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Auto Billing System Using Arduino

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Abstract: ***Shopping at large malls has become a commonplace activity in smart cities. This project is aimed to shorten the line at a supermarket's billing counter. The module displays the total price of the product stored in the cart. In this manner, the buyer can directly pay the amount at the billing counter and leave with the goods purchased. It replaces the traditional scanning of products at the counter, which speeds up the entire shopping process. Additionally, with this system, the user will know the total amount to be paid and can thus plan his shopping accordingly, only purchasing essential commodities, resulting in increased savings. Because the entire billing process is automated, the chance of human error is greatly reduced. In addition, the system contains a feature that allows the user to delete scanned products, which improves the customer's purchasing experience. The test hardware is based on the Arduino platform. There is also an app that communicates with the Arduino UNO board and displays a list of all the products purchased by the user as well as the produced bill.***
Keywords: Arduino, RFID Tags, Shopping cart, EM-18 Module, Bluetooth module.

I. INTRODUCTION

In today's day and age, the number of shopping malls has increased around the world. Sometimes customers have a problem with incomplete information about the product on sale and waste of time at billing counters. In the present system, shopping malls are using barcode technology. Although this technique has replaced the previous manual system yet it has limitations and downsides to it. Barcode scanner requires manual tracking, whereas RFID can be automatically tracked. Barcodes necessitate a significant amount of manpower and human effort. Not solely this, the Barcode system needs the user to stand and wait in long queues so as to get their product scanned and their bills generated. This strategy will be tiresome, and it will also waste a lot of the customers' time, adding to their frustration. Despite the fact that there are numerous shortcomings, the Barcode method is still in use. It is evident that there is a desire to implement a better and more cost-effective method. The advent of newer techniques like RFID technology and wireless networks have makes the process of shopping at a faster speed, making it more efficient as well as making it more transparent. This method will not only skip the long queues in shopping complexes and malls but also save chunks of time for the user. Additionally, the method assists the customer in saving money. The system uses RFID tags rather than barcodes, which are far more efficient and powerful when it comes to product scanning. The device developed using shall be installed on the trolley. The consumer shall scan their products by themselves and the calculation of the total amount happens on the cart and displays in the mobile itself with the help of Bluetooth technology. This shall also give a plan to the user on what items their particular shopping session shall cost them. As a result, time management and money management must be addressed.

II. METHODOLOGY/EXPERIMENTAL

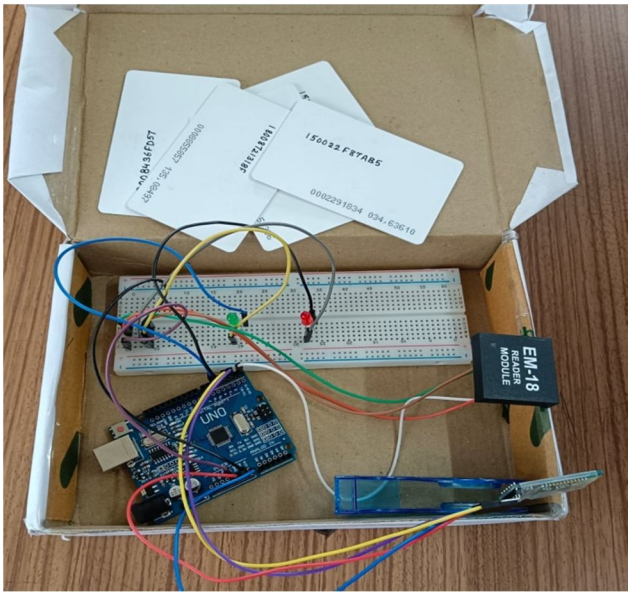
A. Materials/Components

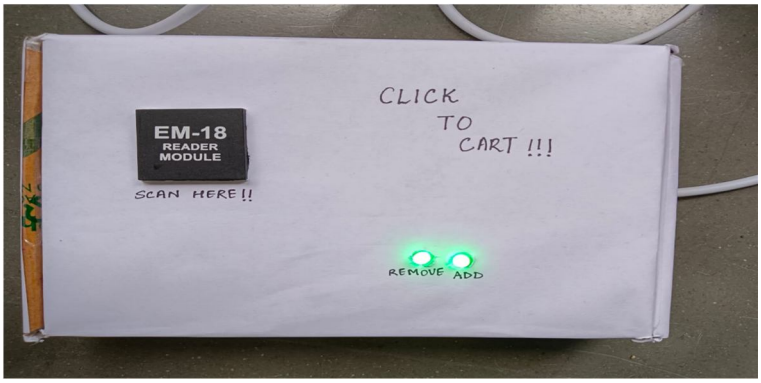
For the hardware side of the project the components used are:

1) *EM-18 Module:* The EM18 RFID Reader is a module that reads the ID data encoded in RFID tags. This ID information is unique to each Tag and cannot be duplicated. When an RFID tag gets into range, the RFID reader reads its unique ID and serially transmits it to the microcontroller or PC. RFID readers are equipped with a transmitter and an antenna. It is typically fixed in a fixed place.
2) *RFID Tags:* Radio frequency identification is a wireless identification technique that detects the presence of RFID tags using radio waves. RFID technology, like bar code readers, is used to identify the presence of persons, objects, and so on. In barcode technology, we must optically scan the barcode by holding it in front of the reader, however, in RFID technology, we just bring RFID tags into the range of readers. Furthermore, barcodes can get damaged or unreadable, which is not the case with most RFID.

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3) *Arduino UNO:* The Arduino UNO is a microcontroller board. It relies on the ATmega328P. It has 14 digital I/O pins (of which 6 can be utilized as PWM outputs), 6 analogue inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It includes everything you need to get started with the microcontroller; simply connect it to a computer via USB or power it with an AC-to-DC adapter or battery.
4) *Arduino IDE:* The open-source Arduino Software i.e., IDE makes writing code and uploading it to the board simple. This software is compatible with all kind of Arduino boards.
5) *HC-05 Bluetooth Module:* The HC-05 Bluetooth module is intended for wireless communication. This module can function as a master or a slave. It is an IEEE 802.15.1 defined protocol that can be used to create a wireless Personal Area Network (PAN). It transmits data over the air using frequency-hopping spread spectrum (FHSS) radio technology. It communicates with devices via serial communication. It uses the serial port to communicate with the microcontroller (USART).
6) *Resistors:* A resistor is a component of an electronic circuit that limits or regulates the passage of electrical current.
7) *Jumper Wires:* A jumper wire is an electric cable used for connecting remote electric circuits on printed circuit boards. It is possible to short-circuit and short-cut to the electric circuit by using a jumper wire to the circuit.
8) *Breadboard:* A breadboard is used to create temporary circuits. It is beneficial to designers since it permits components to be readily removed and replaced. It is handy for someone who wishes to design a circuit in order to show its operation and then reuse the components in another circuit.
9) *LED:* A light-emitting diode is a semiconductor that can source light with two leads. When activated, it is a p-n junction diode that emits light. When an appropriate voltage is provided to the leads, electrons within the device can recombine with electron holes, releasing energy in the form of photons.

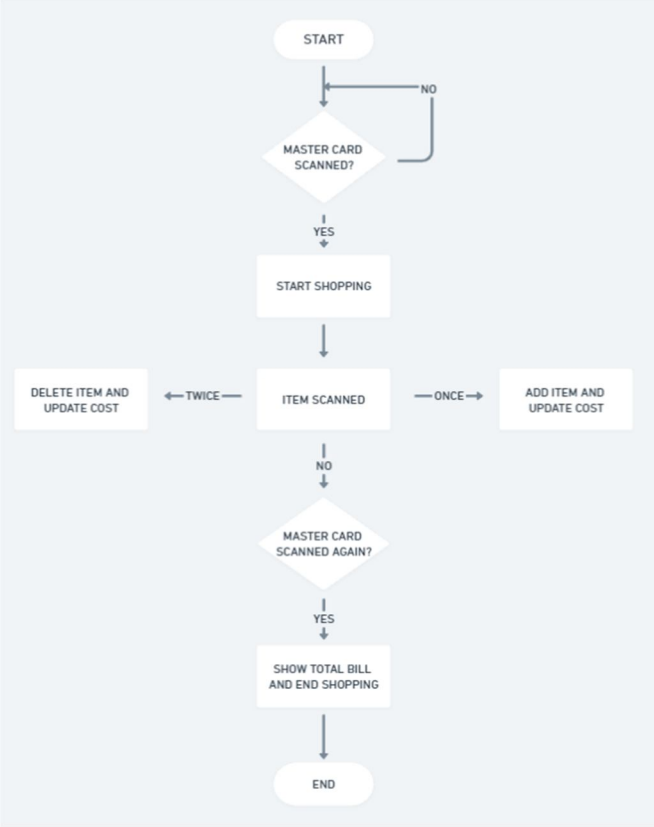




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Price(Rm):25.00
Butter Added
Price(Rm):45.00
Milk Removed!!!
Sugar Added
Price(Rm):40.00
Sugar Removed!!!
Total Price :-
45.00
Total products:-
1
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B. Algorithm

1) Step 1: Start.
2) Step 2: When the system is powered up, display the initial data i.e., welcome message.
3) Step 3: Master card needs to be scanned for start the billing process.
4) Step 4: After master card is detected products scanned will be added to the bill. If a product is scanned twice, it will be removed from the bill. This process continues until master card is scanned again.
5) Step 5: If the master card is scanned again the billing process terminates.
6) Step 6: The total number of products and total amount is displayed along with a thank you message.
7) Step 7: End.



III. RESULTS AND DISCUSSIONS

In the world of Automation, this automatic billing system plays a major role in the upliftment of technology. This technology will replace the present barcode system. Hence this technology can help people to make their lives easy and time-saving too. In this project, we have successfully implemented the RFID reader for the automated billing system.

IV. FUTURE SCOPE

Though the proposed system is efficient, it can be made more user-friendly by using a more sophisticated microcontroller, a larger display system, and GPS to track the product. With the help of optical sensors, motors, and motor drivers, we will make a trolley in such a way that it will follow the customer when purchasing items and it maintains a safe distance between the customer and itself. The customer can just type the name of the product he/she wants to purchase on android device. The trolley will automatically guide them to the location of the product. In the future, the trolley can be implemented with a voice assistant to assist the customer with all the information about the availability of the product, the price, the offers available on that product, etc.

V. CONCLUSION

In this research paper, we successfully implemented the RFID tags for the automated billing system. Even though we have some challenges with smart shopping such as sometimes items cannot be detected because of their tag positioning, size, and shape. Technologies that support the interactions between physical products are relatively expensive. These are the disadvantages addressed that have been overcome through this system. This smart trolley is cost-effective and the automated billing amount will be displayed on the mobile application. In the future enhancement, we can add an indoor navigation system that can locate the required item from the customer's current location. Here we have used a very low range RFID reader, which can be further enhanced with a high range reader when it comes for real enactment of this system. Although many new developments have been made in this area, supporting such application is still a major challenge.

VI. LITERATURE REVIEW

It is clear from the paper "Smart trolley in mall by using Microcontroller & RFID" by Department of Electrical Engineering, Guru Gobind Singh Polytechnic, that the system helps prevent time wastage and as well as help to the consumer to calculate his or her total with the help of smart trolley so he or she can shop within his or her budget. However, one drawback of the smart shopping cart is that kids cannot sit on it. Consumers who bring their young children to the grocery store may find this to be terrible news. Therefore, it's possible that a young mother won't select a smart shopping cart. The authors recommended upgrading the microcontroller, employing a bigger display system, using GPS to track the product, and other methods to make the system more effective. Customers should have a safer shopping experience, according to a paper titled "Smart Shopping Trolley for Supermarket Using Recharged Smart Card." After checking out on the smart shopping cart, you could check the total while you were still shopping and then immediately depart the store. The total cost of the system rises as a result of the components' slightly higher costs. In the future, we will be able to pay our bills online using a smartphone and the supermarket in question's QR code. We will also receive a soft copy of the bill receipt when we check out of the store.

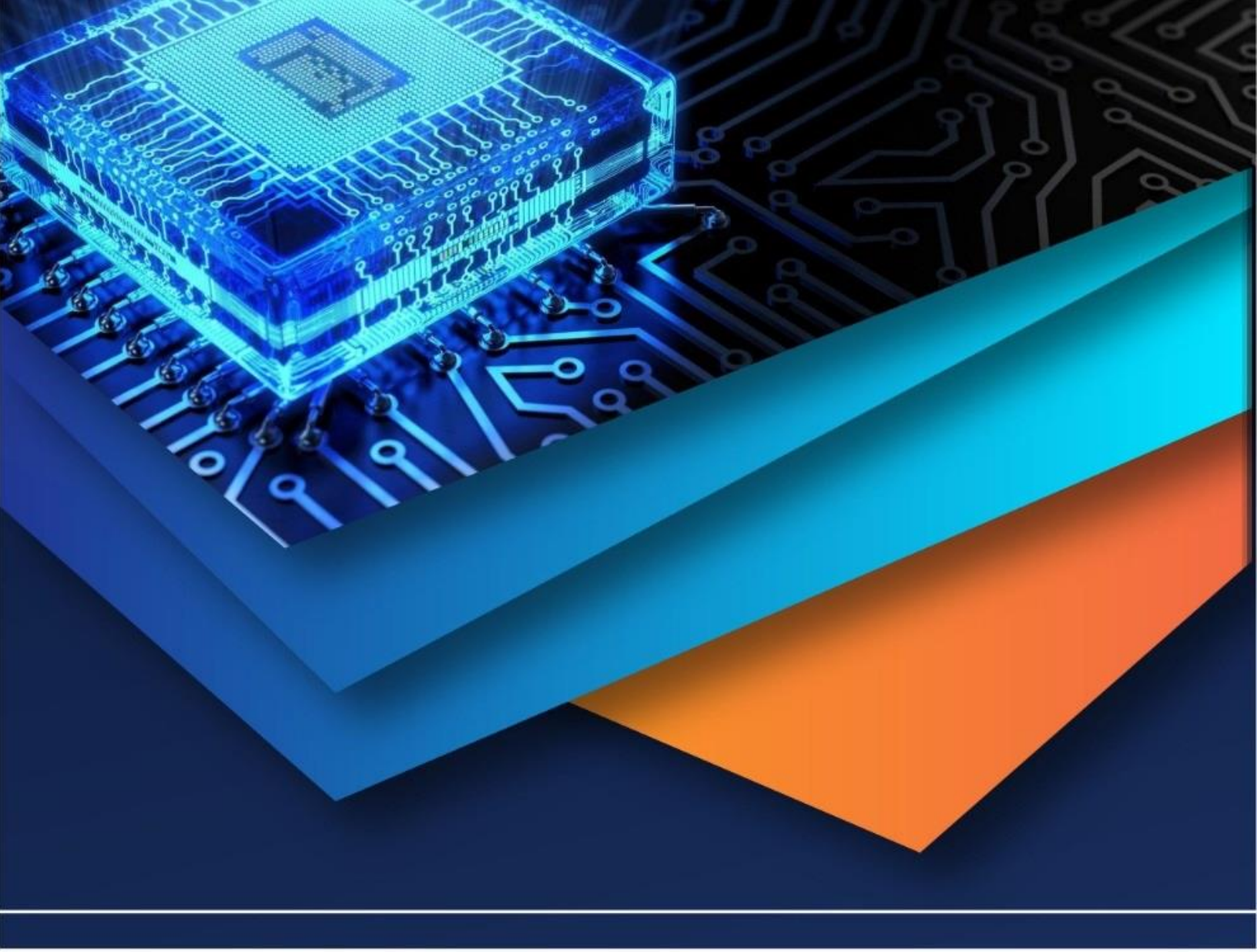
VII. ACKNOWLEDGMENT

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