An-Najah National University
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Shopping cart

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Acknowledgment

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We would like to extend our sincere thanks to our parents for supporting and encouraging us at all times And their sacrifices in order to build a future for us and provide what we need during the period of our education .

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Abstract

With human needs constantly renewed, his need to buy does not stop, And because the buying and shopping process consumes a lot of time, we tried to find a helpful idea for both the customer and the cashier, in order to reduce the effort for both of them using the shopping cart that operates with a smart system.we deal with the problem of the long role in stores and stores, where we will create a shopping cart that will have a scanner to scan all purchases from the buyer's side, in addition to a screen to see prices before putting them in the basket and once it reaches the cashier, the payment will be on the final product, and to ensure that there is no Fraud on the part of the buyer We will design the basket in the form of two boxes, one of which is open to place unconfirmed purchases and the second is closed. It does not open until after scanning the barcode of the product and opens only temporarily and then can be opened when reaching the cashier, also we will use data base to store all products and also there is a connection between the cart and the cashier via Wireless. Also we will use sensors to ensure that the buyer had put the product before close the closed cart.

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1 Introduction

With the development of technology and progress that includes several aspects of life..reducing effort and saving time has become a requirement in our time. This is not limited to one area, but several aspects of life, including shopping or the purchase process.

Therefore, there must be smart ways to help shorten both time and effort. And because our idea is related to stores, there is a good alternative if there is pressure in the purchase process and there is a lack of workers.

And our "shopping cart" project aims to help customers during their shopping, where each cart is connected with the customer through a mobile application using scanning.

This shopping cart not only helps customers know the price of all products, but also provides protection against theft.It contains sensors when passing the goods to make sure that the customer passed the correct product and did not replace it with another product, In addition to that the cart contains two sections, one section contains the goods that you have purchased.

Then, after making sure that the customer wants to buy the goods, they are transferred to the other section. This contributes to providing protection and also prevents any fraud.

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2 Constraints, Problems and Standards

2.1 Constraints and Problems

One of the problems that face us is the high cost of some pieces such as barcode readers ,so we had to replace it with a RFID reader.

In addition to some difficulties in combining several pieces together, as we did not deal with that before.

short time was also one the problems face us

2.2 Standards

In our project, we used the Arduino Mega 2650, and we connected with it the parts we need to control and connected it to the computer via USB.

As for the programs, we used the Arduino IDE, which contained all the codes and functions that we needed in our project, and the language used in the program was C.

As for the mobile application that we needed to connect the customer to the shopping cart through a barcode, we used the language of flutter.

3 Literature Review

The shopping cart that we built, as we mentioned previously, is a smart cart, as it helps customers in shopping and helps them in several ways, including time, as it enables the customer to know all the prices for all products without the need to ask the workers in the store , and he can cancel the purchase process in the event of a retreat from Buying a specific product, but if he is sure of the products he wants, he can pay directly through his account in the bank linked to the store through the mobile application;This reduce the work of the cashier.

The features of the cart are not only limited to that, but our smart cart also has the feature of protection and security to reduce fraud and theft.It contains two sections, one of which is closed, in which the products that have been confirmed that the customer wants to buy are placed, and the other section is not closed,which contains the goods that the customer did not sure that he wanted.

4 Earlier Coursework

Some of the materials that we learned in our department in previous years helped us in our project, for example, the microcontroller, digital, and the rest of the materials related to electrical and electronic circuits that helped us connect the circuits of our project.

In addition to laboratories, including the CBU laboratory, digital laboratory, microprocessor, as well as laboratories related to electrical circuits.

5 Methodology

5.1 Hardware parts

The hardware part contains all the electronic parts that we need to design the shopping cart which we will show as below:

5.1.1 Arduino mega 2650

is a microcontroller board based on the ATmega2560, It has 54 digital input/output pins. which is suitable for our project connections.

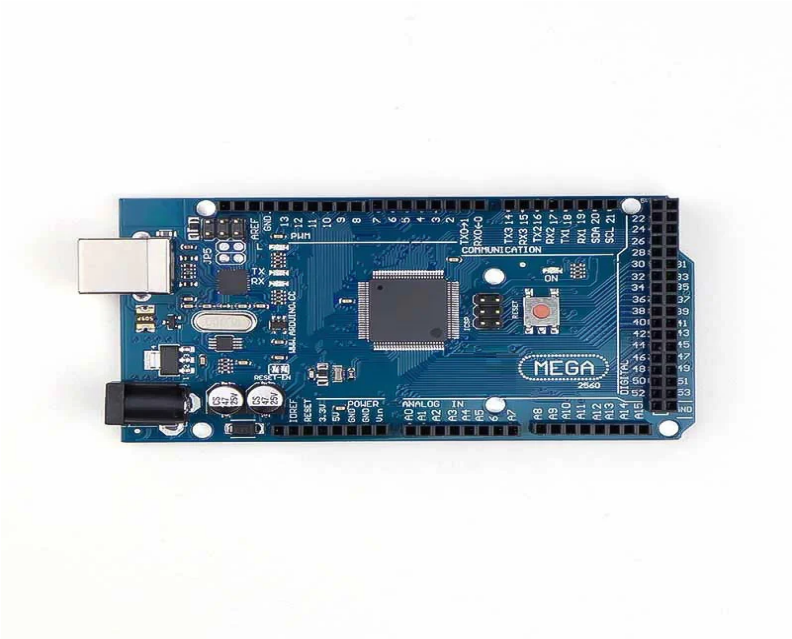


Figure 1: Arduino mega265

5.1.2 Servo motor

A servo motor allows precise control of the angular or linear position as we used it in our project in order to control the opening and closing of the cart sections.and we chose the type of servo that achieves this.

Figure 2: Servo motor

5.1.3 IR Sensors

It detects and responds to some types of inputs from the physical environment. In our case, the input is the movement of products when it's passed into the cart.

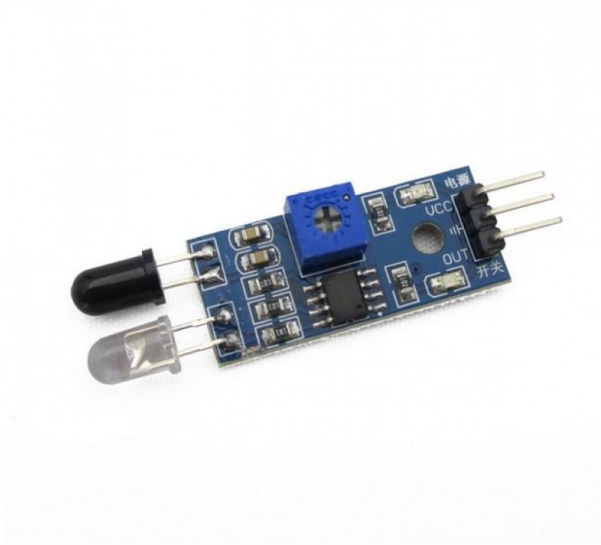


Figure 3: IR Sensor

5.1.4 Keypad

There are many types of keyboard available, but we chose the 4 x 4 keypad, which is simple and meets the purpose. The goal is for the customer to press the Yes button if he has finished the process of selecting the products or press the cancel button of the purchase process.

Figure 4: Keypad

5.1.5 LCD

This type of LCD can display 20 characters per line and there are 4 such lines, and it contains a serial bus interface connection protocol that is connected to the LCD ,called I2C so data is transferred bit by bit along a single wire (the SDA line).

The goal of using the LCD is to display the prices of products inside the store to the customer to facilitate the purchase process.

Figure 5: LCD and I2C

5.1.6 RFID Reader MFRC522

RC522 is the highly integrated RFID card reader which works on non-contact 13.56mhz communication, its consume low power, low cost and small size read and write chip.

The reason we use it, as we mentioned earlier, is that the barcode is more expensive than it.

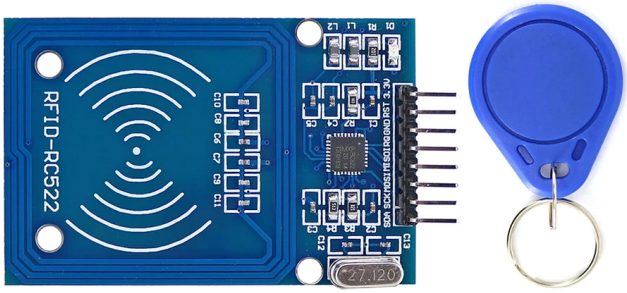


Figure 6: RFID Reader MFRC522

5.1.7 NodeMCU

NodeMCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications ,it is a single 2.4 GHz Wi-Fi-and-Bluetooth.

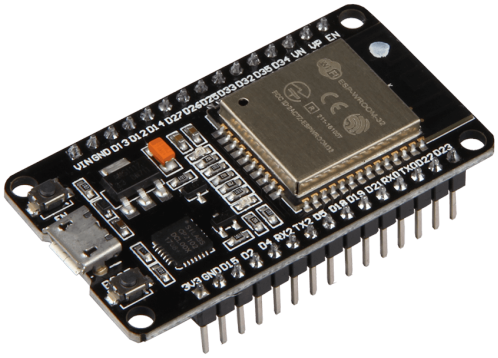


Figure 7: NodeMCU Esp32

5.1.7 Jumper Wires

A jumper wire is an electrical wire that contains connectors,including 3 types male-to-male, male-to-female and female-to-female.

We use it to connect components with board in our project.

Figure 8: male-femal jumper wire

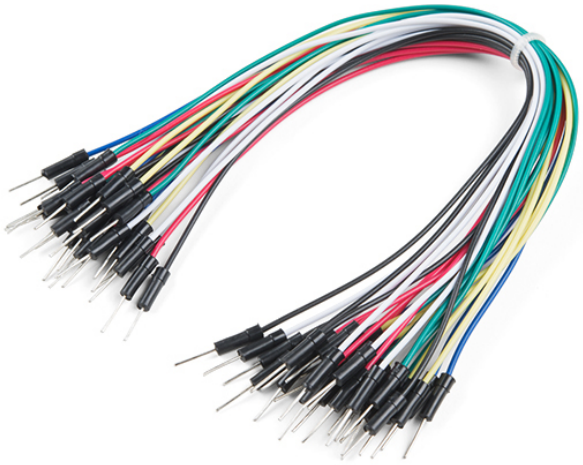


Figure 9 : male-male jumper wire

5.1.8 RGB LED

We used the Leds as an indicator when the customer is passing the goods into the cart.

Figure 10 : RGB LEDs

5.1.9 Solenoid lock

The solenoid lock denotes a latch for electrical locking and unlocking.it has been placed on the side that contains the goods that the customer has confirmed that he wants to buy. It is opened automatically when the customer presses the "OK" button.

Figure 11 : solenoid lock

5.1.10 Buzzer

Buzzer is a sound signaling device that is used to alarm if the item insert the cart .

Figure 12 : Buzzer

5.2 Software part

The software section contains both a mobile application and a website for the store.With regard to the website, the responsible for it is the admin who enters all products of all kinds, types and prices.When introducing new products and merchandise into the store, the admin enters these products into the account of this store through this page.

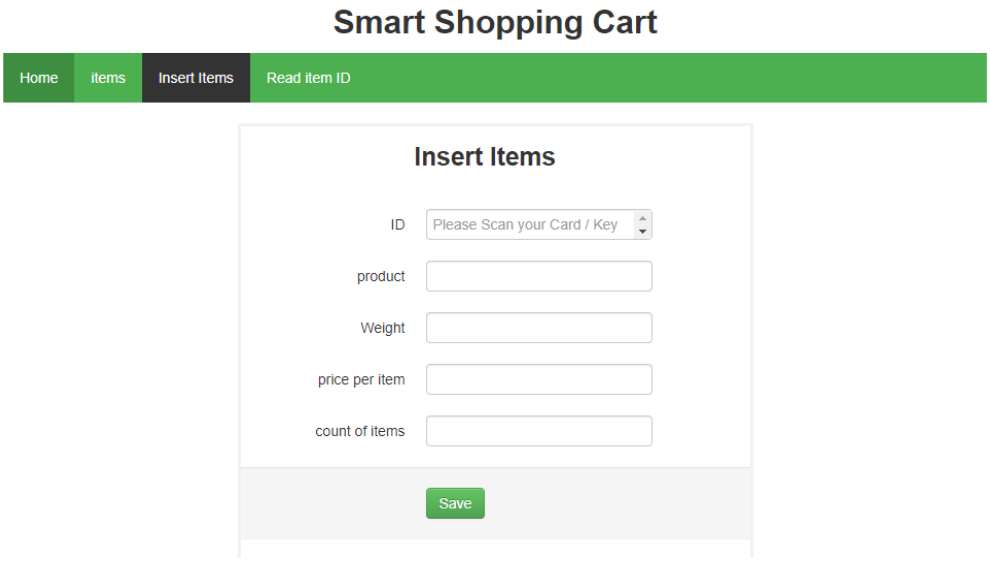


Figure 13: insert items

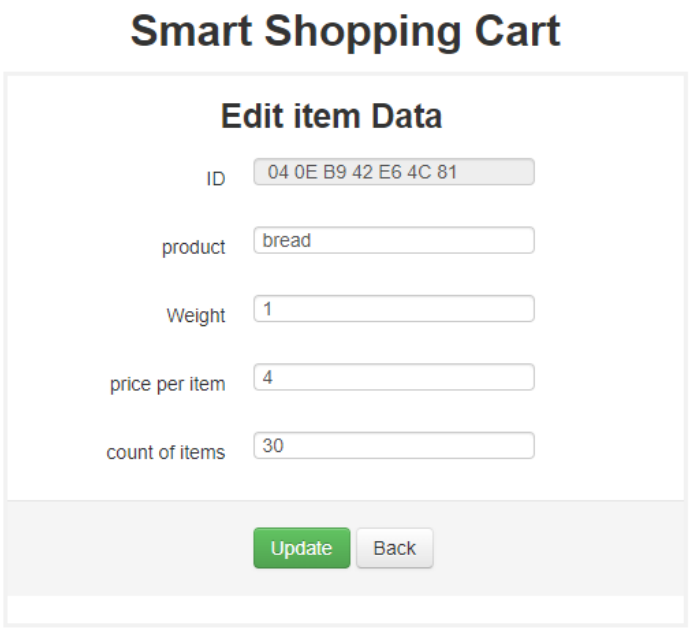


Figure 14: edit items

The admin can read your ID for a product inside the store using RFID Reader to view all information about this product such as weight, price and quantity.As the information for each product inside the store is located in a large database.

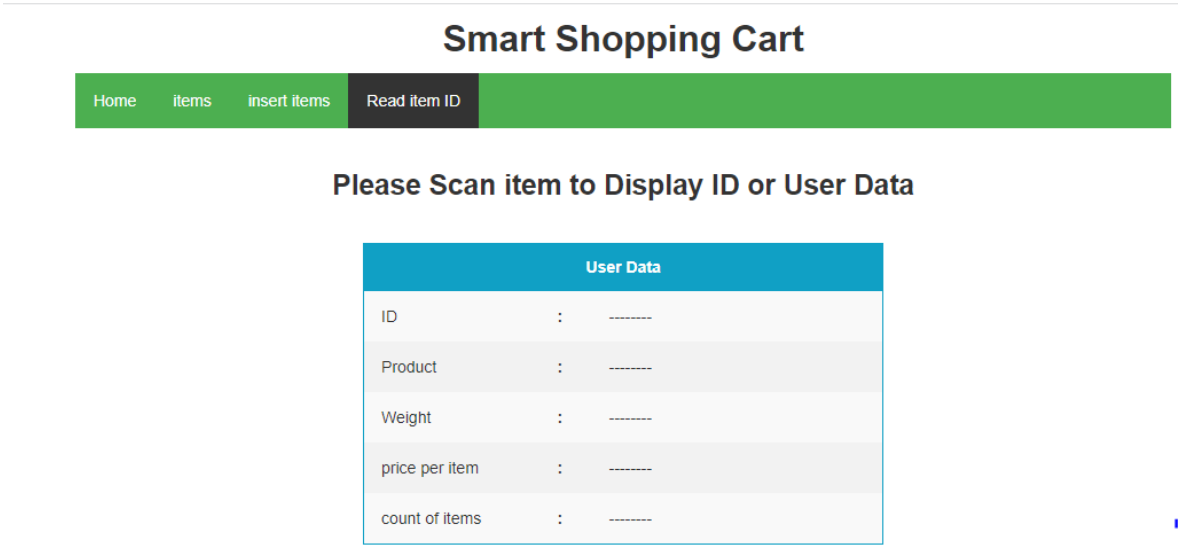


Figure 15: display items

In addition to entering and storing information, the admin can review, modify, or delete this information for each product.

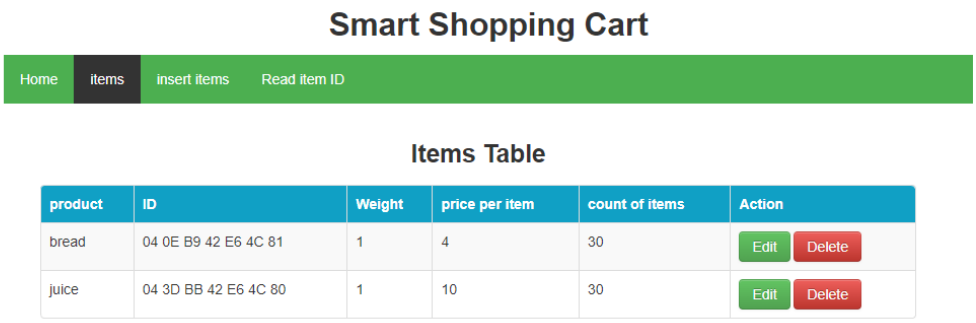
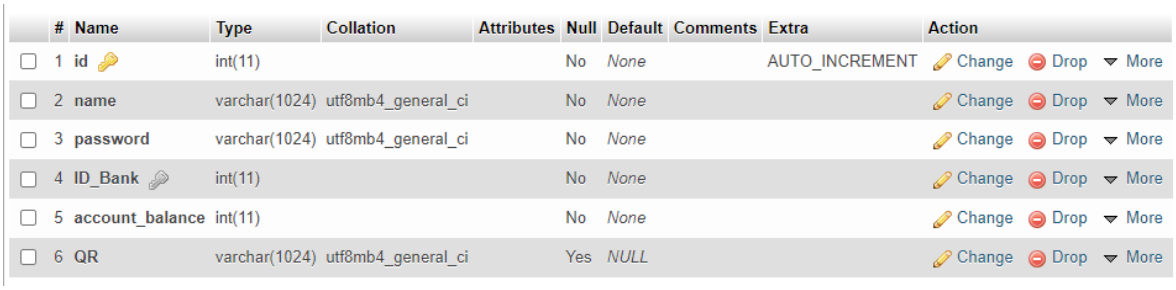


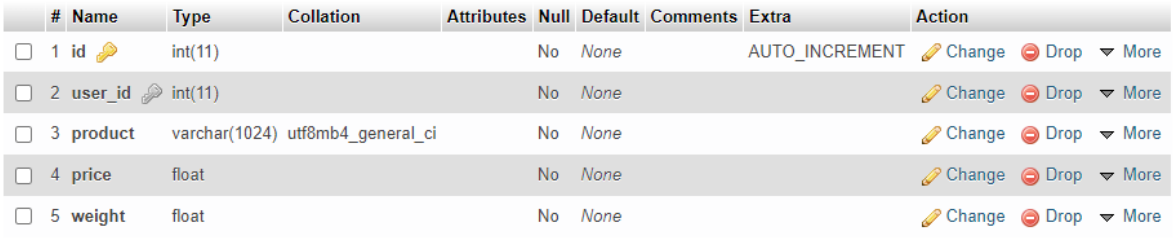
Figure 16 :add or delete items

The website is linked to the store in a large database that is divided into several sections, including customers and their personal information and a special table for the products inside the store and all the information related to these products as we mentioned previously .



#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	int(11)			No	None		AUTO_INCREMENT	Change Drop More
2	name	varchar(1024)	utf8mb4_general_ci		No	None			Change Drop More
3	password	varchar(1024)	utf8mb4_general_ci		No	None			Change Drop More
4	ID_Bank	int(11)			No	None			Change Drop More
5	account_balance	int(11)			No	None			Change Drop More
6	QR	varchar(1024)	utf8mb4_general_ci		Yes	NULL			Change Drop More

Figure 17: user info



#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	int(11)			No	None		AUTO_INCREMENT	Change Drop More
2	user_id	int(11)			No	None			Change Drop More
3	product	varchar(1024)	utf8mb4_general_ci		No	None			Change Drop More
4	price	float			No	None			Change Drop More
5	weight	float			No	None			Change Drop More

Figure 18: products info

We designed a mobile application where the customer can log in using QRScan .Each card has its own QR. When the customer receives this cart, as soon as he enters a store, his bank account is linked with this store in order to facilitate the payment process.

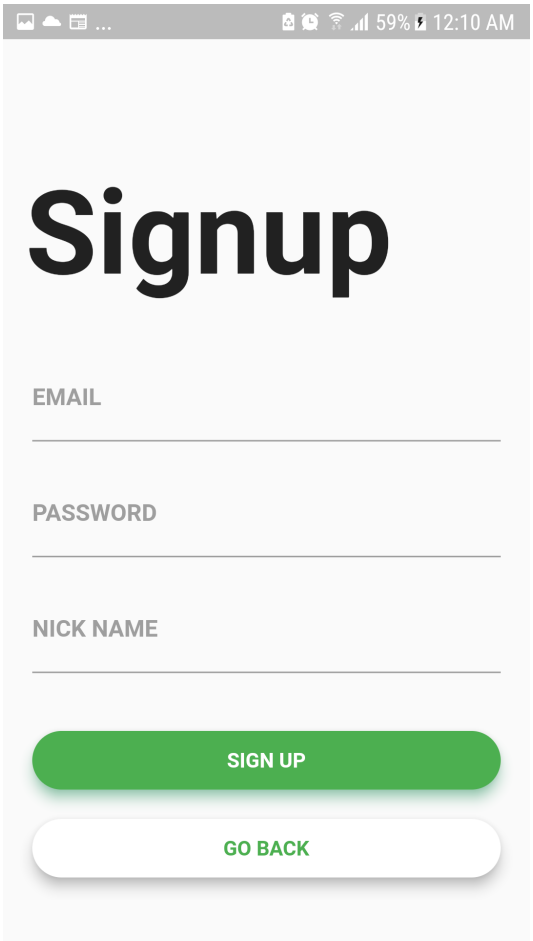


Figure 19: signup page

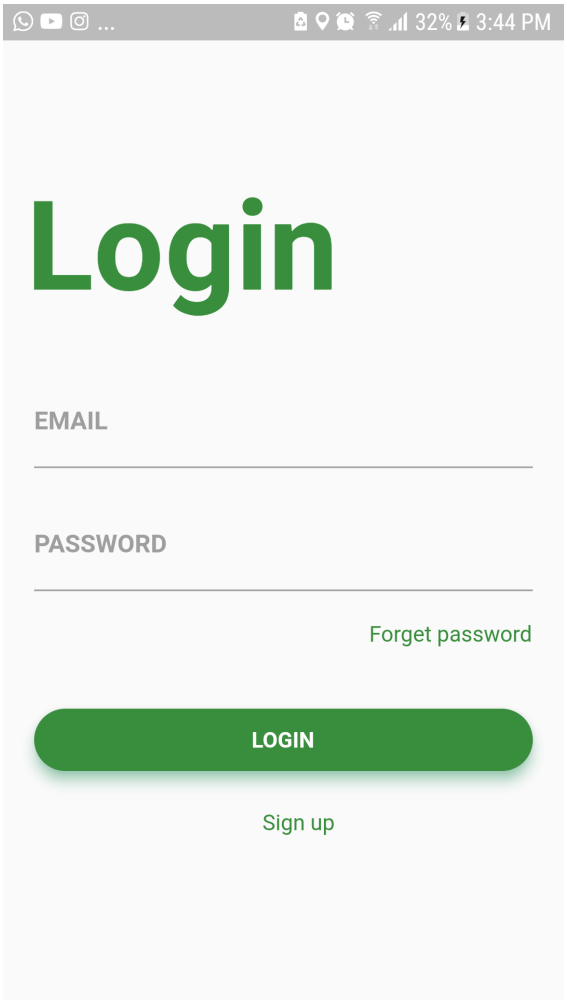


Figure 20 : login page

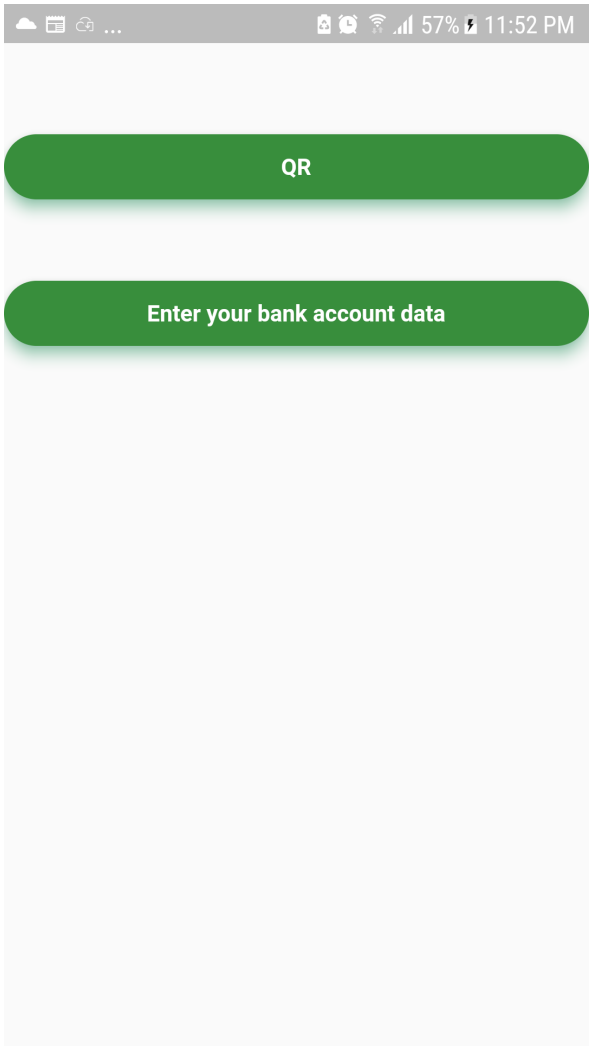


Figure 21: main page

As shown in the previous picture, there are two buttons in this application, one called QR that allows the customer to take a picture of the QR of the cart in order to connect his bank account with the store to start the purchase process. As for the second button, which is called Enter your bank account data . that allowed the customer to enter his information to the system ,If he is a visitor to this store for the first time .

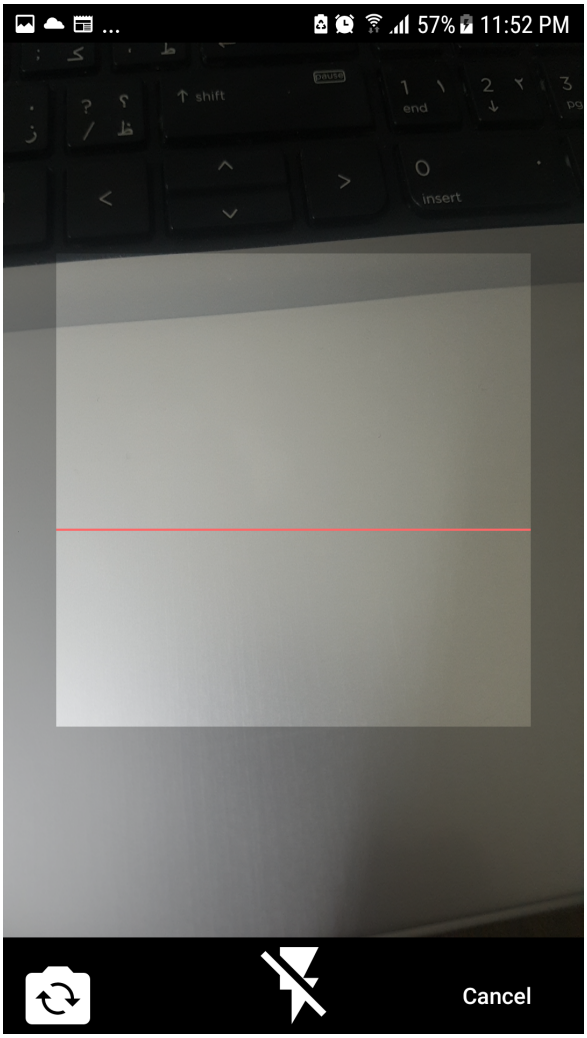


Figure 22: scan QR

6 Results and discussion

In this part of the project, we will present the final form of our project with the design and the final scenarios in it, from the mechanism of work and characteristics, and how the process of purchasing products takes place inside the store, in addition to the customer entering the products into the cart.

we will show some pictures that show the design of our cart

1. At first , the customer passes the goods of his choice into the cart and the goods pass through several sensors, and then one of the sides of the box is opened and goods placed inside this side.

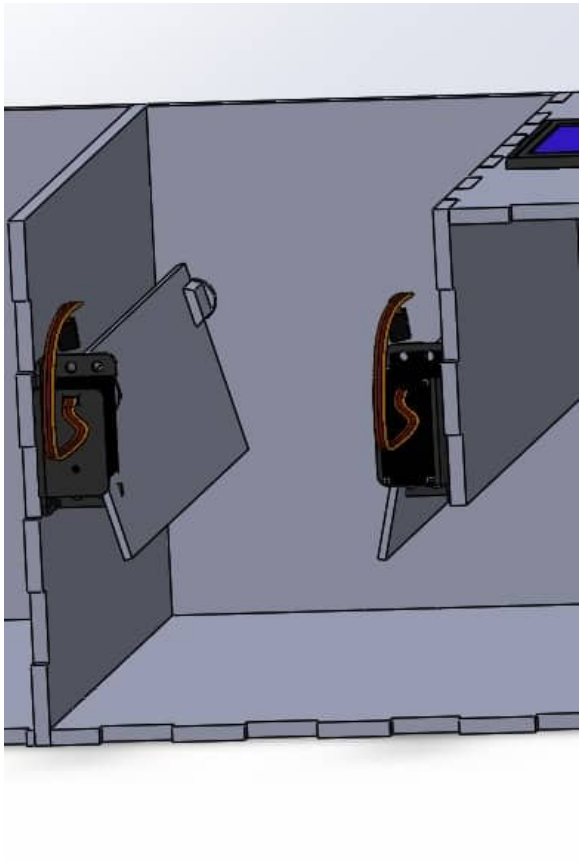


Figure 23: design 1

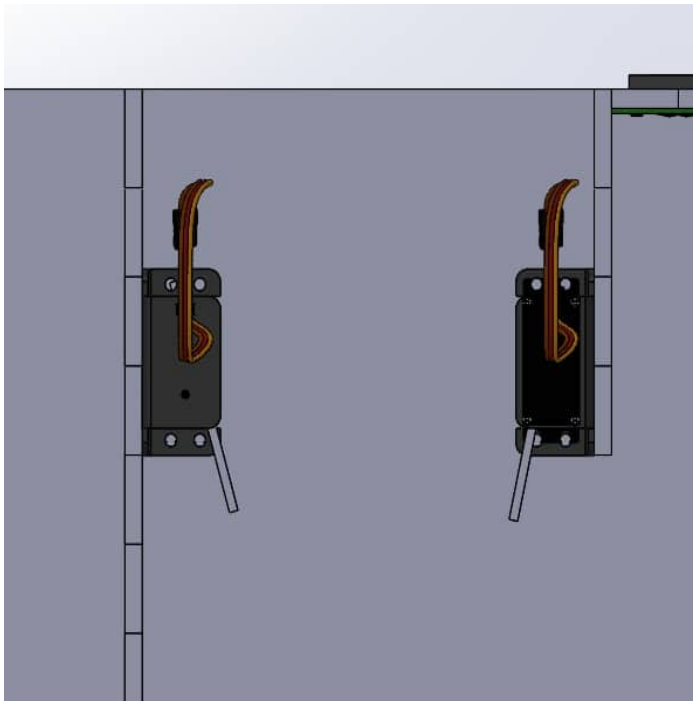


Figure 24: design2

2. The image below shows the RFID Reader website, which reads the barcode for each product selected

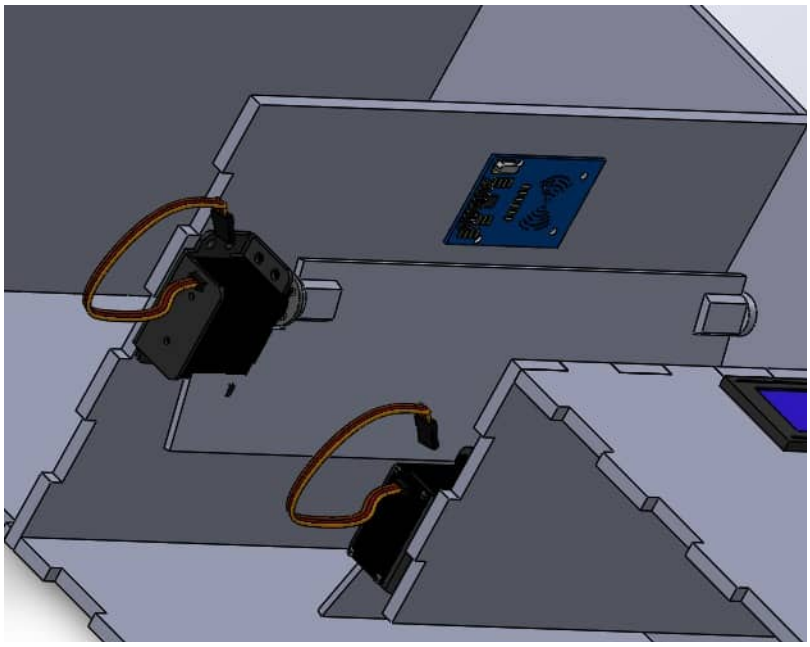


Figure 25: design3

3. After that, as soon as the products enter the cart, all the information about each product is displayed in terms of price, quantity, type, where the customer can add the quantity he wants from any product. After the customer finishes selecting the products he wants, he presses the “OK” button on the keyboard shown in the image below, or presses the “Cancel” button in case he withdraws from the purchase process permanently or one of the products.

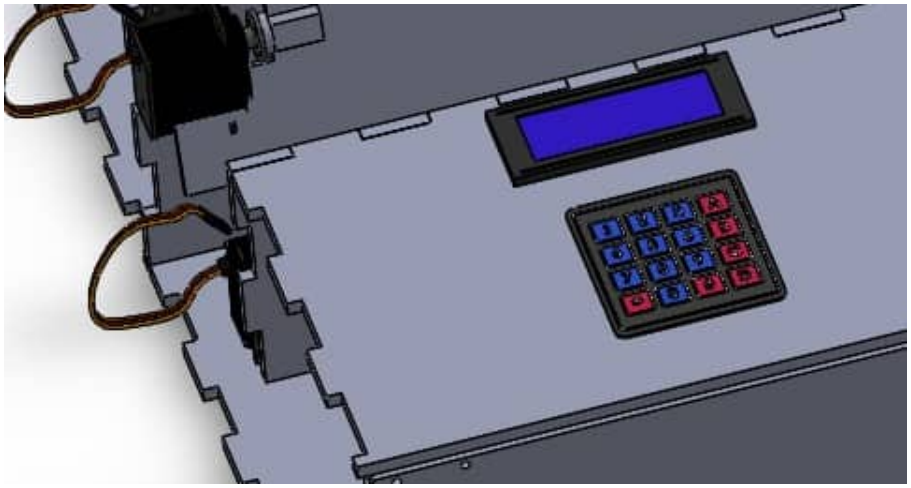


Figure 26 : design4

4. the following picture showing the final look of the design of the cart from the inside

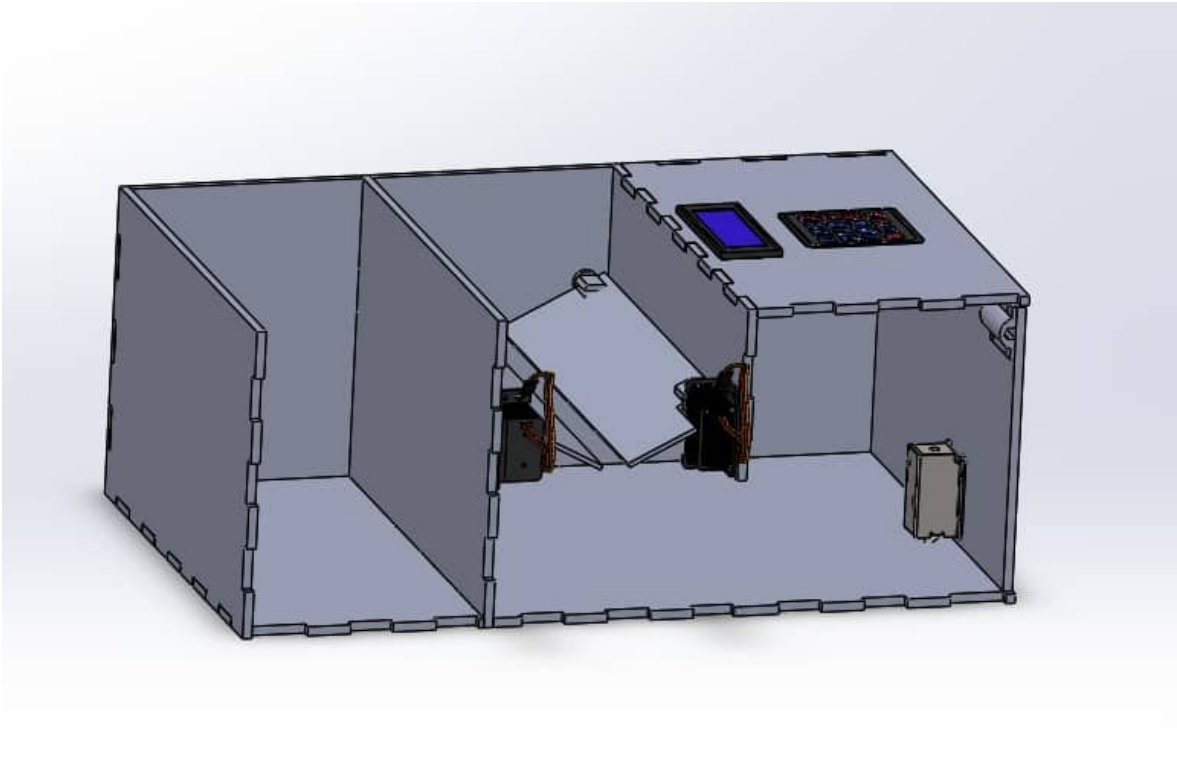


Figure 27: design5

5. final cart shape from outside .

Figure 28 :design6

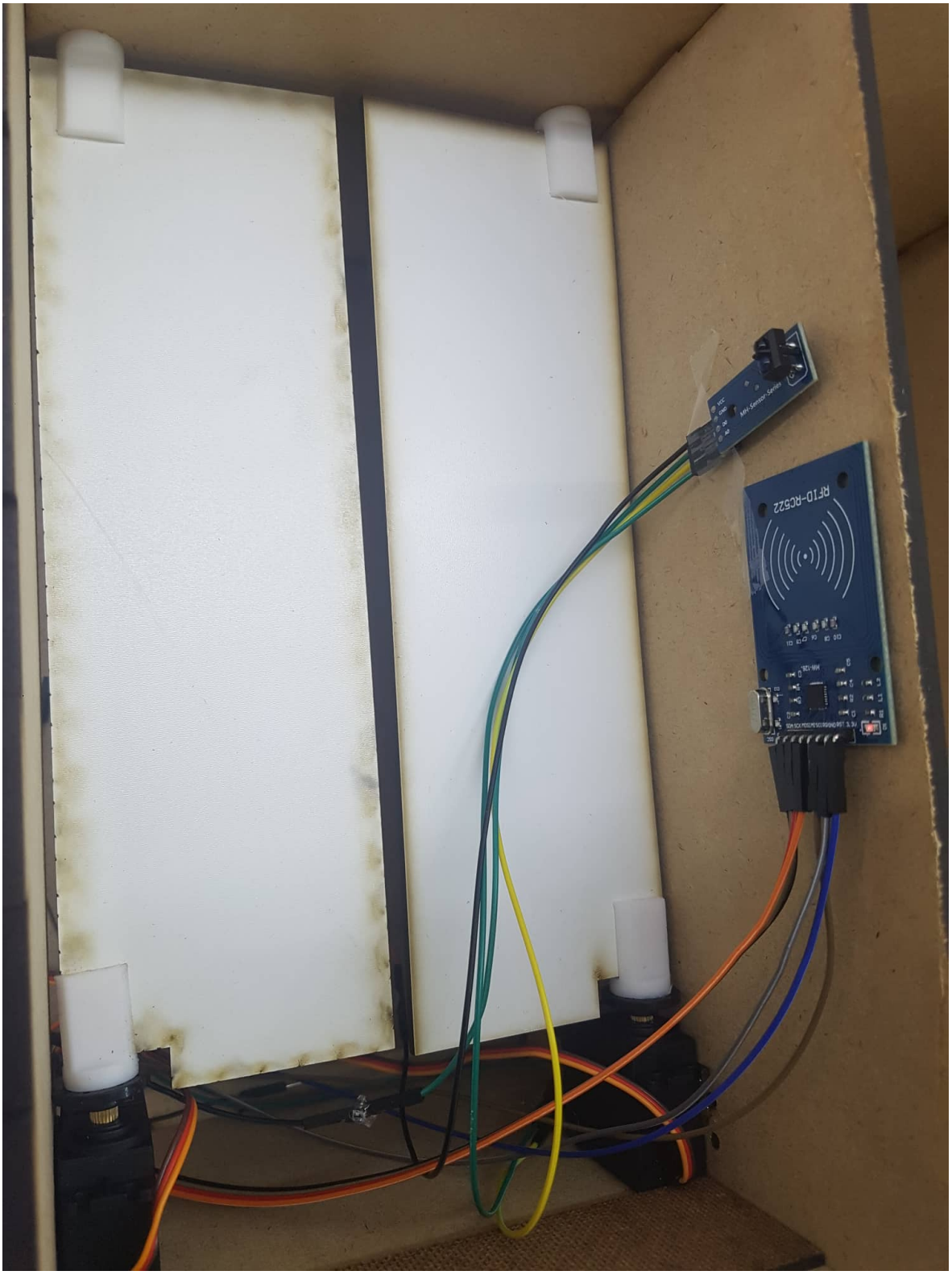


Figure 29 : final design

Figure 30 : final design

7 Conclusion and future work

7.1 Conclusion

As we talked from the beginning, our "smart shopping cart" is a purposeful project that presents a useful idea that with characteristics will facilitate the shopping process and financial transactions for both customers and employees, whether cashiers or assistants.

We mentioned that it allows the customer to finish the purchase process and pay without the need to wait in line in front of the cashier, but this is done by linking the bank account of each person with the store through the mobile application.

Our smart cart also contributes to providing protection against fraud and theft, as the product can only be taken after passing through several sensors inside the cart.

7.1.1 Future work

We aspire in the future to develop this cart to become a distinctive idea .

where we can add features to the movement , so that the cart can follow its owner through the mobile using the GPS, which also makes it easier for the customer to move so no longer need to pull the cart or push it.

in addition to camera that scan the products .

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