Cap Screwing Machine will close it and make it ready to ship it



Also we have a notification system as we have an gmail will send from the ESP when the tanks contents almost finish

To make the adminstratour fill it a gain

5 Results, Analysis and Discussion

we successfully build a fully automatic production line that is easy to use even with language barrier and low knowledge of technology the

machine provide two ways of ordering first using the app the second using the LCD-keypad which is also easy to handle we can select from three milk flavors depending on the worker choice. During testing, the inventory levels were monitored using advanced sensors integrated into the machine.

These sensors effectively detected when items were finished, allowing for the machine to refill automatically. Another functionality of our project is that when the items are finished there will be a notification that will be sent to the owner that one of the items is finished and if it is one of the flavors it has to refill manually. Through the implementation of this milky mood vending machine, we aimed to help factories save time and effort and enhancing the quality. While our project was successful overall, we did encounter some challenges and limitations. One of the constraints we faced was the time limitation. Building such a complex machine with multiple electronic components required extensive research, learning, and troubleshooting.

Balancing this project alongside other coursework and commitments proved to be demanding. Precision and accuracy were critical factors in the design and implementation of our machine including some mechanisms to make sure to drive the bottle to accurate places to fill it with the items and this item has an accurate amount of the items. Power distribution was also a challenge due to the varying voltage requirements of different components. To address this, we utilized a switching control power supply to provide the necessary power and voltage levels for the system to operate effectively and it was hard considering that some of our equipment required high amount of voltage such as 220 V which is highly dangerous .

6 Conclusions, Recommendation and Future Work

In conclusion, the development of the milky mood vending machine saves a lot of time and effort and money.

The integration of sensors to monitor inventory levels and system status adds an extra layer of efficiency and convenience. The automated

notifications sent to the owner about the items finished ensure a timely reduction of the risk of stock outs

Overall, this graduation project successfully demonstrates the feasibility and effectiveness of the milky mood with helping factories produce more, faster and better

in the future we can update some of machine features like add more flavors and we can make the machine faster and take more than one order at the same time

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