An-Najah National University

Faculty Of Engineering

Department Of Computer Engineering

Hardware Graduation Project

(Auto electronic parts shop)

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Yours sincerely

Mosab, Abdullah

Disclaimer

Student Mosab Hanahiysha and Abdullah SaadEddin, Faculty of Engineering, An-Najah National University, wrote this study for the Computer Engineering Department. The student's opinions and any outcomes and recommendations are exclusively their. Therefore has not been amended or modified as a consequence of assessment, except for editorial adjustments, and it may include grammatical and content problems. An-Najah National University assumes no responsibility or liability for the implications of using this study for a purpose other than that for which it was commissioned.

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Abstract

In a small electronic parts shop, there is much time wasted for the customer and seller to find the exact part that the client needs because they are small items.

There is much variation, so we need to reduce the time of preparing the order by creating a project in which will take the order from the customer or the shop owner and prepare it.
It should give the seller the ability to fill the products and track the stock quickly; it should also be easy to add more capacity to the system and provide multiple ways of interacting with it throw multiple platforms.

We will create a mechanism that will be able to grab the order items from their line and group them out in one place so the customer can pick them up. The order can be placed throw multiple platforms, and it will check if there is stock or not and notify the seller to give the total amount of the order.

The most similar machine out there is the snack vending machine.

1. Introduction

Auto electronic parts shop is a Machine used to automate the process of preparing the order of electronic parts shop by having multiple lines that contain different products type and it outs what the order contains. This Machine can automate the process and reduce the error value and the time needed.

The user can interact with the machine in two ways, the first one using the keypad and the LCD, he can create a new order using them or edit the products or show the current stock and prices of the products, and if he submits the order, the machine will start preparing the products.
The other way is using the app that we created for the machine, in which the user can interact and take complete control of the device. He can make orders, view and edit the products. the data are shown on the LCD and the app will be the same, and all edits will be reflected in real-time.

The project handles any unusual user input and simultaneously processes orders from the LCD and the app.

The Buzzer makes a noise after each order to notify the user that the order has been completed.

2. Constraints,Standards and Earlier Courses

2.1. Constraints

We had a problem shifting actual items in the right sequence and quantity without harming them, and with the least amount of space with a large number of products.

2.2. Standards

In the Auto electronic parts store project, we adhered to engineering standards by using the Agile Method, which included weekly meetings and discussions on each item at each stage. We created the machine feature by feature, from mechanics to the testing and modifications.

2.3. Earlier Courses

Some of the courses we have learned over the last few years helped build our project.

The Microcontrollers course gave us a basic understanding of working with Microcontrollers Arduino and basic communication protocols , which was helpful for our project. and in Digital Design course we learned the fundamentals of digital components and how to connect and use them correctly.

3. Literature Review

Many projects are similar to our vending product project, and vending machines typically pass on many items that have been taken from the user to sell great products on the streets. Nonetheless, our task was to categorize tiny things and products in stores such as the electrical components shop.

The primary vending machine mechanism is the same as the standard vending machines, but the difference is in the purpose of the device, how we can control it, and the scale of the products that it can handle.

Also, our machine can scale on demand to add more space and trays to the same device. It starts with four trays, and we can increase them or use the app to control multiple devices at the same time.

The energy is dependent on AC voltage, which is converted to Voltage level by a power source to mimic industry machines.

4. Methodology

The methodology section discusses the development process we went through during this project and the steps we took:

4.1. Hardware Components

4.1.1. Arduino Mega 2560

Figure 1: Arduino Mega 2560

Due to various factors, we chose Arduino Mega when we first began development. However, we concluded the process to continue with Arduino because:

- There are 54 I/O pins on the Arduino Mega. One by one, fourteen of them may be utilized as PWM to control all motors. Crystal oscillator at 16 MHz. The Arduino IDE makes debugging a breeze, because it has several serial ports.
- It is also a very inexpensive Micro-Controller. Code is simple to debug and use, and there are several sheets to aid with usage.

4.1.2. 9g continuous micro servo

We chose four 9g continuous servo motors since they are sufficient for moving small objects. We can add more by connecting them to pins [10,11,12,13]. Vcc, ground, and control pins are all present on every engine. We just attach the control to the Arduino and acquire power from the external power source.

Figure 2: 9g Servo Motor

4.1.3. 5V Continuous Piezo Buzzers

The 5V Continuous Piezo Buzzers were used to show that the machine had completed the order. There are two pins on the buzzer. One pin will be linked to the Arduino, while the other will be grounded.

Figure 3: Buzzer

4.1.4. HC-06 Bluetooth module

The app is connected to the machine using the Bluetooth module. It has four pins: Vcc, ground, TX on pin 18, and RX on pin 19, and it utilizes Serial1 from the Arduino Mega.

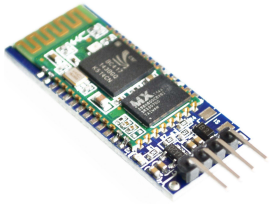

Figure 4: Bluetooth module

4.1.5. 5V 5A Power Supply

To provide the required voltages for sensors and connections, we utilized an AC to DC power source with 5V and 5A.

Figure 5: 5V 5A power supply

4.1.6. Power Socket Inlet Module Plug 5A Fuse Switch

We utilized the same AC cable as the PC to link the machine to an AC source via the power socket. It will accept the neutral phase and ground wires as inputs and provide the system with V+ and V- outputs.

Figure 6: Power Socket

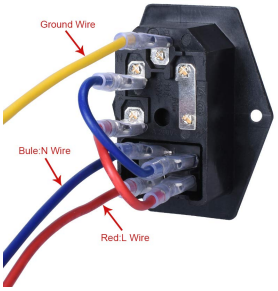

Figure 7: Power Socket

4.1.7. Keypad 3x4

A 7-pin 3x4 keypad features four rows [9,8,7,6] and three columns [5,4,3]. have been used to browse across LCD menus by entering numbers.

4.1.8. Character LCD 20x4 2004

The LCD is Used to show the menus that control the machine, create orders, see products and edit products. The LCD 20x4 is connected to the LCD using an i2c module, which will be discussed later.

Figure 8: Keypad 3x4

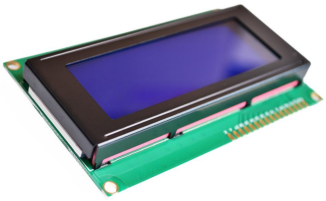

Figure 9: LCD 20x4

4.1.9. I2C LCD Interface PCF8574

By connecting two pins to Arduino: SDA SCL output to Arduino ones, we were able to convert the writing from parallel to serial.

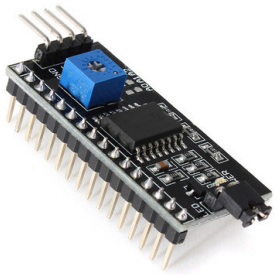

Figure 10: I2C module

4.1.10. 8 pin Connector Terminal PCT-218

The connector distributes power and ground for all modules and sensors across all levels produced in the system.

Figure 11: 8 pin Connector

4.2. Hardware Architecture

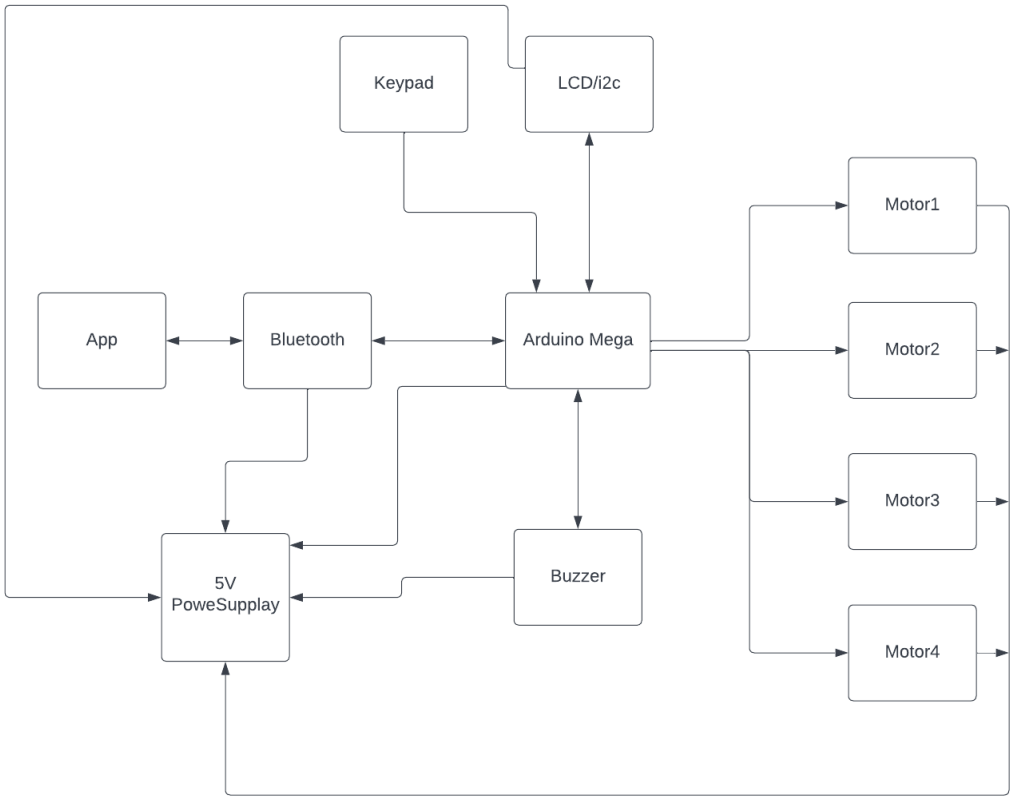

Figure 12: Hardware Architecture

The main component in our machine is the Arduino Mega which controls all parts and saves data. For the LCD and the keypad connected to the Arduino, which takes keypad input and updates the screen accordingly, the screen is connected using i2c, which uses Serial communication to get the connected data SDA SCL port in the Arduino port 20,21.

The screen is powered by an external power supply that uses AC power and converts it to 5V DC.

Also, the buzzer is connected to the Arduino, and the power supply will come

out high to the buzzer when it needs to run its sound after order preparation is finished.

The Bluetooth is also connected to the Arduino in (18,19) connected to Serial1 on the Arduino Mega, so we do not have to use third-party libraries to control it.

Finally, we have 4 continuous servo motors. Each one of them has its control connected to the Arduino, and we use the PWM to control its speed and directions, each one of the motors is connected on its try to a spring that will rotate with the motor when we need to get a product, the items will be sorted in the spring, and to get one item, we need the motor to rotate 360 deg.

The App communicates with the machine using the Bluetooth module, sending Serial Data and getting Serial Data from and to the Arduino. There is no data stored in the App. All data is stored on the Arduino EEPROM, so we do not lose them if the power goes down, and we can use it with any phone that has the App on it.

4.3. Software Architecture

We have two parts on the software side, one in the Arduino and the other in the App.

4.3.1. Arduino

For the Arduino, the code is split into different parts. The first one is controlling the LCD and the different menus that show on it. We use a state machine like code, so we represent every menu with a state and save its data in a header file. Whenever the keypad is pressed, the code will move between states accordingly ,from what will be displayed on the screen and what other thing should be done, so if its the final stage of creating an order, it will send the order to the motors and update the stock on Arduino and any connected app. The other part is controlling the Bluetooth module and the serial data that comes and goes through the app. It translates any command that the app sends Serial and decides what to do if it is updating the data. It will update the data, and the LCD will reflect that because it is reading the data from the Arduino, and if requesting new order, it will send it to the motors and update the data in all required places. The final part of the Arduino code is the part that runs in a startup. This part will initiate all ports and modules and read all required data from the EEPROM.

4.3.2. App

In the App, we created three pages. The first one will list all available Bluetooth devices, and the user should choose the HC-06. After that, the App will try to connect, and if it is connected, it will try to send a Serial command to get the data. If the Bluetooth device responds with correct data, the App will move to the next page in which the user can navigate and choose between cre-

ating new order or editing product details. If the user chooses any of the two options and submits, the App will send the Serial command containing the data to the Arduino that will translate it and do the work. the app also have a background process that listens to the Serial and check if the Arduino but any data on it to update the stock due to new orders using the LCD, and if it detects any change, it will update the App data in real-time.

5. Results

After connecting all parts, the machine was able to work as expected. It contains 4 trays. Each can accept 10 products, and it can out all 40 in the same order using the phone or the LCD. The spring rotation by 360 was able to out one product, and there is no conflict between the app and LCD working simultaneously.

Here are the App screens and photos of the final machine.

Figure 13: start screen

Figure 14: devices list

Figure 15: getting data

Figure 16: page list

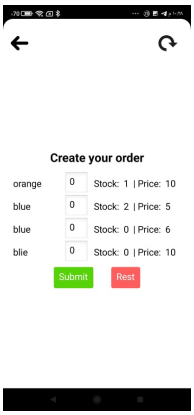

Figure 17: create order

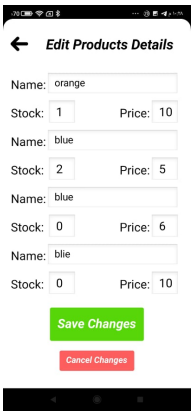

Figure 18: edit products

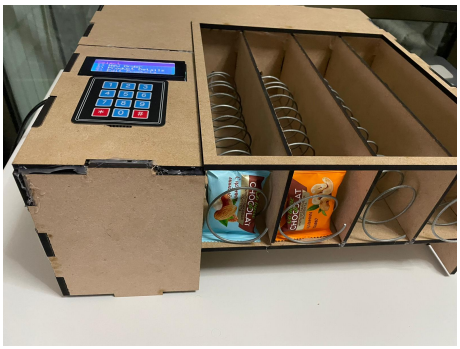

Figure 19: Machine

Figure 20: main page

Figure 21: new order

Figure 22: edit product

Figure 23: chose product for order

6. Conclusions

In this section we are showing the most results in our project:

6.1. Summary

We were able to construct a machine that assists electrical component stores to manage their products and orders for minor things at the end of this project. The project's findings may be applied on a wider scale to accept a greater number and variety of products, and it can be used in any business that sells small items.

6.2. Future Work

- Add more trays to accept more products.
- Add a way that can users pay for the product and use it without needing the shop owner.