Smart Trolley Using Internet of Things For Smart Shopping

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Abstract- *The Internet of Things is emerging in all sectors to provide smart structure and security. The objective of the paper is to provide smart shopping by improving the speed of the purchase in the mart using our smart IOT devices. The Customer would feel despair when he/she cannot check the purchase status and details about the product purchased in the trolley itself. The Customer need to wait in the billing section queue, until all the products are scanned, to know about the purchase status and the list of products purchased .This may give lot of frustration So the new proposed paper improves the speed of purchase and list outs all details purchased with price and product details in the LCD screen in the cart. The cart will have a QR code Scanner/Reader and all the products will have unique QR code. The product taken are to be scanned in the QR code Reader and the amount will be updated in the memory of the Arduino Uno board. The total will be displayed on the LED display attached with the trolley. When the customer has done the shopping, at the cashier end the total amount of purchase will be retrieved with the help of the trolley ID. This device will update the central server system and main admin system in the shopping mart when each product is updated in the trolley cart.*

Keywords- IOT, Smart trolley, Secured cart, QR code , Internet of Things(IOT),Smart shopping.

I. INTRODUCTION

The Internet of Things (IOT) is changing the current world to next generation of modern smart world through Internet and communication. Things-To-Things communication is giving new sense to all the things in the world for building communication between them. The communication that happens between two or multiple things is the major factor that makes the idea work .This is bringing new revolution in all industrial field, Telecommunication field and in many. Everyday objects can be equipped with computing power and communication functionalities, allowing objects everywhere to be connected. Smart city is coming live in many countries and cities. It contains smart bus, smart train, smart home appliances, and mart things rolling in smart world. As part of smart city, more smart world, smart shopping system in getting into the territory of smart world day by day. To make the smart shopping more effective, many geeks are developing smart shopping components. One of the earlier developed product is Smart trolley using RFID tag, which works somewhat similar to the proposed system, but not very effective and well secured. This uses RFID tag to detect the product details from the RFID attached to the product using RFID scanner. But the drawback is, the RFID id can be tampered or broken or misplaced which raises the security issue here.

This cannot work like we expected. One of existing current journal, they have used RFID materials system to process the product details over the system. They propose using UHF RFID technology to support connections in a smart shopping system. Their system is the first system to achieve automatic reading of the items with a proper range. This already existing system has old micro-controller module which don't have lots of features in it. They design a secure protocol for the communications in the smart shopping system. To evaluate the protocol, they give a security analysis and performance evaluation in terms of computational complexity and communication complexity. Reading Collision: Intuitively, the reading range of the RFID reader should be carefully set to avoid collisions with other carts. The current paper has seamless data transfer connection from one thing to the other through internet of things.

II. EXISTING SYSTEM

The automated shopping trolley for supermarket billing system implemented, exploited barcode for billing of products, where customer scans the product using barcode technology. The bill will be forwarded to the central billing system where customer will pay them by showing unique id. The limitation of barcode scanning requires line of sight for scanning and it should be fixed within its boundary. Cash register lines optimization system using RFID technology by Budic, developed a system for shopping using RFID. The RFID is employed for scanning products and the information is stored in the database which could be paid online or in a central bill. It also uses web application to maintain entire shopping details. It requires maintenance of web application server[1]. No necessary steps have been taken for the products

that are accidentally dropped into the trolley by the customer. IOT based intelligent trolley for shopping mall, applied RFID technology for billing during purchase in shopping malls and IOT is used for bill management by means of ESP module. The payment details will be sent to the server by which central billing unit will deal with customer's payment[2]. The ESP module will be working as a short distance Wi-Fi chip for wireless communication. But there is a drawback which includes constraints such as distance and interference

III. PROPOSED SYSTEM

The proposed system will overcome the above disadvantages. Every product in the supermarket will have QR (Quick Response) code reader attached to it. The Cart will hold Arduino UNO Board which is powered by 9V rechargeable battery. The Arduino UNO has the microcontroller which is uploaded with the specified code for the smart trolley project. The Trolley is attached with the QR code reader . Once the user wants to purchase the product the details of the product are sent to the Arduino board via Bluetooth. The Arduino board has been interfaced with the wait sensor so the weight of the purchased product will be matched with the input data from QR code. If the weight of the purchased product is comparatively bigger than the input data then the LED dispay an exception message else the product will be accepted and the total amount of the purchased product as well as the number of products added to the cart will be displayed on the LED display. The EEPROM in the Arduino will have the details of the purchased product in its memory location. If the user wants to remove the product from the cart then user will have to rescan the product. Then automatically the EEPROM will update its memory location by removing the details of the purchased item. The total number of the products purchased and the total cost will be deducted from the initial amount.

A. Setbacks with the existing system

1. It's not possible to attach RFID to all products in the shop.
2. Cost of this system is huge.
3. Tag Tamper-Proofing (Tag Security): The tag design must be resistant to the following misuses:
4.

a) Re-writes in order to pay less.
b) Obstructions and replacement by fake tags.
c) Swapping the tags of different items.
d) Breaking or tampering to avoid paying the price altogether.

B. Architecture Diagram

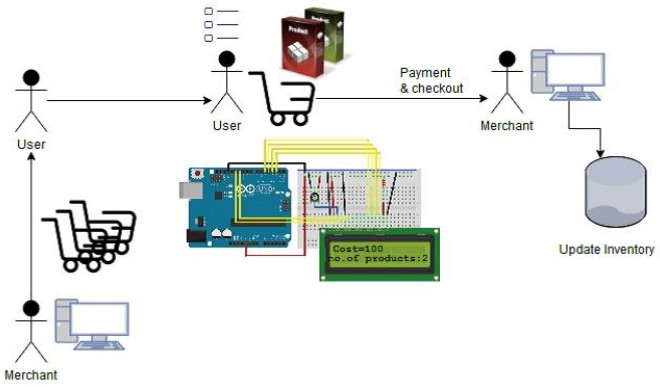

Figure 1. System Architecture

IV. LIST OF MODULES

1. QR CODE Generation
2. Estimation of weight using HX711
3. Communication Interface Module
4. Displaying Purchased Products using LCD 16*2 LD001
5. Data Storage Module

1. QR CODE GENERATION:

The QR code placed in all products will be scanned using QR code scanner. The QR code as shown in fig. will have the information of the product like Product ID, price, weight, expiry date, and the product name. Based on the grid size QR code can hold data (for example. A 101x101 QR code, with high level error correction, can hold 3248 bits, or 406 bytes. Probably not enough for any meaningful SVG/XML data.

Figure 2. QR CODE GENERATION

2. ESTIMATION OF WEIGHT USING HX711:

The HX711 Load cell amplifier is interfaced with Arduino uno to provide the weight obtained to the LED display for the purpose of the security, the weight module is initialized in order to keep track whether the products are all scanned or not scanned as shown in (fig.2.1). A load cell is a transducer that is used to convert a force into electrical signal. This conversion is indirect and happens in two stages. Through a mechanical arrangement, the force being sensed deforms a strain gauge. The strain gauge measures the

deformation (strain) as an electrical signal, because the strain changes the effective electrical resistance of the wire.

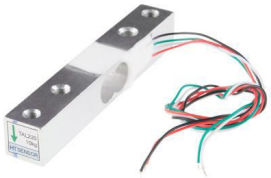

Figure 3. LOAD SENSOR

3. COMMUNICATION INTERFACE MODULE:

The Bluetooth Module HC-05 used in this proposed system is used for Sending and receiving data between Arduino Uno Board and interface device. This acts as the medium for communication between two mediums. The Bluetooth module is paired with the Arduino board and it is the medium for sending the product details to the Arduino board. Thus the QR code reader will act as a slave to the Arduino's HC05 module and transmits the product details.

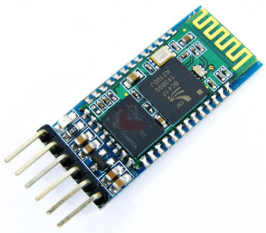

Figure 4. BLUETOOTH MODULE

The Bluetooth module is paired with the Arduino board and it is the medium for sending the product details to the Arduino board. Thus the QR code reader will act as a slave to the Arduino's HC05 module and transmits the product details.

4. DISPLAYING PURCHASED PRODUCTS USING LCD 16*2 LD001:

A liquid crystal display consists of an array of tiny segments called pixels that can be manipulated to present information. This basic idea is common to all displays, ranging from simple calculators to a full color LCD television. In this section, LCD display get the instruction from the microcontroller .it display 16 characters per line and there are two such line. This LCD contains two registers such as command and data. The command register store the command instruction given to the LCD and the data register store the data to be displayed on the LCD. The characters are in the form of ASCII. In this prototype, input section get the details of each product from the controller and output section display the name, quantity and expiry date of the products.

Figure 5. LCD 16 * 2 LD001

5. DATA STORAGE MODULE:

The EEPROM is in built with the arduino. The microcontroller on the Arduino and Genuino AVR based board has EEPROM: memory whose values are kept when the board is turned off (like a tiny hard drive). This library enables you to read and write those bytes.

A. EEPROM Read

The microcontroller on the Arduino and Genuino boards have 512 bytes of EEPROM: memory whose values are kept when the board is turned off (like a tiny hard drive).The EEPROM.read () function lets the user to read the stored value in the Arduino.

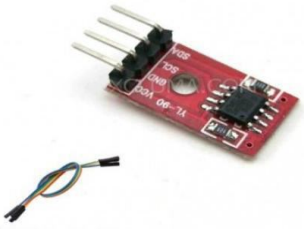

Figure 6. EEPROM

B. EEPROM Write

The stored value in the Arduino. An EEPROM write takes 3.3ms to complete. The EEPROM memory has a specified life of 100,000 write/erase cycles. So, the EEPROM need to be flushed after these numbers of cycles.

V. PERFORMANCE MEASURES

The robustness of the system is tested with our prototype model, and found that the QR code processing is

accurate and precise than existing model. When a new item is put into the smart cart, it will be automatically read by the reader, which is continually scanning items within its range. After a product is read, its ID will be checked to see if it is a newly added item. If so, its information will be listed on the user interface. On the other hand, when an item is removed from the smart cart, the reader will no longer be able to scan its information. In this case, the smart cart determines that the item has been removed and will update the display correspondingly. Evaluate the computational and communication overhead of our proposed protocol is done. The System focus only on the proper communications between the server and the smart cart, as the communication patterns.

VI. OBJECTIVE OF THE SYSTEM

- To setup a Smart Trolley that reduces the overhead in the billing section of The Supermarket.
- To avoid queue in billing section as well as to save the time of customers.
- To give customers the instant bill of Total amount of purchase immediately at smart trolley itself.

VII. CONCLUSION

Smart trolley device based on IOT could be the initial start for the new shopping environment in shopping marts. This device will be upgraded soon for many features such as payment on the way, auto moving trolley, AI cart and many. This will be the first time that as smart trolley with IOT AND AI based device used for the enhancement of shopping experience. In future stores will be covered with this new IOT device and research is a pioneering one in the development of a smart shopping system.

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