AN-NAJAH NATIONAL UNIVERSITY

FACULTY OF ENGINEERING AND INFORMATION TECHNOLOGY

COMPUTER ENGINEERING DEPARTMENT

HARDWARE GRADUATION PROJECT- JUNE 2023

Vending Machine

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A REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF BACHELOR IN COMPUTER ENGINEERING - HARDWARE PROJECT.

Dedication

This achievement would not have been possible without the immense help and motivation from my loving family members; especially my dear father. My mother's sacrifices and tireless efforts are Deeply appreciated as they helped mold me into the person I am today .I am grateful for the support From my friends throughout this endeavor as well as the immense effort and cooperation from Masa That made reaching this incredible achievement possible. Last but not least on the list of people to Thank is none other than myself for all of my hard work and dedication in achieving this feat.

Dana

I acknowledge God Almighty as the source of my inspiration and strength in completing this project. Hence, I dedicate it to Him .My dedication to this project extends beyond myself - I could never have Completed it without my family members' unconditional love and especially without the unyielding Encouragement from my mom. I am also grateful for the continuous support and encouragement That my father has given me throughout my life .Achieving my full potential was instilled in me by Both of my parents. I extend a heartfelt thank you to all of my friends who stood beside me Throughout this journey but a special mention goes out to Dana whose efforts were instrumental in Our joint success.

Masa

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Disclaimer

This paper was accomplished by Masa Abu Odeh and Dana ihsoon from the Computer Engineering Department at An-Najah National University. The thoughts expressed in this report are the authors own and do not reflect the view of An-Najah National University, department of Computer Engineering.

Abstract

A vending machine is an automated machine that provides items such as snacks and soft drinks to consumers after paying cash, credit card, or any other form of payment and is closer to an automated process without the need for human interaction in order to facilitate and expedite the purchase process. This project will rely on the availability of four products in addition to the RFID card payment system. To choose which item to buy, press the button corresponding to that product. After that, a fee will be charged on the RFID card for the cost of this item, in addition to changing the prices of the products in proportion to the available products. Many customers face a problem when dealing with current vending machines, the problem is the product does not come , so the customers pay money for nothing. This project solves this problem through the IR sensors. It also provided a service to send a message To the owner of the machine in the event that one of the products runs out, in addition to a special lock that is opened by the owner of the machine using the RFID card and the servo motor.

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1 Introductions

A vending machine is a self-service device that offers a variety of products and services to users. These machines are automated and programmed to provide products without the need for direct human intervention. Vending machines can be found in public and commercial locations such as airports, hospitals, schools, shopping centers, train and bus stations, hotels, and entertainment venues. They provide a quick and convenient experience for users who need to purchase items or services such as soft drinks, snacks, ready-to-eat meals, health products, personal necessities, gift cards, tickets, and more.[1]

Vending machines operate on a simplified system where products are loaded inside the machine and organized into different compartments. When a user selects the desired product, the choice is sensed, and the payment process is carried out using cash, credit cards, or digital applications.

Vending machines incorporate advanced technologies such as touch screens, barcode readers, and electronic payment systems to enhance the user experience and save time and effort. They are available 24/7, which provides convenience for users who require products or services outside regular business hours.

Overall, vending machines have become an integral part of modern life, offering a convenient and accessible way to obtain various products and services. Their presence in diverse locations contributes to the ease and efficiency of daily tasks for individuals on the go.

2 Constraints, Standards/ Codes and Earlier course work

2.1 Constraints

Dealing with small electrical components such as drivers and small chips was hard as they are too Sensitive to voltage, current or even weather changes. In addition, some of the chips were damaged While developing the machine.

Being a computer-engineering student, it was very difficult to deal with the mechanical part.

Strikes, political situations, and occupation were obstacles to the continuation of our work within the University Therefore, there are some features that we could not complete due to lack of time.

2.2 Standards/Codes

Using Arduino as a programming language. It is is an open-source electronics platform based on easy-to-use hardware and software [2]. Arduino codes are written on a special development environment that is downloaded in our system and then uploaded to the Arduino board.

3 Literature Review

Vending machines that facilitate and speed up the buying process is not a new innovation. However, our vending machine does many things, including buying and selling and RFID card payment. Our machine can make sure that the customer gets the product he purchased because, as noted, many machines face the problem of not delivering the product even though they paid for it.

The feature of changing product prices has also been added so that the owner of the machine can change the price of the products in line with the products that will be offered for sale.

Also, the owner of the vending machine will be able to unlock when he wants to refill it with a card (RFID)

4 Methodology

The procedure of the vending machine is divided into two main parts. The first is the design body and application of the mechanical part. It includes identifying, drawing, designing and installing mechanical parts. The second section is the smart part where the integrated circuits are used tomake the machine in terms of the way it turns on and the other goals that the machine performs.

4.1 Design and Mechanical parts

As an initial step to start building a vending machine, a simple diagram was drawn to explain everything that is required of the machine and for the structure of the machine to be suitable and support the characteristics of the project,

We searched for a way to install the snacks, and after researching and seeking help from specialists in this field, we found that we can use an iron wire and wrap it in several turns and install it on a wheel, and install the wheel on a wooden back surface and connect it with the Motor , There are 4 motors, each motor is connected to a wheel, and each wheel is connected to an iron wire as shown in Figure 1.

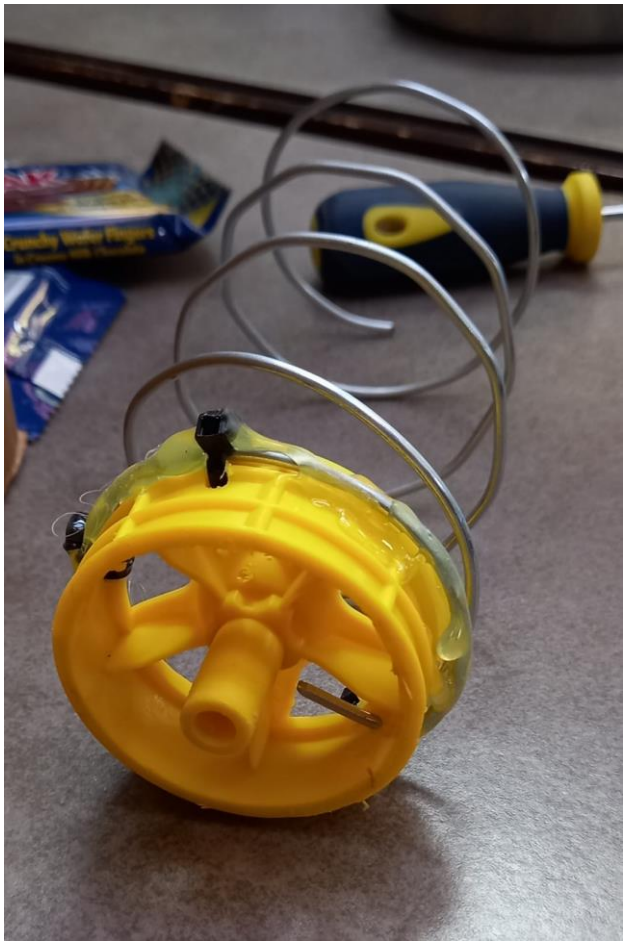

Figure 1: iron wire and wrap it in several turns

Figure 2: wooden front surface

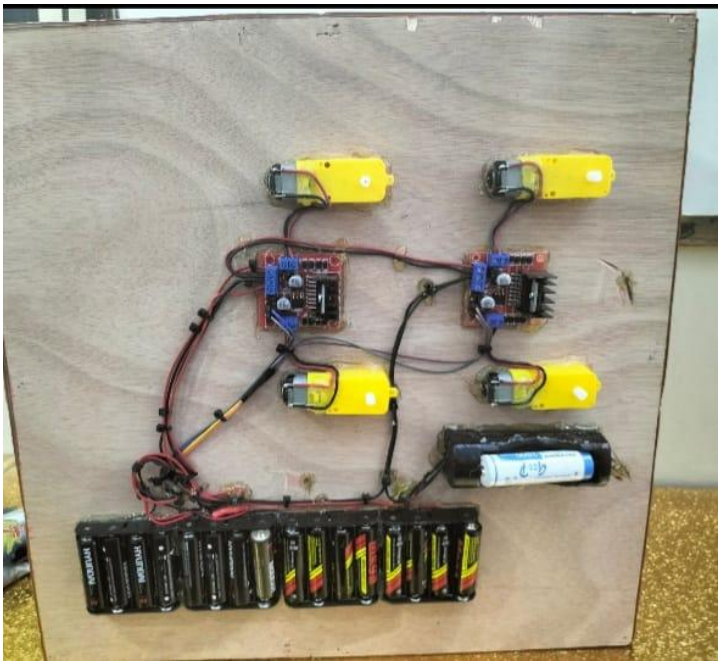

Figure 3: wooden back surface

Figure 4: outer shape of the vending machine

4.2 Electronic parts

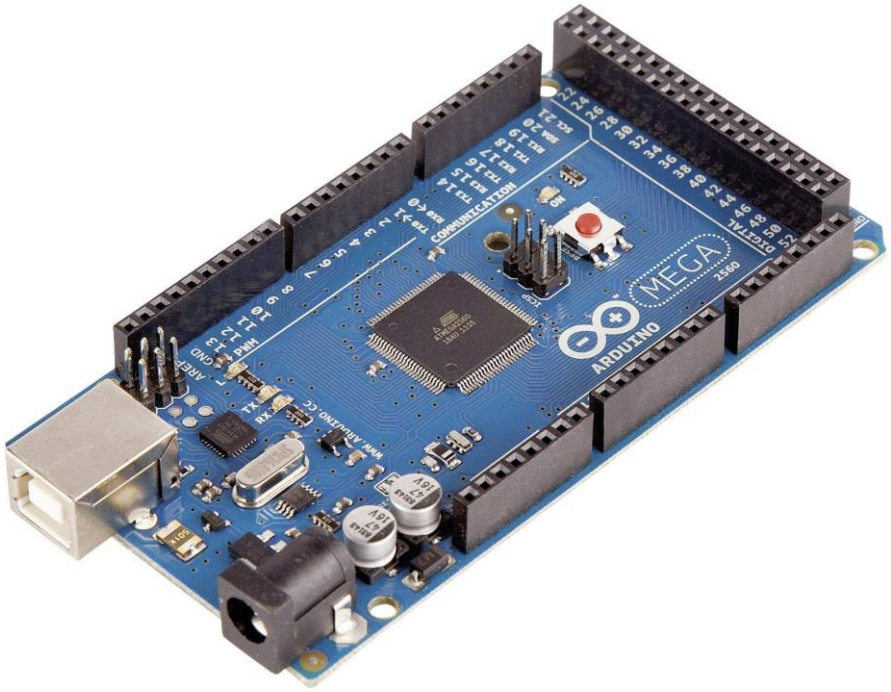

Figure 5: arduino mega

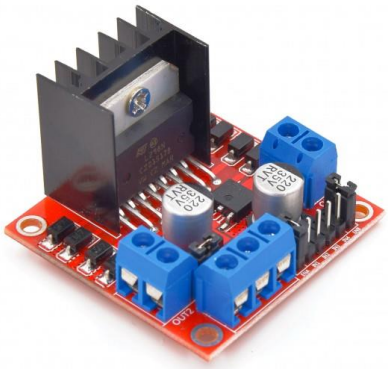

Figure 6: H-bridge motor driver

Figure 7: The Dc motor

Figure 8: Servo Motor

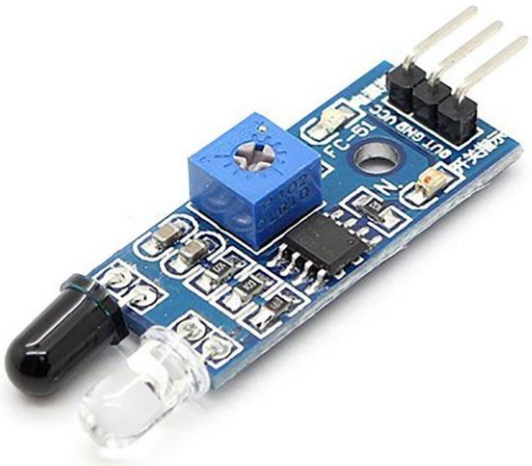

Figure 9: IR sensor

Figure 10: 1.5v battery

Figure 11: RFID with tag and card

Figure 12: Gsm

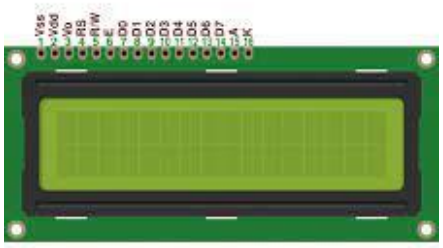

Figure 13: lcd

Figure 14: push buttons

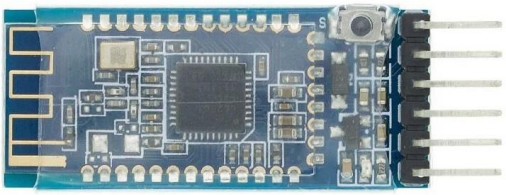

Figure 15: Bluetooth

Figure 16: resistances

Figure 17: potentiometer

Figure 18: 3.7 battery

Figure 19: male female wires

Figure 20: male male wires

4.3 Circuits Design

In the beginning we gave power to the Arduino 12 volts and another 12 volts to the loads

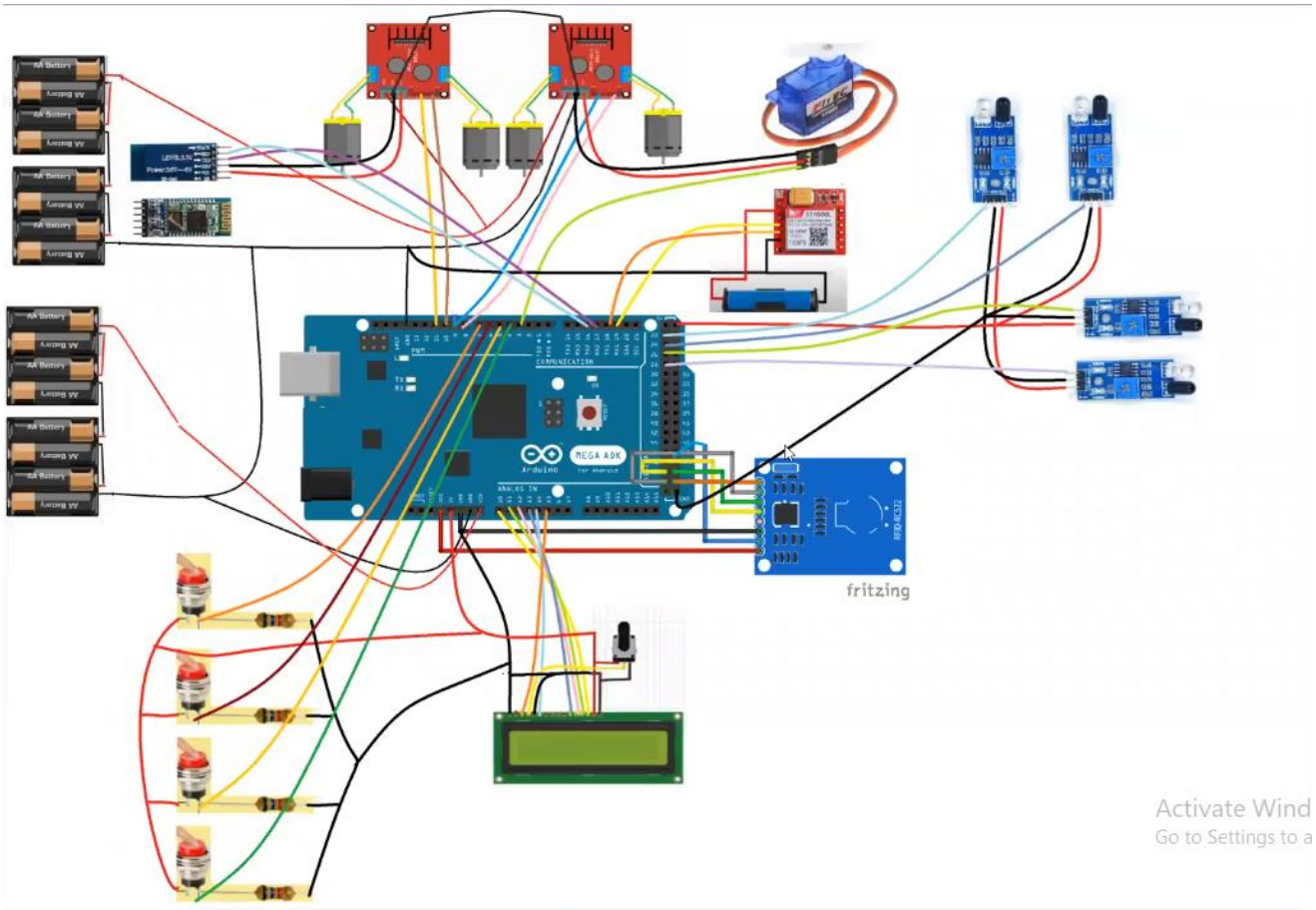

Figure 21: Circuit Design

4.4 Changing snacks price by Bluetooth

Figure 22: changing price

4.5 Message send when snack runs out:

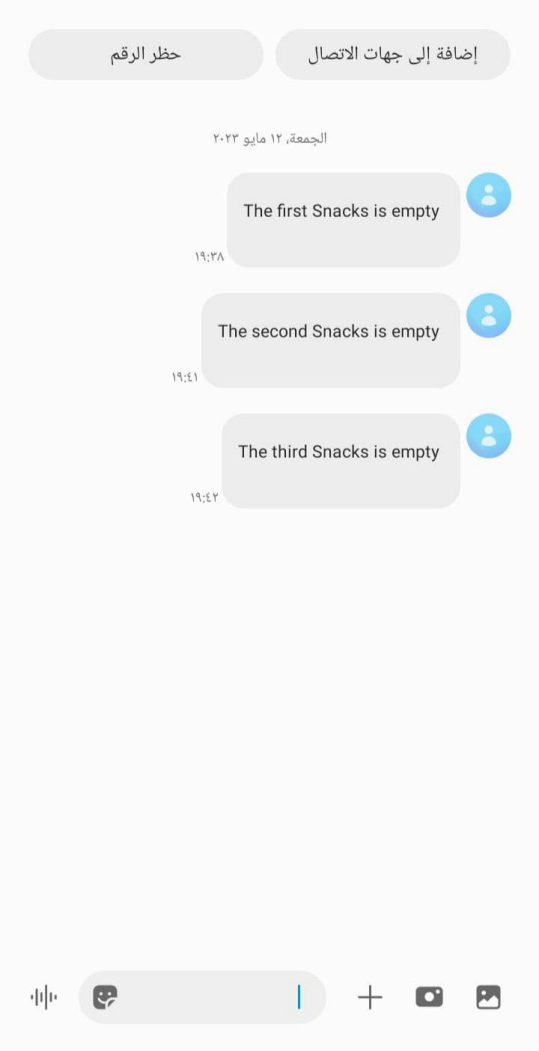

Figure 23: snack runs out message

4.6 Working Principle

In the beginning, when the machine is turned on, a welcome message is printed on the lcd screen for a short period, then the prices of the snacks appear on the screen, and then the customer chooses the snack he wants to buy through one of the buttons that represents each snack, and after choosing the snack he wants, it will appear on the screen that you have chosen This snack and its price, and the snack will not be obtained until after payment. Payment is made via RFID tag. There are two cases, either the card is empty or it is not enough to buy the snack, and a message will be sent on the screen that the value is not enough,

or the second case, the price of the snack will be deducted from the Rfid, A message will appear on lcd with that.

As for the owner of the machine, he will be able to open the machine via the Rfid card, so that the servo Motor will move to open the door, and a message will also be sent to the owner's phone in the event that any amount of snacks runs out.

In the event that the owner of the machine wants to change the prices of the snacks, he will do so through his mobile phone.

5 Result and discussion

Building a vending machine was not easy at first, as we had to determine the shape of the Machine in accordance with the features that we would provide. Then we learned new things about the arduino that we did not know, but our previous background in the PIC course and the lab helped us to learn quickly and easily.

A vending machine is an automated machine that provides snacks to consumers after paying RFID card ,in addition to changing the prices of the products in proportion to the available Products also provided a service to send a message To the owner of the machine in the event that One of the products runs out, in addition to a special lock that is opened by the owner of the Machine using the RFID card.

Conclusion:

The vending machine was successfully implemented using arduino mega as its main controller. In Conclusion, the project has achieved all the proposed objectives to improve the overall performance Of the vending machine on terms of use modern non-cash payment methods, attractiveness, And reliability.

Future work:

We aim to make the project accommodate more products

We aim to offer intuitive touch screen interfaces, voice recognition or augmented reality features to make vending machines more attractive and easy to use. This can include interactive product offerings, virtual shopping experiences, or personalized recommendations.

We aim to integrate technologies such as facial recognition or fingerprint scanning to conduct smooth and secure transactions. It is also possible to make the machine talk about approaching it with welcome messages.

References

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