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RFID BASED SMART SHOPPING CART

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Abstract:

In modern large cities, going to the mall to shop has become a regular practice. People buy different products and put them in carts. Going to the billing counter to make the payment after completing the entire purchase takes a lot of time and can be very frustrating. Therefore, our main design objectives were to minimize human effort, get rid of the line, and reduce the time needed for billing. RFID tags, which are used to identify products as they are placed in a cart and show the results on an LCD screen, are among the components of our prototype. So, at the billing counter, data is sent into the server.

Keywords: Radio Frequency Identification, Liquid crystal display, RFID reader, RFID tag, Buzzer, Node MCU

I. INTRODUCTION

Shopping and making purchases at large malls is now an everyday pastime major cities. On weekends and holidays, there is a significant rush at the malls. When there are discounts and special offers, the rush is much greater. People buy various goods and load them onto trolleys. One must proceed to the billing counter to make payments after making the entire purchase. Long lines form at the billing counter because the cashier must create the bill using a bar code reader by scanning every item, which consumes a lot of time. To address the above-mentioned issue, our goal is to create a system that may be applied in malls. All the carts/trolleys have the system. The component will be an RFID reader. The mall's merchandise will all have RFID tags on them. The trolley's code will be read when an item placed inside, and the price of that item will be recorded in memory. The costs will be applied to the final bill as we place the merchandise. Therefore, the billing will happen inside the tram. The name of the item and its price will be shown on the LCD.
People can purchase their everyday requirements, such as food, clothing, electrical goods, etc., in a shopping mall. Today, there are more small and large shopping malls than ever before because of rising consumer demand and expenditure. Customers occasionally complain about the insufficient information provided about the item for sale and the time wasted at the cash registers.

To give clients a better shopping experience, the traditional billing system needs to be continually improved. We have created a Smart Cart Using RFID to solve the issues and enhance the current system. This can be accomplished by merely attaching RFID tags to the goods and mounting an RFID reader with an LCD display on the shopping cart. With the help of this system, the customer has information about the price of each scanned product., the total price of the product and the product in brief. This system saves customer's time and manpower in the mall and costs associated with the product. This project work introduces smart card reader technology through a wireless communication system. The purpose of this document is to provide a brief introduction to smart cart technology and to describe how to implement a smart card in a business environment. A smart card is a plastic card with an embedded integrated circuit or chip. Often, microchips almost as small as a credit card are used to store cardholder information, and systems using smart cards have multiple POS terminals or readers that communicate with the card and mainframe. The development of smart begins in 1970, and by the end of 2000, advanced technology was introduced, in which different types of smart card are developed using micro technology for different applications. The following is a description. The proposed project work is designed to know the details and price of the product in the cart. It is an

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innovative technology to obtain product details using RFID cards.

Previously, various image IDs with administrative seal and signature were used, now the trend has changed, scratch cards, magnetic cards, etc. is developed to increase security and these cards have become popular. Usually, these cards must be in physical contact with the data readers, mostly the users insert their card into the smart cart reader, the smart card reader is just a data encoder and the decoded data is sent to processing unit. Here the application is quite simple, product information is stored and used for record, identification etc. Such systems were everywhere and are still prevalent today. In order to realize the new trend of smart card technology, this project work is introduced, which offers the miracle of wireless technology to read smart card data through radio frequency technology. Radio frequency identification (RFID) is the wireless, contactless use of radio frequency electromagnetic fields to transmit information so that tags attached to objects can be automatically identified and tracked. Tags contain electronically stored data. Some tags are operated and read from a short distance (a few meters) by means of magnetic fields (electromagnetic induction).

Others use a local power source, such as a battery, but harvest energy from the interrogator's EM field and then act as a passive transponder to emit microwaves or UHF radio waves (i.e., electromagnetic radiation at high frequencies). Battery operated tags can operate hundreds of meters away. Unlike a barcode, a tag does not necessarily have to be in the reader's line of sight and can be embedded into the tracked item. RFID tags are used in many industries. It is possible to follow a car's progression along the assembly line using the RFID tags that are applied to it during production. Medicines can be tracked in the warehouse. Livestock and companion animals can be distinguished allowing positive identification of the animal. On offshore ail and gas platforms, crew wear RFID tags as a security measure to locate them 24 hours a day and find them quickly in an emergency. Because RFID tags can be implanted in the human body, attached to clothing, and other items, privacy concerns are raised by the potential for unauthorized reading of the linked personal data. The whole system is designed with a single chip microcomputer module. The two RFID tags that transmit data with two different codes are designed to identify the difference between the two products.

The RFID reader receives data when the RFID card is nearby. This information is provided to the microcontroller, which decodes the data and displays it on the LCD screen. Here the ATMEL 89C51 controller is used to display the received information through the LCD panel connected to the output port of the controller chip. The data received through the RF reader is compared with a predetermined program written in assembly language. Detailed descriptions can be found in the following chapters. Microcontrollers are crucial to the operation of this project. In the receiver module, a lot of electrical hardware, including an LCD control board and an RF card reader, is interfaced with a single microcontroller, which is chosen to have 32 I/O lines. The 89C51 controller has 40 pins. When it comes to product scanning, bill production, and payment, Smart Cart employing NodeMCU and RFID is an effective method. It makes use of an RFID reader, an LCD, buzzers, a NodeMCU, as well as RFID tags that are affixed to the merchandise.

The RFID tags on the product will be scanned by the RFID reader, and the NodeMCU will save all of the information it receives from the tags. The product may be directly scanned by the reader, and if the consumer wants to take away anything, they only need to scan it once more before deleting it. In addition, if the RFID reader cannot determine the product's weight, a weight machine is available. Following product purchase, the complete bill is created and displayed at the billing area and on the trolley's LCD. The customer simply needs to pay the amount when he visits the billing area. The entire cost of the products in the cart will be displayed on an LCD panel. NodeMCU is utilized in place of the Wi-Fi module, and the system does not have a user interface. The automated and centralized billing system will be employed in malls and supermarkets, according to the smart shopping with the trolley application. Because the complete amount is generated on the LCD, consumers do not need to wait in queue at the billing counters to pay their bills. They only need to visit the counter and make the payment.

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In general, the existing systems have the following features

1. No more queue for billing hence real customer satisfaction.
2. Bill calculation at trolley itself.
3. Low chance of traffic and mismanagement.
4. Reduction in support staff.
5. Cost efficient.
6. Weight machine to calculate the product weight.

III. FUNCTINAL DESCRIPTION

RFID TAG:

Every item in the mall has an RFID tag linked to it. In addition to the product's price, the tag also includes details like the product's name, manufacturing date, expiration date, type, etc. An antenna-equipped reader and an RFID tag composed of a microchip make up the RFID system. The microchip of an RFID tag contains data that is ready to be read. The RFID reader transmits electromagnetic energy to the tag's antenna.

RFID READER:

In addition to reading tags, an RFID reader can do a wide range of other things with the information it receives. Consequently, the term "smart RFID reader" is used to describe it. Due of the Arduino board's connection to the RFID reader, this is feasible. After reading each tag, an RFID reader sends the information to an Arduino. Line-of-sight is not necessary. In order to read numerous tags at once. The primary benefit of an RFID reader is this.

POWER SUPPLY:

The AC supply is applied to the step-down transformer.

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ARDUINO:

An Arduino board is a microcontroller. The Arduino may be programmed using its own software. It employs a proprietary programming language. The output of the RFID reader will be connected to the Arduino board's serial connection port. The Arduino board will also be connected to an LCD display. The data is sent to the Arduino controller by the RFID reader. These data are processed by the controller, which then communicates the outcome to the LCD display. The Arduino calculates the combined price of all the products in the cart and sends this data to the LCD display.

LCD DISPLAY:

The bill is shown on the LCD panel in this instance, The Arduino's I/O part is connected to the display.

TRANSFORMER:

To convert the AC power supply to 4v, we shall utilize a step-down transformer.

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BUZZER:

When an electric current is fed through the Arduino buzzer, it emits sound. By sending the buzzer varied frequency electric pulses, the Arduino buzzer may be directly connected to the Arduino and produce various tones.

IV. PROPOSED SYSTEM

4.1 Design of system

- Creation of an online gateway with a user-friendly interface for paying bills utilizing SQL, HTML, and PHP.
- Use of Node-MCU, which has an integrated WIFI module, to streamline communication.
- LCD display displaying product information.
- Using RFID, automatically scan items in the trolley.

4.2 Proposed Algorithm

The RFID-based smart trolley is made up of a trolley that has an RFID reader built in. The RFID reader integrated into the trolley scans the RFID tag number of the item as soon as the customer inserts the product they want to buy in the trolley, allowing it to be recognized. Each RFID tag number corresponds to a certain product. Using a centralized server, it is possible to get all the data stored in a database about the product connected to an RFID tag. A Node-MCU is used to coordinate all the actions. The product may be directly scanned by the reader, and if the consumer wants to take away anything, they only need to scan it once more before deleting it. Following product purchase, the complete bill is created and displayed at the billing area and on the trolley's LCD. The customer simply needs to pay the amount when he visits the billing area.

Step 1: Start

Step 2: Insert the item with the RFID tag into the cart.

Step 3: An RFID reader reads the data from the tags.

Step 4: Using the Wi-Fi module, the Node-MCU transmits this data to the server.

Step 5: The server stores the data in the database in step five.

Step 6: The server is informed of the total amount.

Step 7: The server displays the total amount.

Step 8: The final step is paying the bill.

Step 9: The database is updated at step nine.

Step 10: stop

V. WORKING

Any type of information that can be recorded in digital binary format, including a single binary bit, a vast array of bits, an identifying code, and personal medical data, can be stored on transponder Tags in an RFID system. Reader produces sine waves for RF carriers. When a tag has enough power, its output transistor shunts the coil responsible for the data being clock-out of the memory array, performing digital data encoding. The cart is brought into range of the IR Receiver as soon as a customer enters a shopping aisle, and the microcontroller then checks for the aisle information code.

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From the cart to the server, the aisle information code is sent wirelessly over ZigBee. The database is queried based on the aisle number received, and pertinent data is extracted and sent to the cart via the ZigBee module. The EEPROM located on the cart stores the received data. This serves as a temporary database until the customer exits the aisle, they are currently in International Journal of Engineering Research and General Science Volume 3, Issue 2, March-April, 2015 ISSN 2091-2730 279 www.ijergs.org. The display device shows the pertinent product information. Each product has an RFID tag with a Unique ID on it.

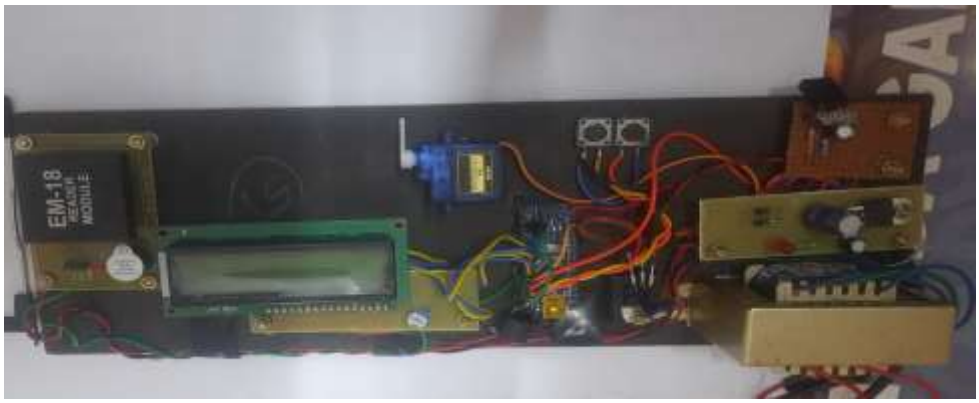
These IDs are entered into the database and associated with the relevant products. If a purchase needs to be made, the item can be placed in the cart where the RFID reader will read the tag. The product's information is taken out and shown on the LCD panel. Additionally updated at the same time is billing information. Aisle information is provided to the server along with the purchase information as soon as the aisle is exited. They are then kept by the server in the database.

Up until the end of shopping button is pushed, these processes are repeated. There is an option to either stop shopping with the same items in the cart or to remove some of the items after pressing the "Complete" button. This is based on client preference. The customer can pay the bill and go right away after finishing their purchase. At the conclusion of shopping, the inventory status of the items is also updated.

ADVANTAGES:

1. Boosts client happiness and decreases time spent at the billing counter.
2. The management's expenses may be lessened as a result.
3. Users can avoid over shopping by being aware of their whole bill at the moment of purchase.
4. Boosts general effectiveness.
5. Reduces long lines at checkout and enables speedy checkout.

VI. RESULT



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VII. CONCLUSION

The finding supports our claim that automatic product billing using RFID technology will become a more practical choice in the future. The system based on RFID technology is effective, small, and shows promise. Barcode reading is slower and less accurate than RFID since it depends on line of sight, whereas RFID does not. This will raise the standard of the entire purchasing experience. The smart trolley's system parameters, such as the product name, price, and weight, among others, are shown.

7.1 FUTURE SCOPE:

1. We can utilize the GSM module to transfer the bill to a mobile device without printing.
2. The tram itself has a switching device for internet payment transactions.
3. It also has a robotic arm for picking up and putting down the merchandise.
4. Additionally, voice assistance is an option.

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