Smart Trolley with Automated Billing System

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***Abstract*— In this modern world, all people like to use products which is of high technology. People do not want to waste time and energy by using conventional systems. Rather they prefer advanced devices which is automated, smart, to finish their work soon. Smart trolley is one such advanced devices which is more flexible and a easy process to complete shopping without any delay. Customers in the store do not want to wait for long time to pay their bill. In the smart trolley the bill can be paid simultaneously without waiting in the counter. Once the shopping is over payment is done through online or offline based on the customer. This flexibility is not provided by the existing trolley. To overcome this, Smart trolley is preferred. The newly designed smart trolley consists of Arduino UNO, RFID reader and tag, Node Mcu Wi-Fi module, I2C, LCD, Buzzer. Apart from this payment feature, smart trolley allows the admin to view the stock details also. Each product's stock can be monitored and planned accordingly without any extra manual work.**

Index Terms: **Uno, cloud server, Mobile app.**

I.INTRODUCTION

Only 8% of customers use existing smart trolley. Many customers don't use the available smart trolley because of its complexity in accessing, payment modes, and membership cards. The complexity is because of the difficult options in the trolley. Many available smart trolleys allow only online payment or payment through master cards which is not afforded by all customers. Smart trolleys is not installed in many stores because of its cost. The cost is high because of the design that includes servo motor which also requires high maintenance. Whereas in the new design it is overcome by using a Smart band which reduces the maintenance, power consumption and the cost of the trolley also. The accessing options are also so simple that every customer can use it. It doesn't include any login option, or membership card. This trolley is proposed, so that difficulty in using existing smart trolley is reduced, additional options are included, many components are replaced from the existing one to decrease the cost of the smart trolley. The working is also simple that thecustomer can add products into the trolley by using the Band and it can be removed similarly. After the shopping is over bill can be generated on Mobile app and on Server computer. so that the customer can have a look at the entire bill and the total price based on the discount in the store. When the shopping is completed by the customer, the stock details get updated and displays the current balance stock to the admin. So, the manual work to keep on monitor the stocks is not needed when the newly designed smart trolley is used in the store.

A. Literature Review

Paper [1] describes about the shopping trolley using microcontroller, GSM module, RFID Module, LCD display. It requires individual login ID to use the trolley. This also allows payment only through online using master cards or membership cards.

Paper [2] is about the shopping trolley using Raspberry Pi, RFID Module, DC motor to close the trolley. The presence of dc motor increases the maintenance cost, battery lifetime will also be less because motor requires high power.

Paper [3] describes about the cart consists of RFID reader and all product in the shop has its own tag. In this design, the trolley does not ensure whether the door is closed or not after the shopping is done, so there is a chance of adding products after the bill is generated.

Already existing smart trolley allows payment via online or through master cards which is not afforded by everyone. If the customer adds or removes any product after the bill is generated it will not be detected in the existing system. When existing smart trolley is used the stock details in the shop cannot be monitored.

II.PROPOSED SMART TROLLEY SYSTEM

The advanced version of trolley which is very much flexible with improved features for the customers in all aspects is smart trolley system.

The proposed system is flexible to the customers as it allows them to pay via online as well as offline. Our device consists of a RFID reader and Smart Band. When the products are added, the RFID reader reads the particular product's information and displays in the screen and in mobile app. If any product is to be removed it can be done. When product get added then green LED and buzzer will on and when we remove the product that time red LED will glow. After adding or removing any product the detail will show on the mobile and on the server computer. If the payment is done, it will be indicated so manual checking is not needed. Stock availability can be monitored by the admins if the shopping is done using trolley. Based on the offers at festival time, device will scan the product and calculate the price after discount, display the price in LED screen and on mobile. It also allows the admin to monitor stock details so, it can be restored once the product gets over.

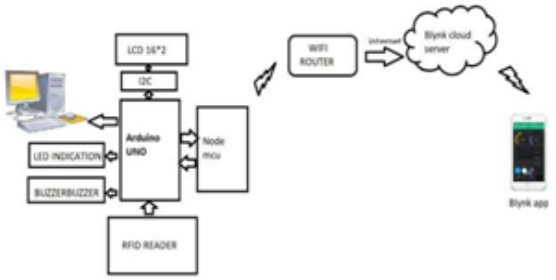

Fig.2.1 Block diagram of proposed model

III.HARDWARE IMPLEMENTATION

Initially smart trolley is connected to a hotspot through which the bill details can be seen. When the products are scanned it displays in the led screen with a beep sound. After the bill is generated it can be seen by both admin and customer. The components used for implementing the smart trolley includes Arduino NANO, RFID module, Liquid Crystal Display, Node MCU, Buzzer, led light, power adapter, I2C

A.Arduino UNO

Arduino Uno is a microcontroller board based on ATmega328P. It has twenty digital input/output pins half-dozen analogue inputs, a sixteen MHz quartz, a USB association, an influence jack, Associate in Nursing ICSP header and a button. Arduino UNO contains everything which are required to provide support to the controller. It is made to come in connection with the circuit by using an USB cable, battery to initialise or to connect it with a AC to DC adapter. The Uno differs from other boards as FTDI USB-to-serial driver chip is not used in this controller.

Fig.3.1 Arduino NANO

B. RFID module

The RFID or Radio Frequency Identification system has two major components, a transponder / tag attached to any of the component, which is to be found, and a Transceiver also known as an interrogator / Reader. Reader contains a Radio Frequency module and antenna that produces a high frequency field. Instead of that it has a microchip which is used to store and process data, as well as an antenna is placed for receiving and transmitting signal. To read the tagged information, it is placed next to the Reader (it does not have to be directly within the reader's view). The Reader produces an electromagnetic field that causes electrons to move the tag antenna and then to power the chip. The RFID reader also has a transceiver in it. When the signal returns to the tag using an RFID student antenna it is inserted into the demodulator and displayed with a decoder.

Fig.3.2 RFID Module

C.Liquid Crystal Display

Liquid crystal displays (LCD's) contain building materials, which include structures for both beverages and crystals. Instead of having a point of melting, they have a temperature inside where the molecules almost go as they would in a liquid but are made it as a single group together in an orderly manner like crystals. The LCD consists of two glass jars, with crystal sand woven material between them. The inside of the glass plates is filled with transparent electrodes describing the character, symbols or patterns that will be shown by the polymeric layers that exist in the middle of the electrodes and the liquid crystal inside the glass plate, which makes crystal liquid molecules maintain a defined standing angle.

Fig.3.3 Liquid Crystal Display

D.Node MCU

The ESP8266 is a UART Wi-Fi optical transmission module powered by ultralow power, specially designed for the needs of the new connected world. Provides a complete and compliant Wi-Fi network solution, allowing it to host the application or download all Wi-Fi communication functions from another ESP8266 its with less advanced development and less loading during operation.

Fig.3.14 Node MCU

IV.SOFTWARE IMPLEMENTATION

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, vizualize it and do many other cool things.

Blynk App allows to you create amazing interfaces for your projects using various widgets we provide.

Blynk works over the Internet. This means that the hardware should be able to connect to the internet. Some of the boards, like Arduino Uno will need an Ethernet or Wi-Fi Shield to communicate, others are already Internet-enabled. Blynk app can connect it over USB to your laptop or desktop.

V.RESULTS AND DISCUSSION

The utility of trolley will be first of its kind for commercial use. This device records the data of the different products with help of the suitable sensors like RFID Tags. This recorded data helps the shop owner with detailed analysis of shopping by the customer & their preferences through the computer; printout of the same can be obtained. In Automatic trolley, there is no need to pull heavy trolley, no need to wait in billing queue.

VI.CONCLUSION AND FUTURE SCOPE

In this project, we propose a secure smart shopping system utilizing RFID technology. It enhanced shopping experiences and security issues are discussed in the context of a smart shopping system. We detail the design of a complete system and build a prototype to test its functions. We believe that future stores will be covered with RFID technology and our idea is a pioneering one in the development of a smart shopping system. Our future work will focus on improving the current system, for example, by reducing the computational overhead at the smart cart side for higher efficiency while preserving security properties.

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