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Smart Shopping Cart Using RFID

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Abstract*: *In today's technology, many companies are developing products that ensure convenience toward all people. One of the conveniences that involved will be providing with new and easy shopping experience. With a problem of waiting in a long queue to check-out the shopping items, new technology must be implemented to provide lowest delay time. Thus, we have developed a Smart Shopping Cart, a system that allows faster check-out. Cart uses the RFID technology to identify the products details which is already available in the database. The total cost will be displayed on the LCD attached to the cart as and when the product is added to the cart. If the product is expired then the customer will be notified via buzzer. If the product is invalid then a message saying "invalid product" will be displayed on the LCD. Total cost will be displayed continuously which will be added or subtracted as the product is added or removed from the cart respectively. There will be a mode button based on which the product will be added or removed from the final bill. Once the shopping is done customer just needs to press the bill button and pay the bill at the check-out point thus eliminating the time required due to conventional queue system for bill generation.
Keywords: ***Smart shopping, Smart cart, RFID, XBee, Arduino Uno***

I. INTRODUCTION

Humans have always invented and developed a technology to support their needs ever since the beginning of mankind. The basic purpose of advancement in technology has been in minimizing tasks and making everyday chores easier and faster, irrespective of the various domains available. A major task on which human beings are found spending considerable amount of time is shopping. According to a Survey, approximately most of the humans spend 1.5 hours daily on shopping. A large number of customers will always tend to walk out of a queue if the queue is very long.

Hence, there is a need to develop a smart cart that reduces this delay for bill generation. The smart cart that we have implementedconsists of LCD, XBee, buzzer, Arduino Uno, RFID tags and RFID reader. Whenever the product is added to the cart, its price will be displayed on the LCD. If the product is expired, the customer will be notified via a buzzer. If the product is invalid then a message saying "invalid product" will be displayed on the LCD. Total bill amount will also be displayed on the LCD. Thus the customer just needs to pay the bill at the check-out point.

The smart cart described above eliminates the time required for bill generation and thus benefits both customer and the retailer. The ustomer's time won't be wasted standing in queue for billing and retailer too won't lose the customers due to long queues. The customers will be alerted if the product is expired and hence saving them from purchasing expired product that may lead to any health issues.

The objective of the project is to develop a smart shopping cart which makes use of RFID technology and generates the bill as the products are added to the cart. The cart should also be able to notify the customer if the product is expired via buzzer. And the customer can directly just pay the bill at check-out counter. He need not wait for bill generation.

II. RELATED WORK

Varsha jalkote et ai., [1], proposed a system futuristic trolley for smart billing with amalgamation of rfid and zigbee. In this system they have used microcontroller, the rfid reader reads the rfid tag number and compared with stored tag numbers if it is present, then the product cost is added to the total bill amount, and product details are displayed in lcd screen like product cost, manufacturing year, brand name etc. If it is not in found in data base it will display product is not found or not present and this process will continue until the end of shopping. This total bill information will be sent to master pc using zig bee at the receiver and the receiver side the bill is generated. The output of this proposed system is better than existing technology but it has certain limitations because of them, it cannot be used to keep the all sales track and item availability at the shopping malls.

Rupali sawant et ai., [2] , proposed the concept of the rfid based smart shopping cart, bar code technology is replaced with rfid technology which has advantages over bar code in terms like reducing time spent during consumer shopping and reduces sales men

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required in malls to assist product details to the consumer.

Kalyani dawkhar et ai., [3], proposed a system as electronic shopping cart for efficient shopping based on rfid technology. In this system the rfid reader, microcontroller is used to read the did tag number and comparing with database, if it is present then it displays product details and like this goes on.

Galande jayshree et ai., [4], proposed a system as automatic billing trolley based on rfid technology. In this system shopper will have the details about price of every item that are scanned and total price of the items. This system will save time of customers and reduces the employees required in the mall. Bar code technology is replaced by fixing rfid tags to the products and a rfid reader with a lcd in the shopping trolley.

III.PROPOSED METHOD

Smart shopping cart is developed to help the customer as well as the retailer. The customer will be helped since the time required for bill generation is eliminated and he will get notified if the product is expired. The vendor will be helped since he won't lose any customers due to delay in bill generation and also it will be easier to generate bill. Smart cart is composed of RFID tag reader. It reads the tag present on the product and fetches the price form the database and display it on the LCD attached to the cart. There is a mode button that a customer can use to add or remove the product from the cart and hence the final bill. When the button is on add mode, upon adding product to the cart, its price is added to the total bill. When the button is on remove mode, the product is removed from the final bill. Suppose if the product is expired then the customer will be notified about it through the buzzer. The cart communicates to the admin PC for sending bill via XBee. The specification of components used is as follows:

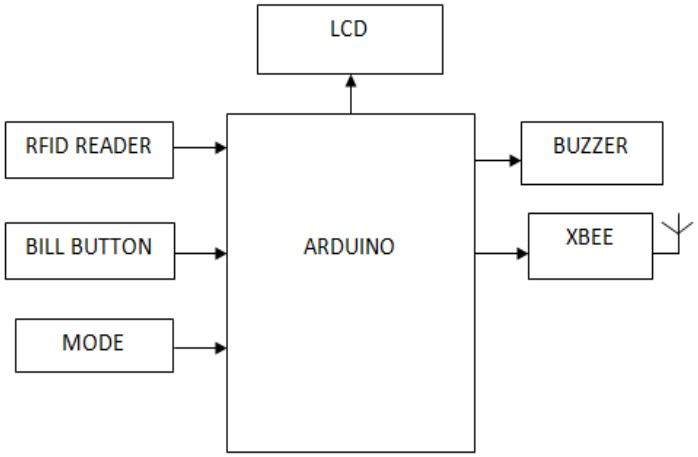

Fig. 1 Customer part

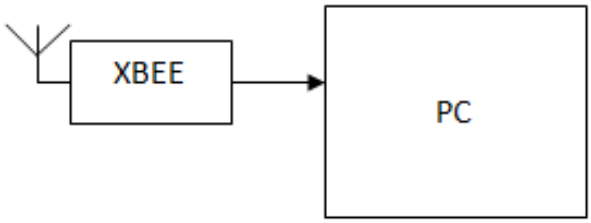

Fig. 2 Admin part

A. Arduino Uno

Act as a microcontroller, the central controller for the whole unit of smart cart. Arduino Uno based on the ATmega328. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, and a reset button. The board can be programmed with Arduino Software (IDE). The board can operate on an external supply from 6 to 20 volts. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts. The ATmega328 has

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32 KB flash memory. It also has 2 KB of SRAM and 1 KB of EEPROM.

B. RFID tag and RFID reader

Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information. RFID tags can be passive, active or battery-assisted passive. An active tag has an on-board battery and periodically transmits its ID signal. A battery-assisted passive (BAP) has a small battery on board and is activated when in the presence of an RFID reader. A passive tag is cheaper and smaller because it has no battery; instead, the tag uses the radio energy transmitted by the reader.

RFID systems can be classified by the type of tag and reader. A Passive Reader Active Tag (PRAT) system has a passive reader which only receives radio signals from active tags (battery operated, transmit only). The reception range of a PRAT system reader can be adjusted from 1–2,000 feet (0–600 m), allowing flexibility in applications such as asset protection and supervision. An Active Reader Passive Tag (ARPT) system has an active reader, which transmits interrogator signals and also receives authentication replies from passive tags. An Active Reader Active Tag (ARAT) system uses active tags awoken with an interrogator signal from the active reader. A variation of this system could also use a Battery-Assisted Passive (BAP) tag which acts like a passive tag but has a small battery to power the tag's return reporting signal.

C. Piezo buzzer

A piezoelectric buzzer is a loudspeaker that uses the piezoelectric effect for generating sound. A Piezo buzzer has a Piezo disc and an oscillator inside. When the buzzer is powered, the oscillator generates a frequency around 2-4 kHz and the Piezo element vibrates accordingly to produce the sound. An ordinary Piezo buzzer works between 3 – 12 volts DC. Piezoelectric speakers are frequently used to generate sound in digital quartz watches and other electronic devices, and are sometimes used as tweeters in less expensive speaker systems, such as computer speakers and portable radios.

D. LCD

A liquid-crystal display (LCD) is optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome. LCDs are used in a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays, and indoor and outdoor signage. Small LCD screens are common in portable consumer devices such as digital cameras, watches, calculators, and mobile telephones, including smartphones. LCD screens are also used on consumer electronics products such as DVD players, video game devices and clocks. Results are displayed on LCD.

E. RTC

A real-time clock (RTC) is a computer clock that keeps track of the current time. Although the term often refers to the devices in personal computers, servers and embedded systems, RTCs are present in almost any electronic device which needs to keep accurate time. RTCs often have an alternate source of power, so they can continue to keep time while the primary source of power is off or unavailable. This alternate source of power is normally a lithium battery. It is used so that we can get to know if the product is expired.

F. XBee

Digi XBee is the brand name of a family of compatible radio modules from Digi International. The XBee radios can all be used with the minimum number of connections - power (3.3 V), ground, data in and data out (UART), with other recommended lines being Reset and Sleep. Additionally, most XBee families have some other flow control, input/output (I/O), analog-to-digital converter (A/D) and indicator lines built in. It is used to communicate between the two parts.

IV. RESULTS

The bill amount of products added to the cart is displayed on LCD and when the bill button is pressed the bill is sent to admin part via XBee.

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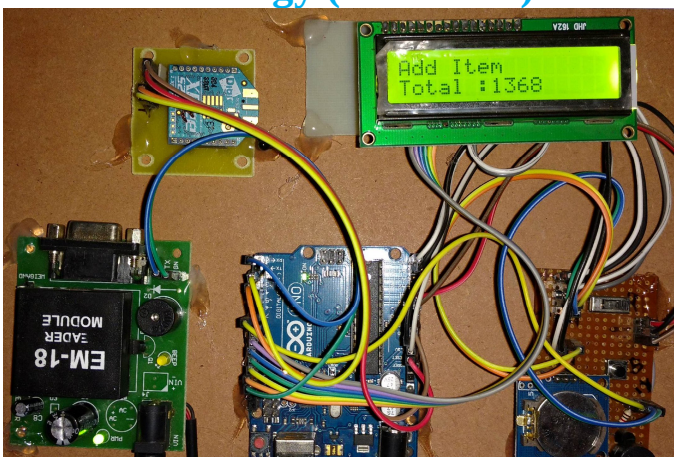

Fig. 3 Message displayed after adding items

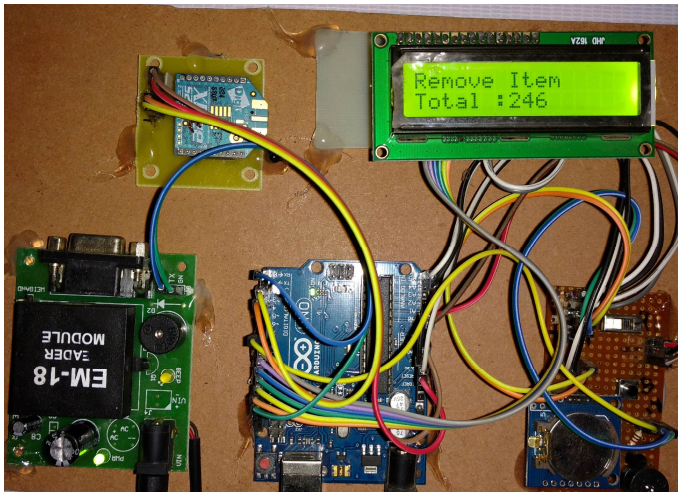

Fig. 4 Message displayed after removing items

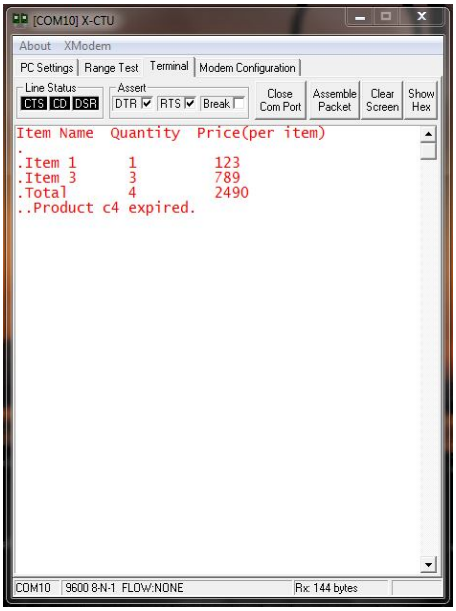

Fig. 5 Bill generated at admin side

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V. CONCLUSION

The smart cart reduces the billing time and also notifies the customer if the product is expired. It notifies the customer via Piezo buzzer. The bill will be made as the person keeps adding the products to the cart. If he removes any product by switching to remove mode, then its price will be deducted from the total amount. The total bill will be displayed on the LCD. The customer just needs to pay the bill at the check-out counter.

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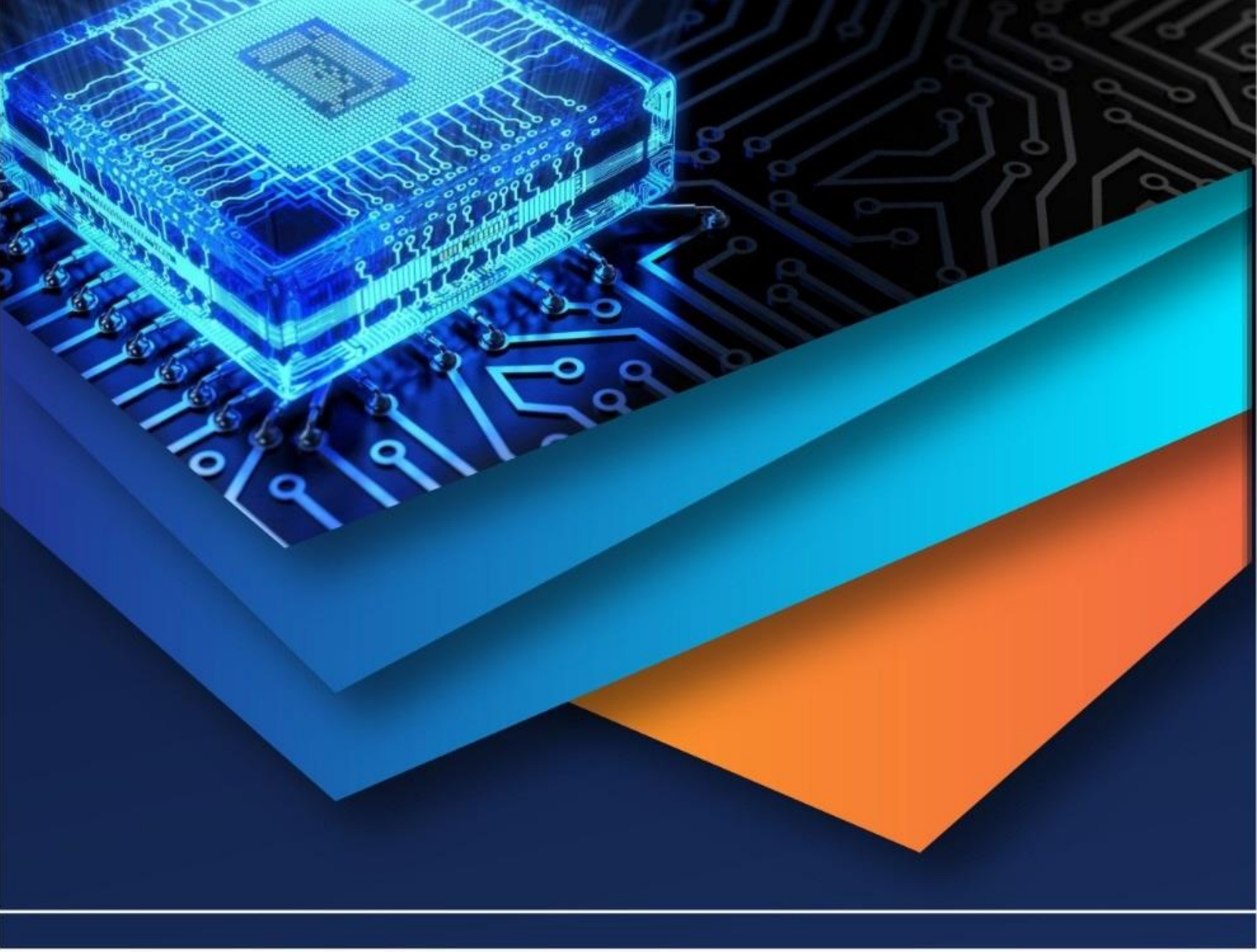

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