An-Najah National University

Faculty of Engineering & Information Technology

Presented in partial fulfillment of the requirements for

Bachelor degree in Computer Engineering

Graduation Project 2

Cocktail Machine

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August 29, 2023

Acknowledgment

We appreciate Dr. Ashraf Armoush, our supervisor, for his essential help and guidance on how to make our project better. We would want to express our sincere appreciation to our family, friends, and anybody else who helped or encouraged us on this trip.

Disclaimer Statement

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Contents

List of Figures

Abstract

Cocktail machine is a fully autonomous system from ordering the juice to getting it. Since our machine is independent so no need for a worker to make cocktails therefore it saves money and effort. Also, our machine is easy to use and safe. for these reasons, this machine can be used in schools, universities, and institutions providing them with a fresh and healthy drink instead of the coffee machine.

Our machine is connected to a mobile application to allow the client to choose the drink he wants. The client can choose between predefined drinks or customized drinks as he prefers by using a keypad and LCD or ordering by mobile application. After choosing the drink the client will pay using RFID then the machine will start the process by getting the fruits in the correct quantity and then putting the fruits in the blender with liquid juice (to make it easy to mix) and mixing them all. After mixing it will pour the cocktail into cups (we have two sizes of cups, and the client chooses between them). And finally, clean the mixer and prepare the machine for the next order.

In our project, we utilized an Arduino Mega microcontroller in addition to an ESP32 module. We handled the interaction with additional devices like a blender, pumps and valves. Moreover, we handled multiple types of motors: stepper, DC and servo motor. We used multiple sensors to make sure that everything is done in the right way and to achieve good accuracy. We used ultrasonic sensor to measure the level of fruits and juice so that when it becomes less than the minimum level it gives a notification to refill the substance. Additionally, a weight sensor is used to make sure of the right quantity of each fruit according to the drink that has been chosen by the client. We used IR sensor to make sure that there was a cup and that it was in the right place to pour the drink.

Chapter 1

Introduction

1.1 Statement of the problem

The Cocktail Machine is in contrast to conventional coffee makers, it strives to produce drinks that are healthy and fresh for consumers. It resolves issues with other drink dispensers. The problem is that customers cannot completely control how much of each component is added to their drinks using the machines. Additionally, they don't support ordering drinks through mobile apps, and they don't provide real-time information on what is inside and how much of a substance is remaining.

1.2 Objectives of the work

Making a new drink dispenser that works better for people today is the aim of this project. We're launching a mobile app so consumers can order and pay simply, and we want to give them more control over how their drinks are created. We will also receive real-time updates from the machine regarding the sensors' readings and how much of each ingredient is still present. Both customers and admin will find it easy with our help. Our goal is to address the issues with the present drink dispensers and meet consumer demand for customized, tech-friendly experiences in the food and beverage sector.

1.3 Significance of our work

People are asking for drinks that are easy to buy and easy to modify in increasing numbers. People demand control over the ingredients used in their drinks because they are more concerned with their health. Mobile ordering for meals and drinks is also becoming more and more common. Our device can satisfy these requirements. The operation of drink dispensers may be significantly impacted by what we're doing. We are creating something unique and useful that people will want because they want to customize their drinks based on their preferences. Our machine might greatly enhance things for everyone.

1.4 Organization of the report

This report is organized into several sections. The introduction provides an overview of the project and its objectives. The second section describes the scope and boundaries of the work. The third section outlines the methodology and procedures followed in completing the project. The fourth section presents the results and findings, including any challenges encountered and how they were overcome. The fifth section discusses the significance and potential impact of the project. Finally, the conclusion summarizes the key points of the report and provides rec- ommendations for future work. Appendices are also included to provide additional information and data relevant to the project.

Chapter 2

Constraints, Standards/ Codes and Earlier course work

2.1 Constraints

Through designing and building our machine, we faced multiple constraints:

1. Power supply - Our machine contained several electrically powered components, such as a blender that required 220 volts. motors, pumps, and valves that required 12 volts. LCD and HX711 need 5 volts. Using the power supply from an old computer, which had both 5 volts and 12 volts, we were able to resolve the problem. We used standard household or lab electricity for 220 volts.

2. Arduino - We initially decided to control the machine with an Arduino Mega. The one we received had a problem. On its digital pins, it provided 3.3 volts for a high signal and 1 volt for a low signal rather than 5 volts for a high signal and 0 volts for a low signal. The relays in charge of the pumps, blender, and steppers experienced issues as a result. They did not receive the required 5 volts. We swapped out the Arduino Mega for a new one that provided the correct voltage to fix the issue. The Arduino Mega pins weren't enough for our project, so we decided to use an Arduino Uno in addition to Arduino Mega to finish it.

3. Stepper motor - At first, we attempted to rotate the disk containing the components using the Nema17 stepper motor that had previously been utilized, but it was unsuccessful. and we employed welding to secure the stepper to the disk; but, as a result, the stepper's coils were destroyed by the welding process, which in turn caused damage to the YS-DIV268N driver. We had to use another stepper to complete the job after much testing.

4. Wiring - The wires continued to be separated during the movement, so the solution was to install them by welding and then using silicone.

2.2 Standards and Codes

Using the C++-written Arduino IDE, which includes libraries and functions like Keypad.h, LiquidCrystalI2C.h, wire.h, HX711_ADC, Servo.h, etc., we created the system's software components. Blynk was used in the creation of the user interface. The system's software components were designed and implemented according to hardware components standards and guidelines.

2.3 Earlier coursework

The electronics course provided a foundation in fundamental electronics concepts. This was really helpful to us when we built and fixed the hardware components of the machine, such as the sensors, motors, valves, and pumps.

The microcontroller utilizing PIC controllers' course was really useful. It gave us a wealth of information on programming microcontrollers, which was essential for creating our machine using the Arduino Mega. We also learned how to connect different components and how to use tools like I2C and PWM. This knowledge allowed us to write the project's main piece of code, which runs on machines.

We were able to develop the machine's networking infrastructure as a result of the networks course's teaching of communication protocols and networking basics. This was crucial since we needed to develop a solution that would enable users to control the machine remotely via an app and become familiar with using an ESP device.

The ability to approach the project methodically and make wise conclusions was provided by the Critical Thinking course, which was crucial to the project's success. The course helped us develop critical thinking abilities that enabled us to recognize potential problems, examine them, and come up with workable solutions. This became even more crucial as the project progressed and we encountered design and power-related challenges.

Chapter 3

Literature Review

The development of an autonomous juice vending system and the technical innovation have given birth to our hardware graduation project- an autonomous cocktail dispensing system that exceeds the conventional models of drink provision. This project illustrates a comprehensive approach to redefining the drinking experience, including the full process from order placement to drink delivery. By eliminating the need for human presence, this fully autonomous system not only saves money and labor but also highlights the project's commitment to ease of use and safety. The impacts of such an innovation are especially useful in educational institutions, where the transfer from typical coffee machines to an autonomous, customized, and health-focused alternative.

Barron Noel, Mulder Luke, and Hieltjes Ben developed the “Bartini automated drink dispensing system”. It is an entertaining solution in the amenities industry that will automatically pour a mixed beverage based on input from a user. By use of a graphic user interface (GUI), a user can request any number of predefined drink recipes or create their own based on the liquids available in the machine. Valves, motors, and the software-based GUI are controlled by a single embedded processor system and work together to produce the product (Barron et al., 2016).

An “IOT-based SMART AUTOMATIC JUICE VENDING MACHINE” was created by the student Sarvesh Pandey and the assistant professor Mrs. Manjiri. M.Gogate in SLRTCE, Maharashtra University in India. This project is based on the Internet of Things (IoT) which aims to provide a smart juice vending machine for the people. And it provides different kinds of fresh and cool juice. A juice vending machine is a machine that gives out different kinds of fruit juice when a person inserts a coin into it, therefore it is a coin-based vending machine (Pandey & Gogate, 2017).

Kwangsoo Kim, Dong-Hwan Park, Hyochan Bang, and Geonsoo Hong introduced a smart coffee vend- ing machine that automatically measures its own indoor environmental conditions and controls the amount of coffee, sugar, and powdered coffee creamer to make a cup of coffee according to the customer’s preference on taste. The study shows the potential for sensor and actuator networks to improve the customizability of coffee vending machines, which is a goal of the Caffeine Shot Machine.(Kim et al., 2014)

In our project patrons can choose from a menu of predefined or customized drinks by integrating with a keypad or smartphone application, and then pay using RFID technology. To achieve an accurate and integrated system we need various sensors, including ultrasonic and weight sensors, to ensure accurate ingredient quantities, while others guarantee cup presence and placement, culminating in the seamless delivery of the desired beverage. Also, in “IOT BASED SMART AUTOMATIC JUICE VENDING MACHINE” they used a juice level sensor for measuring the juice level in the reservoir tank, a solenoid valve was used for juice dispense, and the data were sent wirelessly to the cloud over the internet using ESP-8266(Pandey & Gogate, 2017).

The most well-known vending machines created using IoT-based technologies include smart computerized vending machines, smart automatic juice vending machines, and vending machines with cashless payments for snacks. Some of the newly created devices incorporated a PIC microcontroller as the system's brain and read information from an RFID reader.(Ratnasri & Sharmilan, 2021)

In the context of vending machine research, our project stands as a creative step forward, sharing a common thread with past studies but introducing a unique strategy that differentiates it. While the fundamental concepts of vending machines are there, the originality of our proposal resides in its emphasis on using raw fruits to produce healthier drinks, a departure from the traditional options provided.

Chapter 4

Methodology

The hardware components used for building the system, their interconnections, and the overall system design will all be covered in this chapter. Additionally, we will go through how the system functions as well as how the software, mobile application was implemented.

4.1 Hardware Components

4.1.1 Microcontrollers

Arduino Mega 2560

A microcontroller board based on the ATmega2560 is called the Arduino Mega 2560. It contains 16 analog inputs, 4 hardware serial ports (UARTs), a 16 MHz crystal oscillator, 54 digital input/output pins (of which 15 can be used as PWM outputs), a USB connector, a power jack, an ICSP header, and a reset button. because of its extensive collection of features, it is an all-inclusive microcontroller solution for our project's demands. Considering how many connected devices must connect to the microcontroller

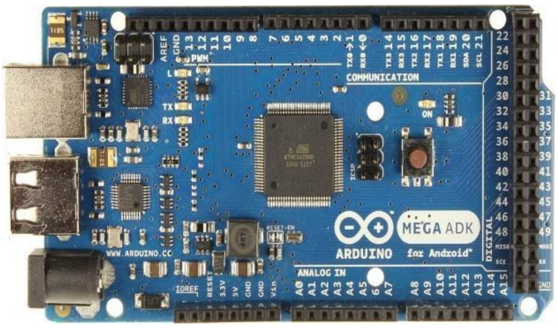

Figure 4.1: Arduino Mega 2560

ESP32-DevKitC ESP32-WROOM-32U Core Board

ESP32-WROOM-32 is a powerful, generic Wi-Fi + Bluetooth® + Bluetooth LE MCU module that targets a wide variety of applications, ranging from low-power sensor networks to the most demanding tasks, such as voice encoding, music streaming and MP3 decoding.
In our project we used it to connect to Wi-Fi and run a mobile application.

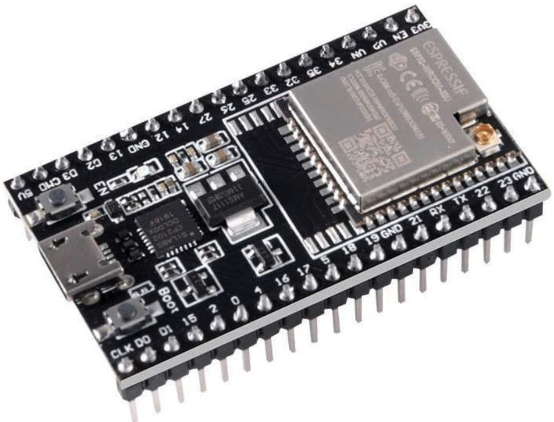

Figure 4.2: ESP32-DevKitC ESP32-WROOM-32U Core Board

4.1.2 Motors and drivers

Servo motor

A servo motor is a type of motor that can rotate with great precision. Normally this type of motor consists of a control circuit that provides feedback on the current position of the motor shaft.
A servo motor usually comes with a gear arrangement that allows us to get a very high torque servo motor in small and lightweight packages.
In our project, we used Micro Servo motors, which have a responsibility to close the cover of the blender before mixing the fruit.

Figure 4.3: Servo Motor

J-5718HB2401 Stepper motor and YS-DIV268N driver

A stepper motor is an electric motor that rotates as a result of electrical current flowing through it. Stepper motors can be big in size physically, yet they are frequently small enough to run on milliampere-level current. When the motor is subjected to current pulses, the motor shaft rotates discretely. Stepper motors include input pins or contacts that let current flow into the motor's coil windings from an external supply source. The necessary electromagnetic fields can be produced by pulsing waveforms in the right pattern.this stepper carries a weight load of 20 kg, in our project, the main function of this stepper is for it is rotating the disk that holds the container of fruits.

We utilized a 12A power source and the YS-DIV268N driver to drive the motors. The A and B pins of the driver were used to connect the motor coils, and the equivalent Arduino pins were used to connect the control pins, with the Arduino ground serving as the connection point for the negative pins. A 12A power supply provided the DC+ and DC- pins. We created a program that makes use of the Arduino's pulse width modulation pins to control the motors with code. The enable pin is always activated for each motor, while the direction pin is altered according to the required direction of movement, so initially it will move clockwise, then after each order it will reflect its position to move counter-clockwise until it returns to its original location. The number of pulses can be changed to adjust the amount of movement, while the delay amounts can be changed to adjust the speed.

Figure 4.4: J-5718HB2401 Stepper motor

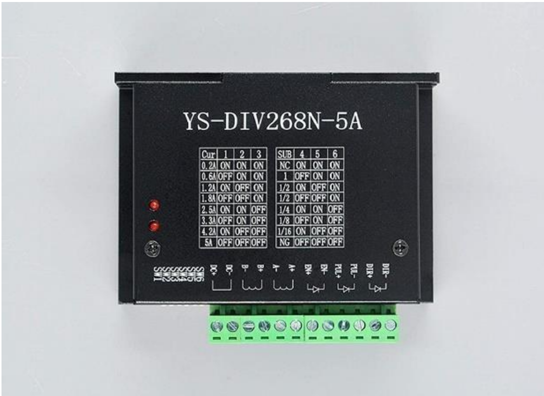

Figure 4.5: YS-DIV268N driver

DC motor and H-Bridge

- An electrical device that transforms electrical energy into mechanical energy. It is made up of a stationary field magnet that produces a magnetic field and a spinning armature that rotates. The armature receives an electric current, which creates a torque that turns the motor.
- We reused a computer disk's DC motor for our project because the 3D-printed cup dispensing element needed a DC motor to be driven. We used an H-Bridge to control how the motor operated. The voltage and current levels of the Arduino are too low to directly control the DC motor, regardless of its ability it can generate a PWM signal. So, between the Arduino and the DC motor, we incorporated a hardware driver called the H-Bridge.
- In our design, the H-Bridge served two purposes. First, it increased the voltage and current levels of the Arduino PWM signal, enabling speed control. In order to offer directional control, it also switched the power supply's pole after receiving the control signal from the Arduino.

Figure 4.6: DC motor - Optical Disk Drive

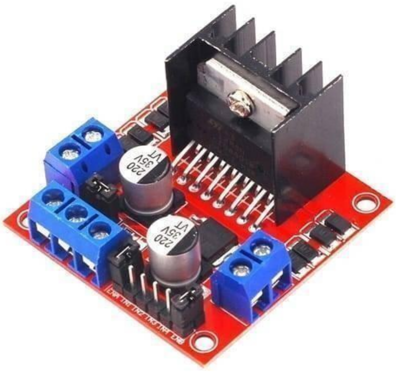

Figure 4.7: H-Bridge

4.1.3 Sensors

IR Sensor Module

An electrical sensor known as an infrared sensor picks up infrared radiation from its surroundings. Based on variations in the infrared radiation that objects emit, the sensor is made to measure the temperature of objects or detect motion. Many different applications, including remote temperature sensing, motion detection, and security systems, frequently employ infrared sensors.

In our project, the IR sensor module was applied to the conveyor belt in three different places. The goal was to find out whether cups were present at the points of cup dispensing, drink pouring, and cup stopping at the end of the conveyor belt.

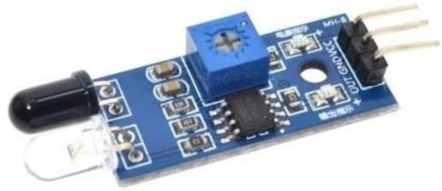

Figure 4.8: IR Sensor Module

Ultrasonic Sensor

An ultrasonic sensor is a device that measures the distance to an object by using sound waves with frequencies above the upper audible limit of human hearing. Ultrasonic waves from the sensor bounce off the item and come back to the sensor. The sensor can determine the distance to an item by timing how long it takes for the waves to return.

In our project, the ultrasonic sensor was used to measure the distance to calculate the number of components still present in the fruit container and the pot that holds the juice and water. The administrator sees this information so they may replenish the materials as needed.

Figure 4.9: Ultrasonic Sensor

Load cell & HX711 module

A load cell is a transducer that converts force into measurable electrical output. A load cell works by converting mechanical force into digital values that the user can read and record. Almost all electronic weighing scales use load cells because of the accuracy with which they can measure weight.in our project, we use a load cell to measure the amount of fruit that we take from the container.

There are 24 high-precision A/D converters in HX711 module. This chip has two analog input channels, an inbuilt amplifier with configurable gain of 128 and is made for high-precision electrical scale and design. A high-precision, low-cost sampling front-end module is excellent when the input circuit is configured to give a bridge voltage electrical bridge (such as pressure, load) sensor type.

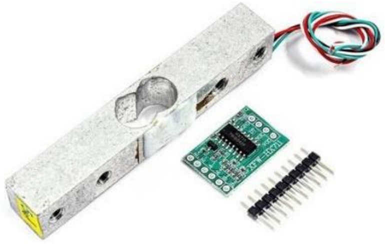

Figure 4.10: Load cell & HX711 module

4.1.4 Input/Output Devices

LCD and I2C

Electronic displays called Liquid Crystal Displays (LCDs) are frequently employed in a wide range of electronic applications. A particular kind of LCD panel called a 20x4 LCD can show up to 20 characters in each of its four rows.

This display is widely utilized in a variety of applications that call for the visual display of enormous volumes of data, including consumer electronics, medical equipment, and industrial automation systems.In our project, we used the LCD 20x4 as an output device to give the client pertinent data and instructions.

This strategy offers a user-friendly interface that makes it simple for the user to interact with the system. In particular, the LCD shows questions and prompts that need input from the user using the keypad. After processing the input, the system displays the proper results on the LCD.I2C Serial Interface Adapter was also utilized.

A tiny module called the I2C Serial Interface Adapter can be used to use the I2C communication protocol to link an LCD display to a microcontroller. By converting the parallel signals from the LCD display into serial signals that can be communicated over the I2C bus, it serves as a bridge between the microcontroller and the LCD display. Because it uses fewer wires and can be controlled by just two I/O pins on the microcontroller, the I2C Serial Interface Adapter makes it much easier to connect an LCD display to a microcontroller. It is also helpful for situations where space and wiring are constrained because it enables several devices to be linked to the same I2C channel.

Figure 4.11: 20*4 LCD and I2C

RFID

Tags and readers are the two halves of the wireless system known as Radio Frequency Identification (RFID). The reader is a portable device with one or more antennas that transmit radio waves and take in signals from RFID tags.
Tags can be passive or active, using radio waves to transmit their identity and other information to adjacent readers. Without a battery, passive RFID tags are powered by the reader. Batteries are used to power active RFID tags.

We used RFID as a method of authority in our project. Customers can order drinks using the standard manner by allowing them to scan their RFID cards. The technology links their individual ID to the requested drink, making payment processing simple,

Figure 4.12: RFID

Keypad

A keypad is a collection of buttons arranged in a matrix, with each button's row and column coordinates used to identify it. For microcontroller-based systems, especially those created using the Arduino platform, keypads are frequently utilized as input devices.
In our project, the keypad has been used as an input device to give clients the choice of their preferred beverage. To do this, instructions are presented in a clear and straightforward manner on the complementary LCD display. The consumer may then confirm their selection by entering the information into the keypad.

Figure 4.13: Keypad

Coupling

Aluminum Flexible Shaft Coupling is a lightweightt coupling and exhibits more strength in class. In our project, we use coupling to connect stepper motors with the containers of fruit.

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Figure 4.14: Coupling

4.1.5 Power Devices

Power Supply

We chose to use a computer power supply since it can offer the required 5 volts for numerous devices and 12 volts for pumps and stepper motors in order to meet the voltage specifications for our project. The power supply also provides a sufficient current output to fulfill the needs of our project.

Figure 4.15: Power Supply

Arduino Power Cable

The Arduino Power Cable is a sort of cable that connects an Arduino board to a power source, such as a USB port on a computer or a wall adapter. Its major duty is to power the board while also allowing for programming and data transfer. In our project, we used the Arduino Power Cable to ensure that the Arduino board received a stable 5-volt power supply, which was required for the board to function properly.

Figure 4.16: Arduino Power Cable

4.1.6 Other Devices

3D Cup dispensing

In our machine, we used a 3D-printed cup dispensing element that acts as a cup separator, allowing one cup to drop through while keeping the stack of cups intact.

Figure 4.17: Cup Dispensing Piece

Conveyor Belt

A conveyer is used to transfer the cups from the dispensing area to the pouring area so that the customer can get his cup and go.

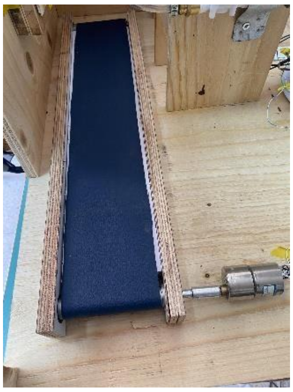

Figure 4.18: Conveyor Belt

Relay

Relays are electronic switches that allow low voltage and current signals to control high voltage and current loads. A specific kind of relay that can be managed by a 5-volt module a 5-volt signal that the Arduino microcontroller can handle. For connecting the load and control signals, these modules normally contain a small circuit board with a relay, an LED indicator, and screw terminals.

Figure 4.19: Relay Module

Mixer (Blender)

We used the blender which is an electronic device that operates on 220 volts and is used for mixing fruits. It is connected to a relay that is controlled by the Arduino, determining when the blender will work.

Figure 4.20: Blender

Fruit Container

This plastic component served as a container for the fruits. and the ball with blades, which is coupled to a stepper motor. When the stepper moves, the fruit falls from it and falls into the blender.

Figure 4.23: Fruit Container

Pumps

for transferring water and juice to blender, and for pouring cocktails into cups and draining the water after washing.

Figure 4.26: Pump

Breadboard

A breadboard was used to connect various components, such as the 5- and 12-volt power supplies, to the electronics that required these voltages.

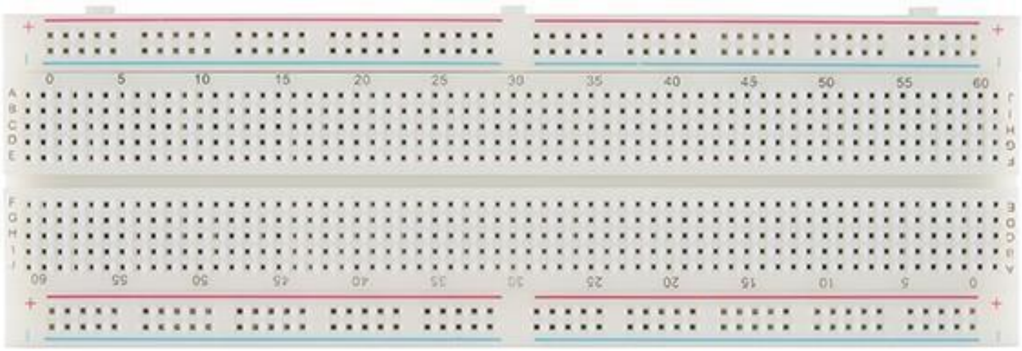

Figure 4.28: Breadboard

Wires

We used 3 types of wires: male-to-male, female-to-female, and male-to-female wires for various connections.

Figure 4.29: Wires

4.2 Software Implementation

The system will begin by presenting the user with two options from which to choose. either normal drink or customized. And the user chooses his preference. If the user selected the normal drink, a list of normal drink contents is displayed to him. and then asked him if he wanted to confirm his choice, but if the user chose to personalize drink, we asked him what kind of fruit he went with and how much of each type he wanted (should enter 0 for types he doesn't want). Before approving the order, the system will check the container of fruits, juice, and water to ensure that there is enough quantity and that the order can be granted.

After the request, we asked the user to enter his card to pay and we check the card balance if it is enough.
Then the disk holding the fruits starts to rotate and chosen fruits will fall directly to the blender.

When all fruits are ready in the blender the disk will rotate to the initial point.

The juice pump will begin pumping juice into the blender, and the servo motor will close the blender's cover. And the mixer begins to work. The cup dispenser will dispense one cup to the conveyer.

The DC motor begins to rotate, causing the conveyer working to transport the cup to the pour point. We used an IR sensor to ensure that the cup arrived at the correct location to pour the cocktail.

It's time to clean the mixer once you've poured the cocktail. To accomplish this, first begin pumping water into the blender, and then restart the mixer.

Finally, the pump and the valve responsible for draining the water will begin to operate, and the water will be emptied.

4.2.1 Flow Chart

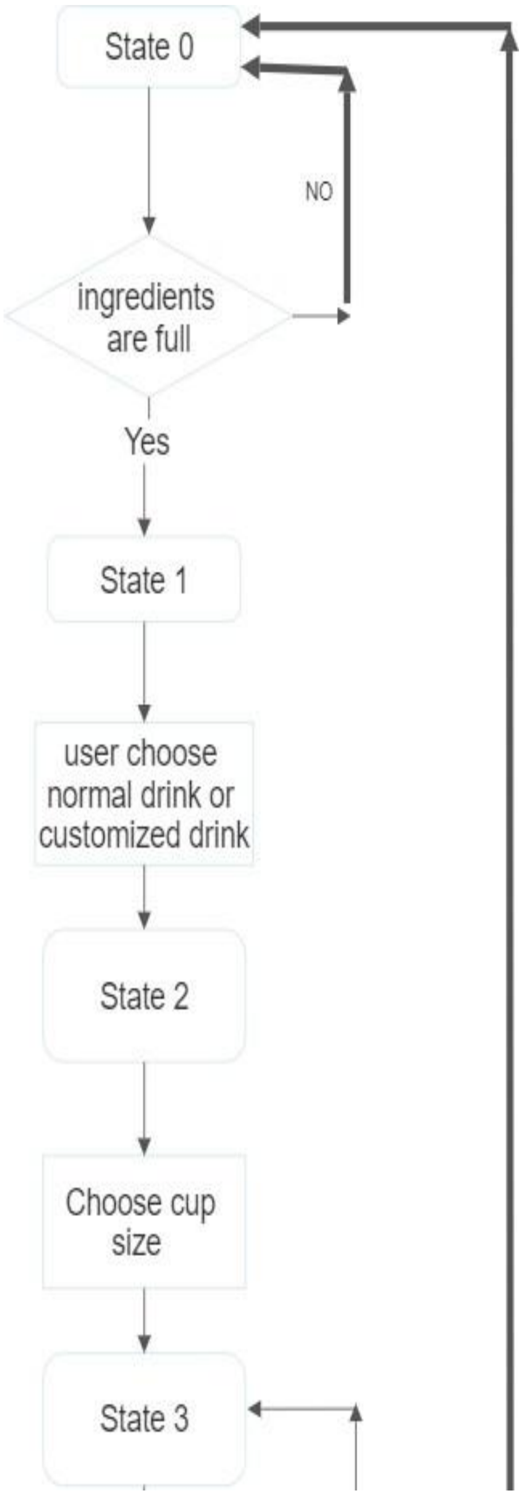

Figure 4.30: Part 1

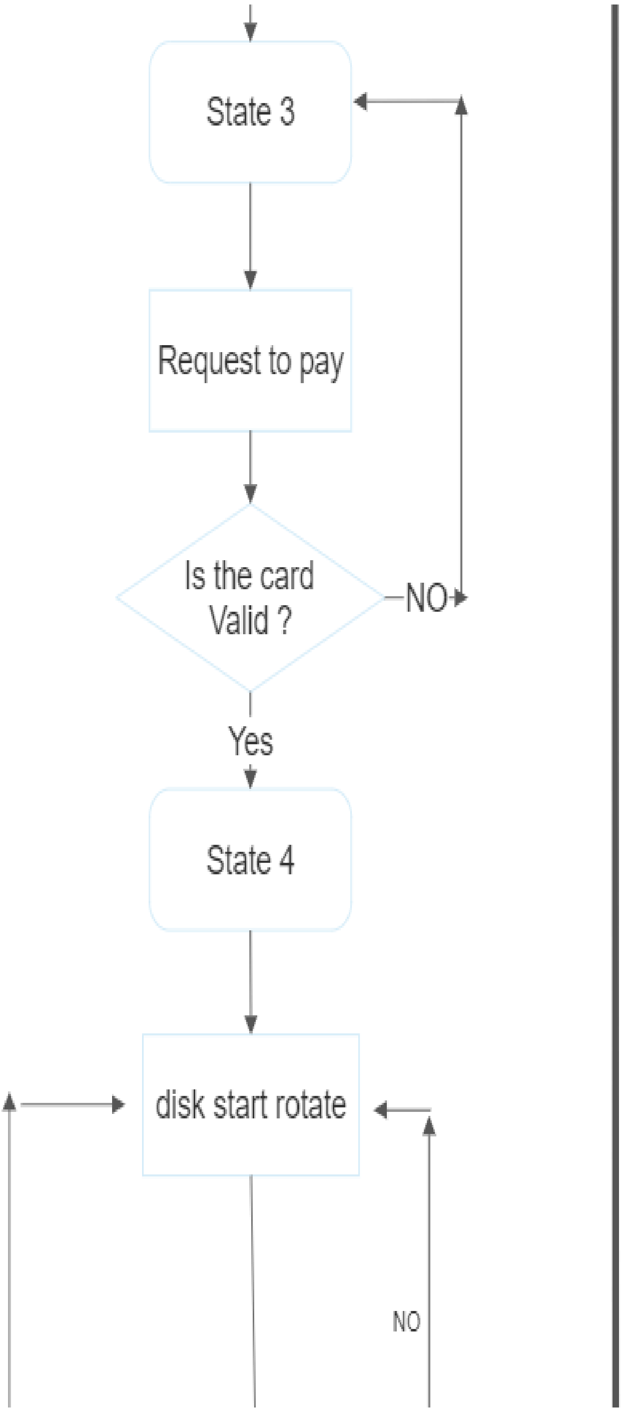

Figure 4.31: Part 2

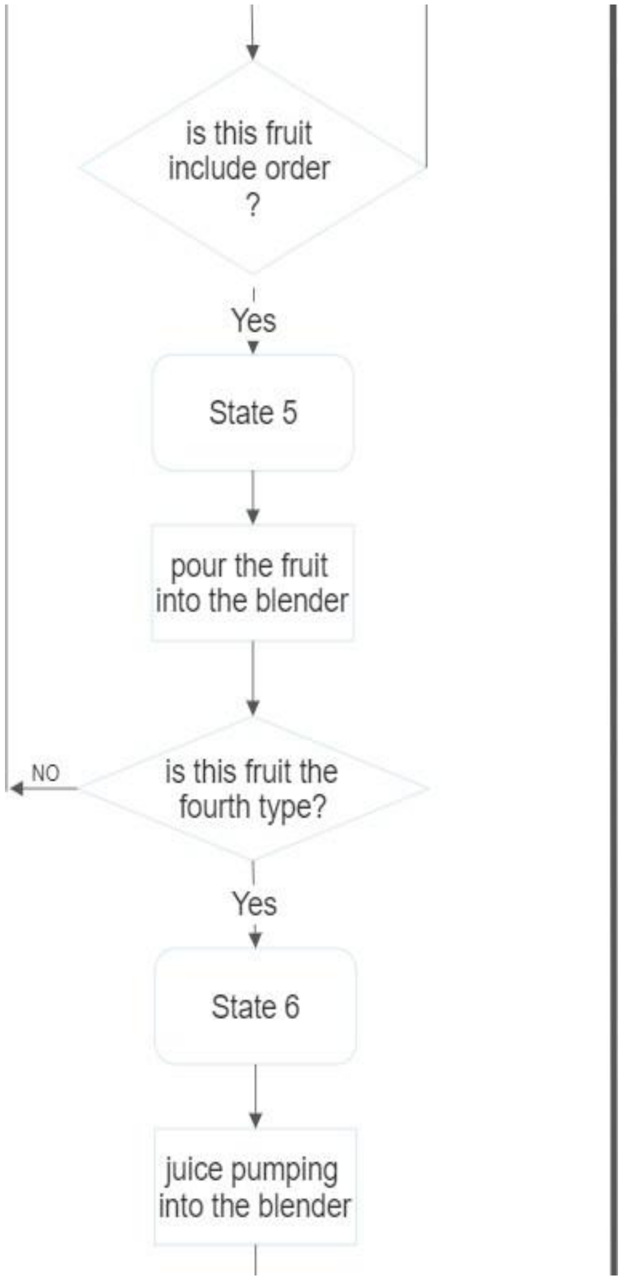

Figure 4.32: Part 3

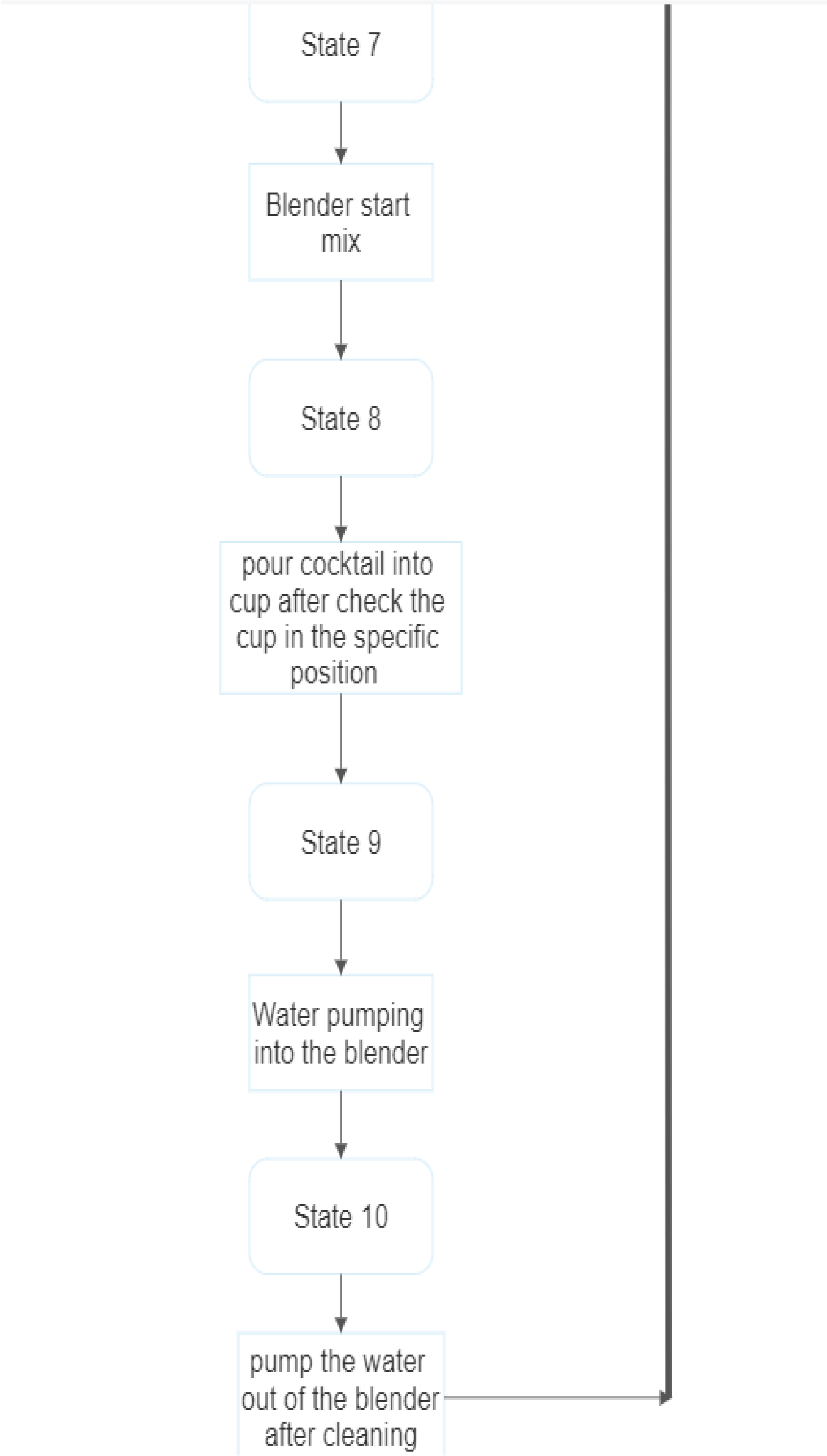

Figure 4.33: Part 4

4.3 Hardware Implementation

4.3.1 Rotating Disk and Fruits Containers

We have a circular wooden disk that holds the fruit containers is available. The disc will rotate so that each type of fruit has become directly above the blender and falls into it. Each fruit container contains a ball with blades connected to a stepper motor through coupling. When the stepper rotates, the ball rotates as well, causing the fruit to fall into the blender directly.

4.3.2 Input-Output Unit

User interaction is enabled by input/output components. The drinks and system information are displayed on the LCD. The keypad allows the user to make his selection. RFID was utilized to allow the user to pay for the drink.

4.3.3 Controlling Unit

All machine actions in the control area are overseen by Arduino. The mobile application is linked to the ESP32, which manages ultrasonic and communicates with Arduino. The Arduino is linked to the ESP32. Users can place orders through the application since the administrator oversees the system.

4.3.4 Monitoring Unit

The sensors we employed represented a monitoring system. Ultrasonic sensors are utilized to determine the quantity of each type of fruit, juice, and water. IR sensors are used to identify whether or not a cup is present. The IR sensor is also utilized to determine whether the cup arrived at the correct pour place.
A load cell (weight sensor) is used to detect the weight of each fruit and determine if it has achieved the proper weight.

4.3.5 Mixing Unit

The blender is responsible for muxing the fruits. Arduino controls the blender.

4.3.6 Pumping Unit

Pumps are in charge of two things. First for directly pump juice and water into blender. second for emptying the cocktail and water from the mixer.
We also employed valves to regulate the flow of water and cocktail. This ensures that the water or cocktail won't leak out of the mixer.

4.4 Mobile Application

We implemented simple mobile application using Blynk IoT. This application enables the user to order his drink easily. And we uploaded its code to ESP32.

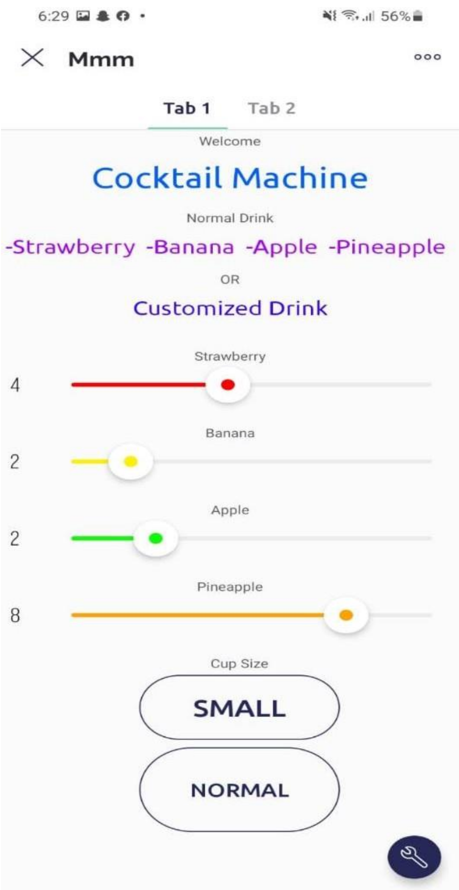

Figure 4.34: Mobile Application

4.5 Full System images

Chapter

Results and Discussion

As our project came to a close, we constructed an autonomous and intelligent cocktail machine that enabled us to accomplish our objectives. The administration may easily monitor the fruit and container of fruit using a mobile app, and users can easily place orders.

On our road trip, we faced a range of challenges and found solutions to them:

- Relays: During debugging, we found problems with how well the relays worked. A closer look showed that the Arduino was only producing 3.1 volts, not the required 5 volts. To fix this, we chose to use an alternative Arduino output that supplied the required 5 volts. The relays could now operate as intended, guaranteeing the project's success.

- ESP32 Upload Issue: We had trouble uploading code to the ESP32; after numerous tries, it refused to accept it. We spent a lot of time looking for a solution before deciding to boot while uploading the code and another problem was the serial communication between Arduino mega and ESP32 since the output voltage of Arduino equals 5volt and the input voltage of ESP32 is 3.3volt to solve this problem we used simple voltage divider circuit using 2 resistors:1kohm and 2.2kohm.

- Stepper Motor Challenge: At first, the disk or roller could not be rotated by a stepper we used then we used 3. J-5718HB2401 stepper motor to fulfill both duties were the best choice, according to our testing.

- Powering Components: Due to the varied voltage needs (220 volts and 12 volts), powering various machine components was difficult. Using a power supply from an old computer that could produce both 5 volts and 12 volts, we were able to successfully handle this. We also used conventional household and laboratory electricity for the 220-volt components.

By resolving these issues, we made sure that our project to build a smart cocktail machine ran without a hitch and effectively accomplished our planned objectives.

Chapter
Conclusions and Recommendation

6.1 Summary

We created the cocktail Machine, an automated system that makes it simple for customers to place hassle-free drink orders. A smartphone application and a remote-ordering keypad are included in the machine's setup.

Our machine's accuracy in gauging the weight of the fruit that goes into the blender based on user orders is one of its most remarkable features.
We added personalized drink options to the machine to make it even more user-friendly. Users can utilize this functionality to choose the quantity of drink ingredients they want in their cups, resulting in a customized user experience. Depending on personal likes, the machine also gives the option of selecting between small and large cup sizes.

While developing the machine, we overcame several issues. Powering the various parts of the machine was one of the difficulties we encountered. Others just needed 12 volts, while certain components needed 220 volts. We used a power supply from an old computer to generate both 5 and 12 volts, and we used regular electricity from houses and labs for the 220-volt components to overcome this issue. Additionally, we initially attempted to rotate the disk using an old stepper motor, but it failed to do so.

In conclusion, our cocktail Machine is an effective and well-designed tool that makes it simple for staff members to order their preferred beverages. The machine provides a distinctive and user-friendly experience for its users given its advanced capabilities, customization choices, and smooth automation.

6.2 Recommendations

Recommendations:

1. Use carefully while using the Arduino board, particularly the Chinese version, as it has an output voltage of 3.1 volts rather than 5 volts. Instead, we advise utilizing the Italian version.

2. Steer clear of using the Arduino board to directly power sensors and gadgets. Utilize a different power source.

3. Because wires are easily broken, you should always solder them rather than just connecting them.
4. Always try every component before fixing it in the project

6.3 What we have learned

1. How to operate equipment like pumps, blenders, and valves, as well as sensors like ultrasonic and IR, DC, servo, and stepper motors.

2. Instructions for using and connecting various high-voltage sensors and devices with Arduino.

3. Using the Wi-Fi capabilities of the ESP32 by connecting the Arduino to it.

6.4 Future Work

- Build a system to refill fruits, juice, and water automatically.
- Include more types of fruits and more flavors of juice.
- To save time, include a choice that forces the customer to order two cups at once.
- Implement monitoring of orders to make reports about ordered drinks.

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