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SMART SHOPPING CART USING RFID

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ABSTRACT - Nowadays, buying and searching for products at shopping malls are turning into a daily activity in cities. We can see many number of people shopping at malls on holidays and weekends. The rush happens when there are special offers and discounts. People purchase completely various things and place them in trolley. After total purchase, one must visit the billing counter for billing and making payments. In the billing counter, the cashier prepares the bill victimization bar code reader that might be a time overwhelming method and leads to long queues at billing counters. This paper targeted to minimize the Queue at a billing counter in a shopping mall. The smart shopping cart does the same by displaying the total price of the product kept inside the cart. In this way, the customer can directly pay the amount either in-app or in the billing counter and leave with the commodities he/she has bought. The hardware relies on Arduino Uno, RFID Reader Module, RFID Card, and Buzzer. It eliminates the normal scanning of products at the counter and in turn speeds up the entire process of shopping is easy and also with this system, the customer shall know the total amount to be paid. Hence the customer can plan his shopping only by buying the essential commodities according to his savings. Since the entire process of billing is based on RFID, so it reduces the possibility of human error substantially. The system also has a feature to delete the scanned products by customers to further optimize the shopping experience.

Keywords: Arduino; Smart Trolley; RFID Reader Module; RFID Cards; Buzzer.

1. INTRODUCTION

Nowadays a number of shopping mall has increased around the world. Sometimes customers have problem regarding the incomplete information about the product on sale and waste of time at billing counters[1]. In existing system, shopping malls are using barcode standards [2]. This technique has replaced the previous manual system however has limitations. Barcode scanner requires a manual tracking, whereas RFID can be automatically tracked[3]. Barcodes additionally need a considerable quantity of manpower and human effort. Barcodes will get broken simply. Not solely this, The Barcode system needs the client to the square in long queues so as to induce their product scanned and their bills generated. This method will persuade be wearisome and it additionally consumes heaps of your time of the shoppers, thereby adding to their frustration. With such a big amount of disadvantages there too, the Barcode system remains in use. It is obvious that there is a desire to bring on a better and a lot of economical systems. The advent of newer techniques like RFID technology and wireless networks have makes the process of shopping at a faster pace, making it more efficient as well as making it more transparent[4].

Smart shopping cart using Arduino and RFID may be a new advancement in the field of Supply Chain Optimization. This method shall not only to skip the long queues in supermarkets and malls but also save plenty of your time for the purchasers. The system also helps the customer in saving money. The system uses RFID tags instead of Barcode tags which are much more efficient and powerful when it involves scanning of products. The device developed using Arduino and RFID shall be installed on the handbasket or trolley. The customer shall scan their products by themselves and the calculation of the total amount happens on the cart and displays in the app itself. This shall also give a plan to the shoppers on what proportion their particular shopping session shall cost them. Hence, time management and money management shall be taken care of. The paper is ordered into five segments. the primary segment gives a fast introduction to the system. The second segment is about shopping systems and therefore the study of related existing systems. The third segment details the implementation of the system. The fourth segment displays the results obtained using the Arduino and RFID-containing device. Finally, the conclusion provides the summary and future scope of the system.

2. LITERATURE SURVEY

Dr. Suryaprasad J [5] in "A Novel Low-Cost Intelligent Shopping Cart" proposed to develop a low-cost intelligent searching aid that assists the client to go looking and select product and inform the client on any special deals out there on the product as they move around within the shopping complex.

Amine Karmouche [6] in "Aisle-level Scanning for Pervasive RFID-based Shopping Applications" proposed to develop a system that's ready to scan dynamic and static products in the shopping space using RFID Reader antennas. Instead of conducting the RFID observations at the level of individual carts, aisle-level scanning is performed.

Satish Kamble [7] in "Developing a Multitasking Shopping Trolley Based on RFID Technology" proposed to develop a product to help someone in everyday searching in terms of reduced time spent while purchasing. The main aim of proposed system is to produce a technology oriented, low- cost, easily scalable, and rugged system for assisting shopping in person.

Mr. P. Chandrasekar [8] in "Smart Shopping Cart with Automatic billing System through RFID and ZigBee" proposed to develop a cart with a Product Identification Device (PID) which will contain a microcontroller, a LCD, an RFID reader, EEPROM, and ZigBee module. Purchasing product information will be read through a RFID scanner on cart, meanwhile product information will be stored into EEPROM attached to it and this EEPROM information will be send to Central billing System through ZigBee module. The central billing system gets the cart data and EEPROM information, it access the product database and calculates the total amount of purchasing for that particular cart.

3. EXISTING SYSTEM

At present they use the barcode method in shopping malls. In this method, every product has a barcode label on it which might be scanned with the help of specially designed barcode readers. A barcode reader is an electronic device used for reading information encoded with a barcode label. A lens and a light sensor converting optical impulses into electrical ones are the key components of a barcode scanner. Additionally, barcode readers contain decoder circuitry, which analyzes the barcode's data provided by the sensor and sends the barcode's content to the scanner's output port. We have a tendency to choose any product for purchasing we place it in a trolley and take it to the cashier. Then the products will be scanned by the cashier through a barcode reader one by one. After this cashier provides the bill. But this will be tedious once a ton of products is to be scanned, therefore this billing method will be slow. This eventually results in long queues.

4. PROPOSED SYSTEM

The system we are proposing will have an RFID tag attached to every single product. When we entering a shopping mall, we have to connect trolley with our mobile app. Items put into a smart shopping cart can be automatically read and the billing information can also be generated on the mobile app. The list of items we put into the trolley will be sent to the cloud and that data will be fetched by the Smart shopping cart mobile app. It makes inventory management easier for the management as all items can be automatically read and easily logged. From admin, they can manage all sold-out items through a web application. If stock is sold out, easily an admin can be intimate to Managing directories.

5. Why RFID?

RFID could be a method of knowledge collection that involves automatically identifying objects through low-power radio waves. Data is distributed and received with a system consisting of RFID tags, an antenna, an RFID reader, and a transceiver. Like barcode technology, RFID Scanner recognizes locations and identification of tagged items — but rather than reading laser light reflections from printed barcode labels, it leverages low-power radio frequencies to gather and store data. in a very warehouse or distribution center, this technology is employed to automate data collection. The transceiver reads radio frequencies and transmits them to a Radio Frequency Identification Reader(RFID)tag. The identification information is then transmitted from a little computer chip embedded within the tag and broadcasted to the RFID reader.

Some major applications of RFID:

Logistics & Supply Chain Visibility

Attendee Tracking

Materials management

Access control

Item level inventory tracking

6. HARDWARE

6.1 RFID Reader Module:

EM-18 RFID scanner module uses an RFID reader which will read a hundred twenty-five kilohertz tags. So, it will be known as a low-frequency RFID reader. It offers out a serial output and contains a range of 8- 12 cm. There is an inbuilt antenna and it is often connected to the laptop with the assistance of RS232. RFID Reader Module, are also called interrogators. They convert radio waves returned from the RFID tag into a type of signal that will be passed on to Controllers, which can make use of it. RFID tags and readers need to be tuned to a similar frequency for communication.

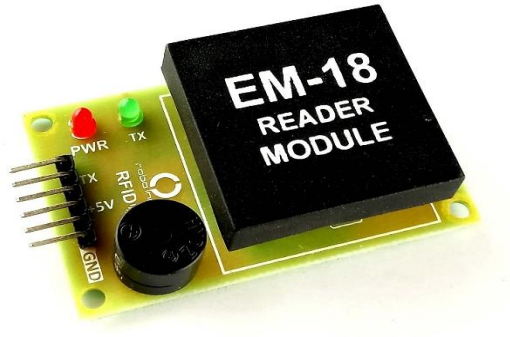

Fig.1. RFID Reader Module

6.2 RFID Tag:

An RFID reader is a device used to gather data from an RFID tag that is employed to trace individual objects. Radio waves are used to transfer signals from the tag to a reader. RFID is also a technology similar in theory to bar codes. The RFID tag should be among the range of an RFID reader, which ranges from three to a few hundred feet, so on be scan. RFID technology permits many things to be quickly scanned and permits quick identification of a particular product, even once it's encircled by many various things. RFID tags haven't replaced bar codes thanks to their price and therefore they have to singly determine each item.

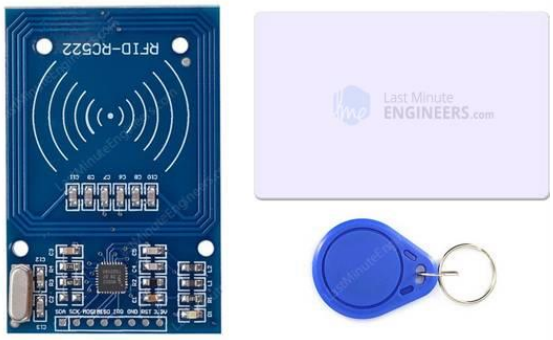

Fig.2. RFID Tag

6.3 Arduino UNO:

The Arduino Uno is an open-source microcontroller programming board supported by the Microchip ATmega328P microcontroller and developed by Arduino.cc . The board is supplied with sets of digital and analog input/output (I/O) pins which will be interfaced to numerous expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a sort B USB cable.[4] It will be powered by a USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. it's like the Arduino Nano and Leonardo.

Fig.3. Arduino UNO

6.4 Node MCU:

NodeMCU is a low-priced open-source IoT platform. It at first enclosed code that runs on the ESP8266 Wi-Fi SoC from Espressif Systems and hardware that was supported the ESP-12 module. Later on, the support for the ESP32 32-bit MCU was additional. NodeMCU is an associate degree ASCII text file code that ASCII text file prototyping board styles area unit out there. The name "NodeMCU" combines "node" and micro-controller unit(MCU). The term "NodeMCU" to be precise refers to the code rather than the associated development kits. each the code and prototyping board styles area unit open supply.

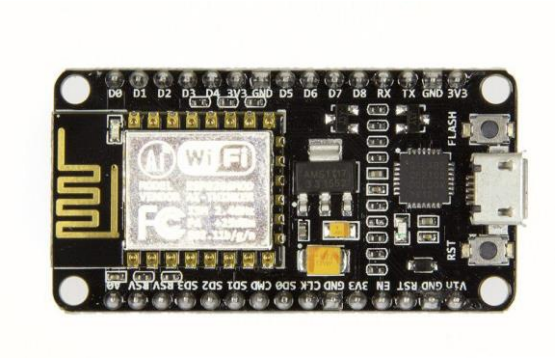

Fig.4. Node MCU

7. WORKING

1. All the products in the mall will be tagged with RFID cards. When a person adds an item to the trolley, the card will be scanned by the RFID reader.

2. Reader sends this code to Arduino Uno which further reads the product's code and sends it to the cloud, where the product database is available. Then a smart shopping cart application fetches the data and displays it on mobile. The item details like name, price & total bill of things inserted in the cart are displayed on the mobile app.

3. As we add the items, the costs will get added to the total. Thus, the billing is done. Simultaneously all details are displayed on the mobile app.

4. And additionally if we would like to get rid of some inserted item, then that product can be removed by pressing the push button and scanning it again from the trolley. The cost of the removed product will be deducted from the total amount which will be displayed on the mobile app.

5. Every trolley will have a separate Identification number. The smart shopping cart would be able to automatically read the products that have been put into the cart by scanning RFID. A buzzer is used for giving an intimation when a product is added or removed.

6. NodeMCU ESP8266 is used to transmit the data collected from the server and transmit it to the app and webpage. It is a tool for accessing the database stored in the cloud.

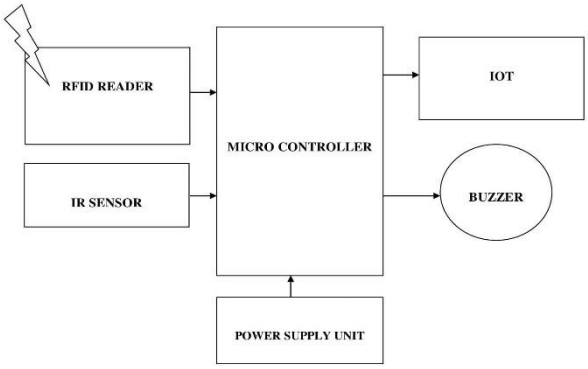

Fig. 5. Block Diagram for Smart Shopping Cart

8. RESULT

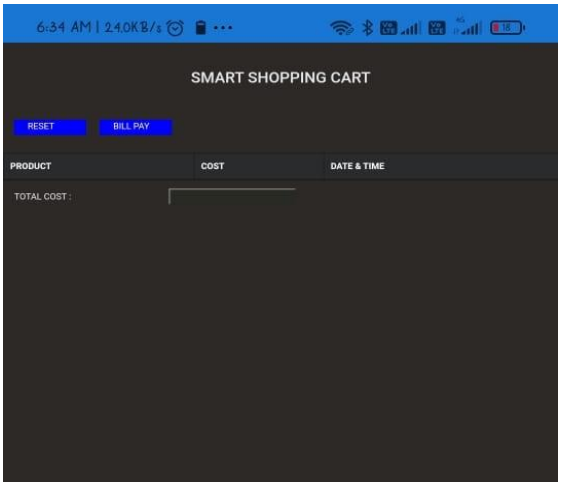

Fig. 6. Initialization of Smart Shopping Cart

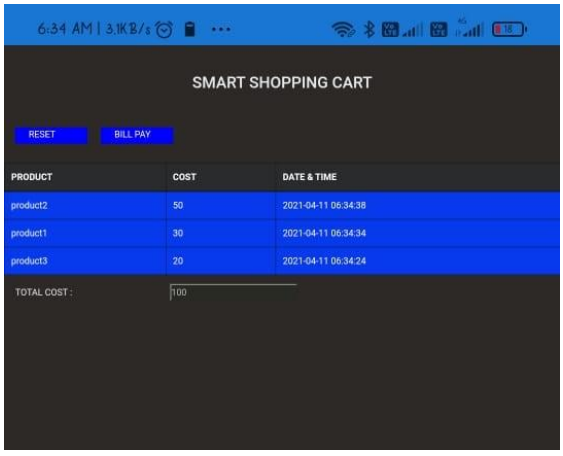

Fig. 7. Added products in Smart Shopping Cart

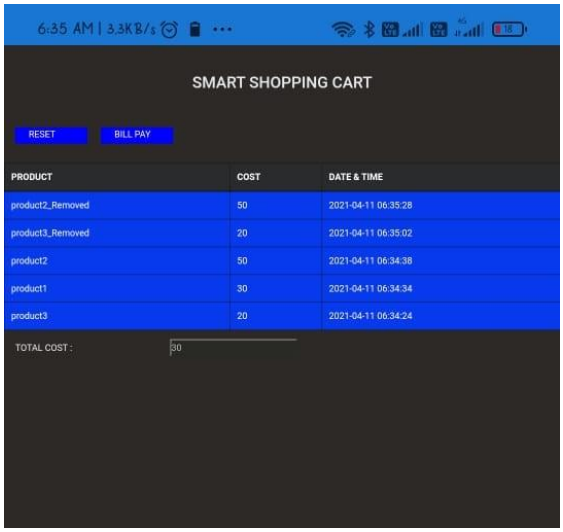

Fig. 8. Products removed from Smart Shopping Cart

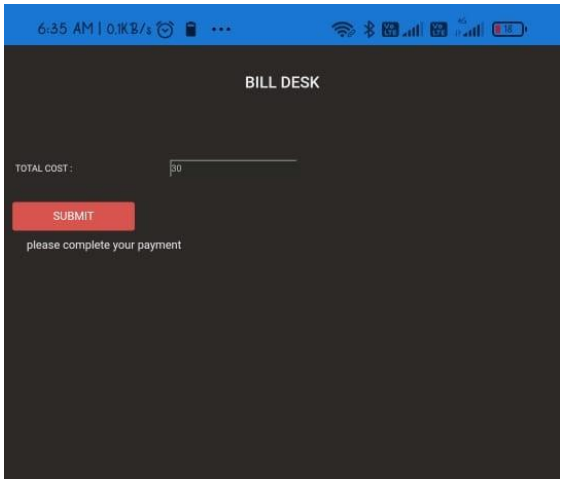

Fig. 9. Payment

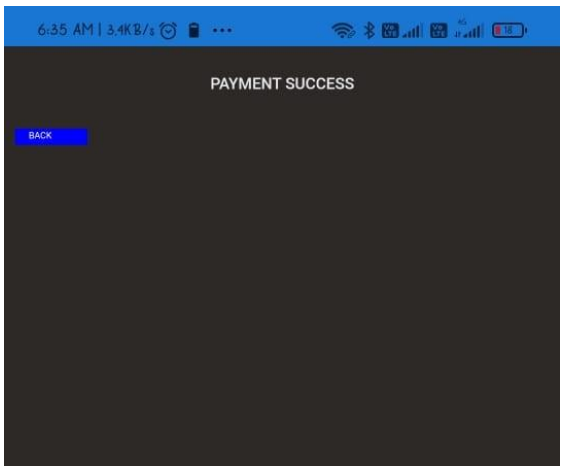

Fig. 10. Completion of Payment

9. Conclusion

The smart shopping cart application helps the retailers to manage the customers in an efficient way since the

customers need not have to wait in long queues. Since the data of the purchased products are displayed in the mobile display the customers can get to know about the bill details in advance with which the customer can plan for an affordable purchase. This system thus helps in achieving a faster billing system. Through this way of shopping system, more customers can be served at the same time thus benefiting the customers and retailers as well. The proposed system does not make use of an intricate routing system.

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