An-Najah National University

Faculty of Engineering & Information Technology

Computer Engineering Department

Graduation Project 2

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Snacks On The Way

Acknowledgment

It is our pleasure to dedicate who supported us to complete this work.

Every challenging work needs self-efforts as well as the guidance of elders especially those who were very close to our hearts, In the first place, our humble efforts dedicate to our families and friend. Strong and gentle souls who taught us to trust in Allah, believe in hard work and that so much could be done with little.

We would like to thank our supervisor Dr. Emad Natshi, for his generous help, patience, feedback and guidance to improve our work as well as his encouragement through times.

Last but not least, all thanks and gratitude to those who lend a hand.

Disclaimer

This paper was accomplished by Marah An-najjar and Dalia Omar 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.

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First chapter

1. Introduction

1.1 Statement of the problem

University students need to be able to get snacks in between lectures in a convenient and a time and cost-saving manner.

Looking at the location of the cafeteria, each student needs approximately 10 minutes to go and get a snack from it. And that sounds inconvenient especially when they have two consecutive lectures.

Also, using the regular way for buying things could be boring especially when you have to wait for a couple of minutes to pay.

The convenience of smart vending machines cannot be denied especially when everyone is in hurry and have no time to go out and wait for their food in the middle of their lecture's hours.

By using smart vending machine, we are making sure that the students are well-fed and satisfied that enhancing their productivity and willingness to attend lectures on time.

Taking into consideration all of the above, there is a desperate need to have a smart vending machine for snacks in every department in the university, it should support new paying methods, has a variety of snack types and easy to access and use.

In this project, we afford Help University students so they will be able to get snacks that could help them boost their energy and concentration.

1.2 Objectives

This project aims to provide a product that eases the process of buying a snack by any student studying at An-Najah National University in a convenient and a time and cost-saving manner.

1.3 Project Scope

An-Najah National University, focuses on the students of An-Najah National University especially in the engineering department.

1.3 Report Organization:

This report contains 4 chapters each with several topics.

The first chapter contains introduction with its subchapters.

The second one is constraints, the third on is the literature review and the methodology. And the last one contains conclusion, references and recommendations.

Second chapter

2. Constraints, Components and Earlier coursework

2.1 Constraints and Limitations:

2.1.1 Time Limit:

The project needed 3 consecutive months to be built and tested, starting with designing and building the shape and apply it, creating and connecting features, and finally putting all the components together, these all combined together formed a real challenge to be accepted.

2.1.2 Cost:

As we were compelled to cancel some intended features due to the highly expensive cost.

2.1.3 Electrical components sensitivity:

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. Also, some of the chips were damaged while developing the machine.

2.2 Components:

2.2.1 Hardware components:

Figure 1: Arduino Mega Microcontroller

Figure 2: Breadboard

Figure 3: Coin Acceptor

Figure 4: Esp8266 nodemcu

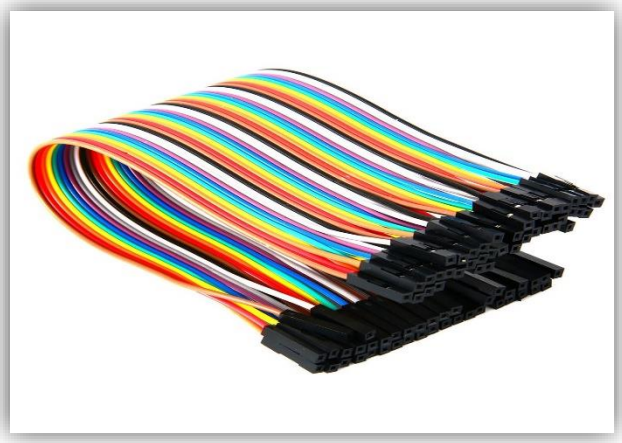

Figure 5: Female-Female jumper wires

Figure 6: Female-Male jumper wires

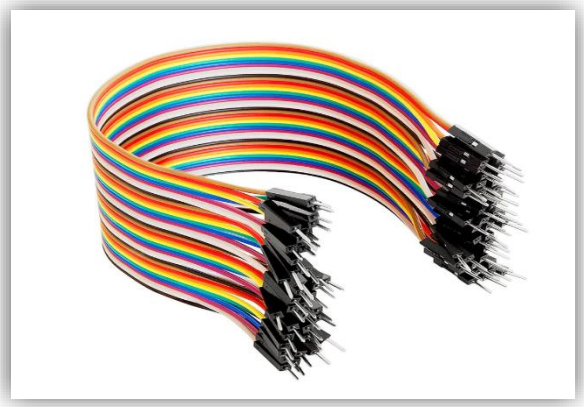

Figure 7: Male-Male jumper wires

Figure 8: Stepper Motor

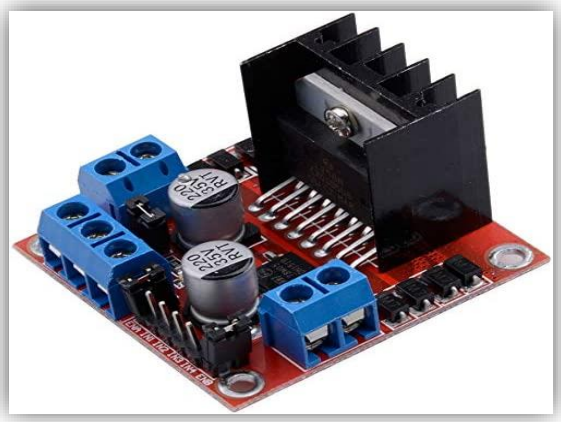

Figure 9: H-Bridge L298N motor driver

Figure 10: 4X1 Keypad

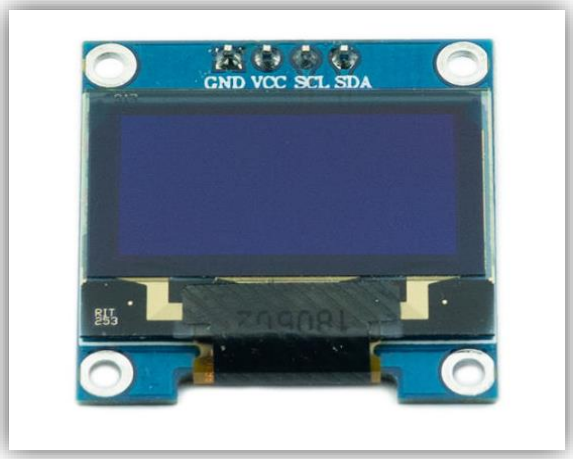

Figure 11: OLED Liquid LCD

Figure 12: Resistor

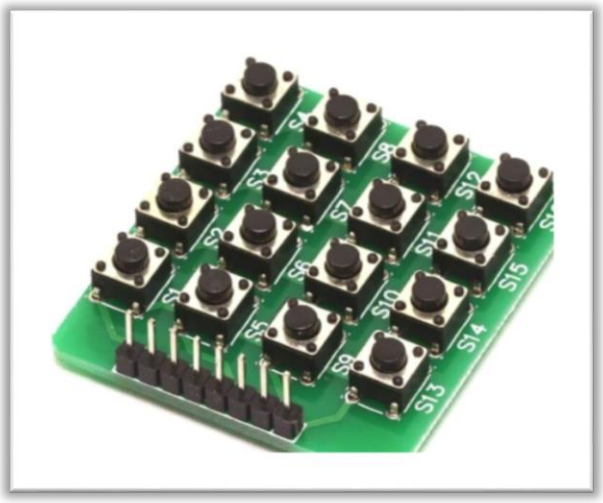

Figure 13:4X4 Keypad

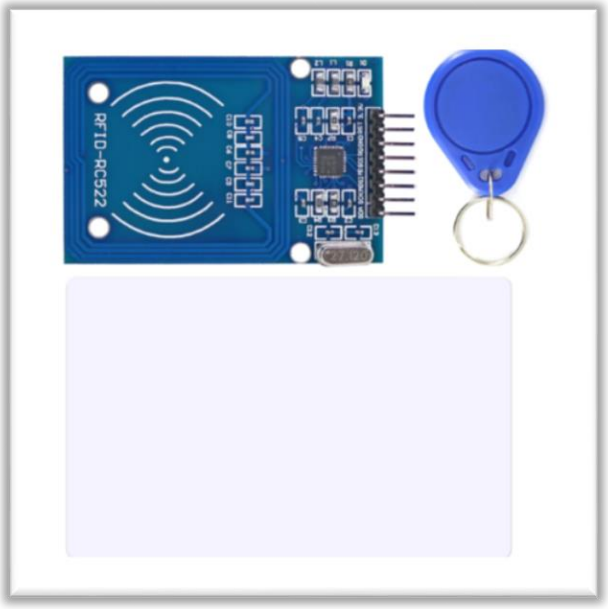

Figure 14:RFID Module

Figure 15:Relay

Figure 16:Solenoid lock

2.2.2 Earlier Coursework:

Web, PIC courses and PIC lab provide by Computer Engineering Department have helped us in developing the project. In addition to that, we needed to enroll in other courses such as Arduino course to get this job done.

Third chapter

3. Literature review

Due to the contiguous growth of students' numbers in An-Najah National University, and students' needs for a convenient and a time and cost-saving solution for buying snacks.

There are many solutions that were created or suggested to solve the dilemma of students waiting for their inquiries to be heard out. But yet, there is no solution to combine and solve the problem.

Solution	Saves time and effort?	Easy to reach?
Departments Cafeterias	No	No

Table 1:Suggested solutions for the problem

As table 1 demonstrates, we can conclude that the solution was not sufficient, meaning that it's not especially developed to solve the core of the problem.

Also, it does not guarantee saving time and as a result, students' problem with wasting time trying to get a snack in between lectures is not solved.

In this project (The V-Vending Machine), we combined the problems of students to come up with an effective solution that will solve the difficulties all at once using a variety of input methods of ordering a snack. As users can pay in one way as it supports more than one input method.

Also, the owner of the vending machine will be able to track the quantities that the vending machine has and access to unlock it when he wants to refill it with a card (RFID) or a password by keypad.

The vending machine features discharging units (a helical coils to carry snacks) each is controlled via continuous rotation steppers motor that will be responsible for rotating the coil, a Barcode Scanner to support the second input method, a wifi component to receive the selected choice out of the web application, a stepper motor responsible for the carrier system and an Arduino board connected to all of the components as a main core for processes.

Motors will be stimulated to work based on what element the user has chosen based on any of the two input methods, only the one attached with the chosen snack coil will rotate.

Input methods can be described as follows:

- A panel consisting of buttons each assigned to a specific element, an LCD to display the buying operation based on the selected button and a coin opening connected to a coin detector which is a simple infrared proximity sensor works when a coin will pass near it and will give positive feedback if a coin is detected.

- Choosing a snack via a web application by QR barcode using WIFI, the user will have a screen with a list of available items and will be able to choose from them and purchase the order on button click , when selected an item ,web page appears an alert warning about the content of the item, if you are allergic to something .

A purchase counter will be used to detect whether rows are empty or not, and will automatically send a notification to the owner of the machine stating that a specific row need to be refilled and then he can access the machine to refill it using one of the following methods:

- Using his card, an IDF module will be used as a method to unlock and open the door of the machine.

- A keypad allowing the owner to enter a password to unlock the machine.

To conclude all of the above, this project aims to create a smart vending machine that supports two different input methods for choosing a specific snack, one of them are using a mobile (online web application) and the other one is the original method using a panel sticked to the machine.

Also, it will provide the owner a smart managing method using notifications to inform him if any element is out of stock and then he will be able to unlock the system using his card (RFID) or by using a password.

Third chapter

4. Methodology

4.1 System Features and Design:

This system contains more than 8 hardware components combined together in a user-friendly design that will smoothen the process for users and admins.

Starting from user features moving to admin features, everything was combined to give the best experience for both of them.

Also, as computer engineers, we must find software solutions side by side to hardware solutions, that's why we chose WIFI as an alternative input method for users.

A questionnaire was done online among the university students. With total of 11 response.

The following screenshots are taken from the questionnaire that was distributed among students; results came as follows:

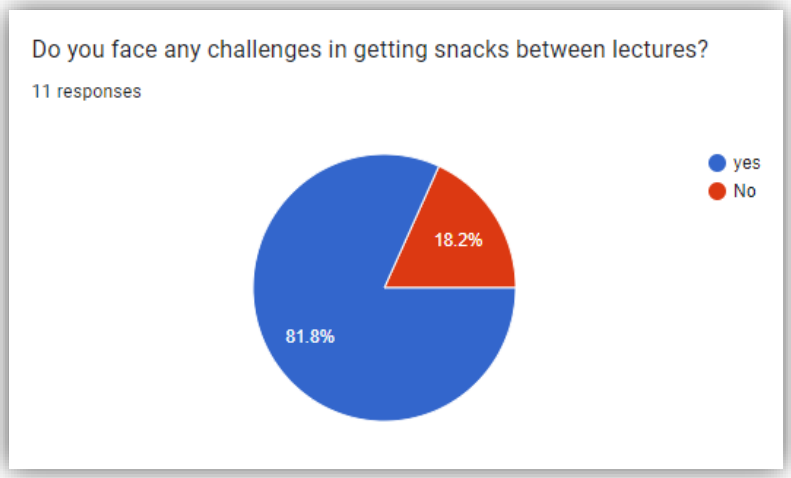

Figure 17:Do they find it challenging to get snacks between lectures?

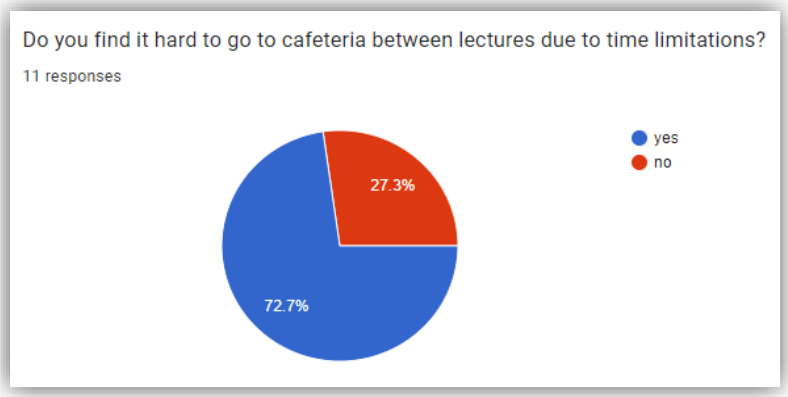

Figure 18:Do they face time limitations?

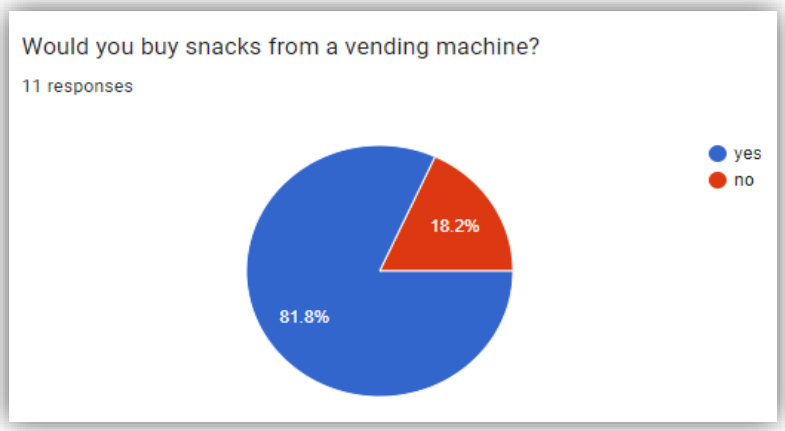

Figure 19:Will they buy a snack from a vending machine?

As a result, there is a severe need for a specific machine to solve the previous problems taking into consideration what students need. System design came as follows:

Figure 20:Machine Design

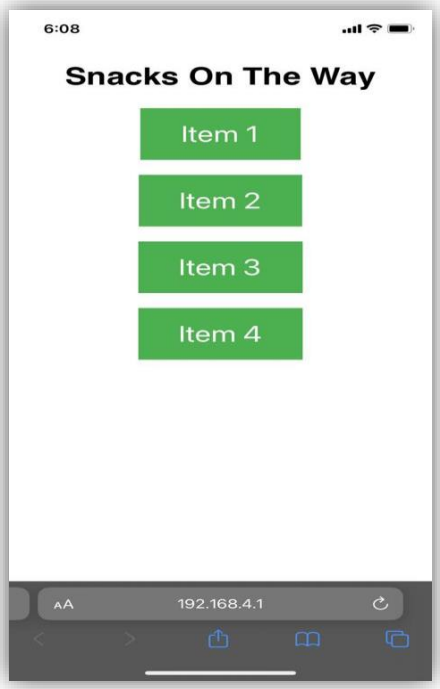

Figure 21:Website Design

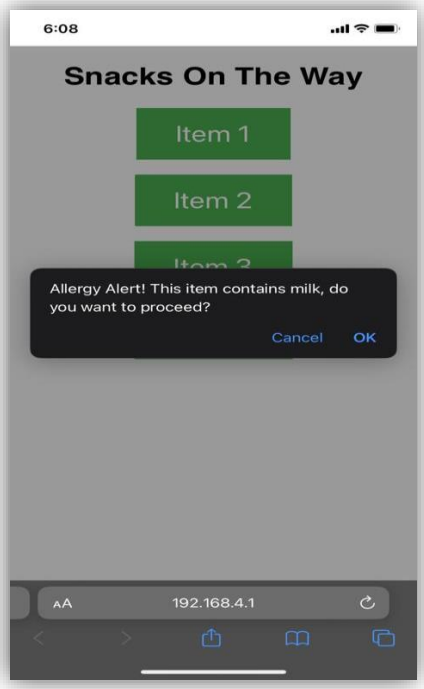

Figure 22:Allergy Alert

Figure 23:Restocking Alert

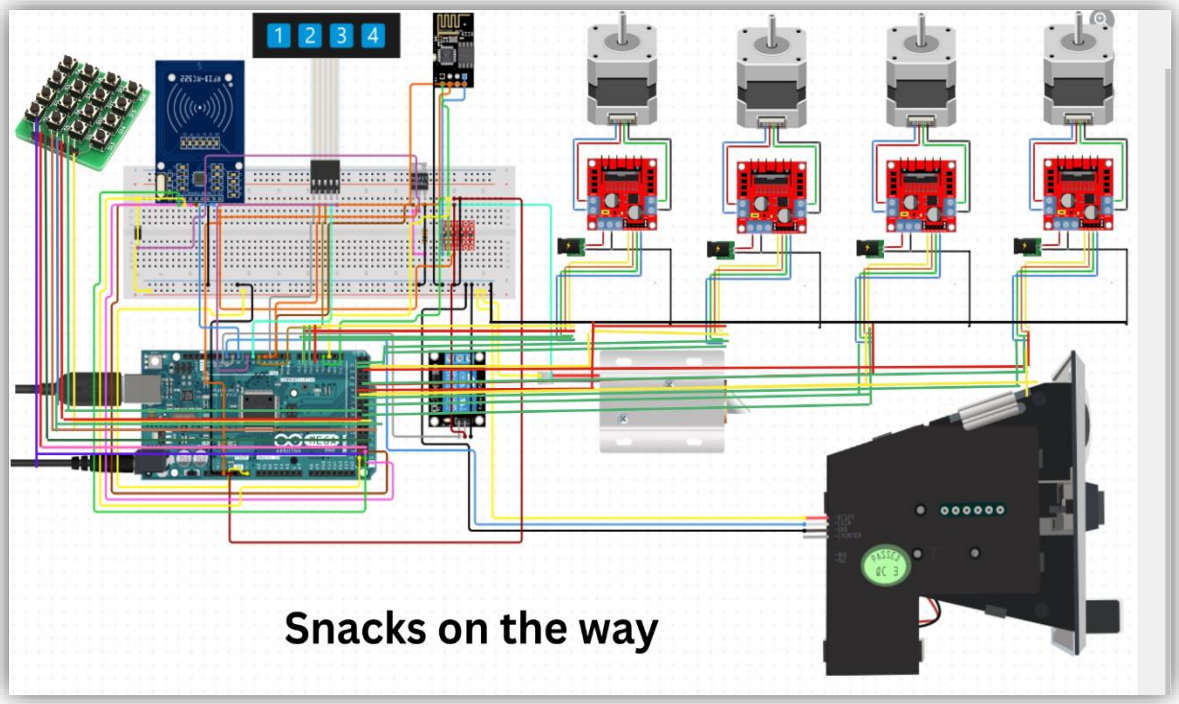

Figure 24:Circuit Schematics

Fourth chapter

5. Conclusion and discussion

The V-vending machine is a unique product that has been designed to effectively solve students'problems and needs for a sufficient method of getting a snack in between lectures. The servicesprovided by the machine will levitate the students' ability to save their time and effort and also toboost their concentration and energy within minutes before attending lectures. Also, it will help them to effectively engage technology in their university life. As a result, professors will be satisfied and happy when students attend lectures on time, and students will be satisfied and recharged their energy for lectures.

Recommendations

6. Recommendations

- The necessity of using technology to solve real life problems.
- Creating a product that helps An-Najah National University students to save time, effort and communication process.
- Using technology does not mean dispensing traditional paperwork but giving a more effective solution and that's what is clearly obvious as we combined the traditional method with the modern one that mainly uses technology.

7. Future Work

- We aim to expand project aspects so it can cover all types of vending machines (food, books, drinks…etc.).
- Taking feedbacks from users and develop the product according to it.
- Use artificial intelligence in all possible parts.
- Activating notifications for users' feedback progress.
- Integrating with PalPay so they can use it as a payment method.
- Adding a fingerprint component to unlock the machine from the admin side.

8. References

- https://mytectutor.com/interfacing-ssd1306-oled-i2c-display-with-arduino/
- https://www.youtube.com/watch?v=9lxdIAvV0l0
- https://github.com/me-no-dev/ESPAsyncWebServer
- https://randomnerdtutorials.com/esp8266-nodemcu-access-point-ap-web-server/
- https://randomnerdtutorials.com/guide-for-oled-display-with-arduino/
- https://www.youtube.com/watch?v=vW3P6iNCblU
- https://www.hackster.io/mertarduino/solenoid-door-lock-contol-rfid-527505
- https://www.faranux.com/product/plastic-front-panel-input-advanced-cpu-coin-acceptor-for-vending-machines/
- https://www.hackster.io/mertarduino/solenoid-door-lock-contol-rfid-527505
- https://arduinogetstarted.com/tutorials/arduino-keypad-door-lock