

Trolley based Automatic Billing System

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Abstract— Now a days despite the presence of online shopping people choose to buy products only in supermarkets and in megamalls for the sake of their own satisfaction. One of the common difficulties faced by customers in supermarket is to follow the long queue for billing the items purchased. Even though if the customer purchased only one or two products there is no other way that the person has to wait in a queue for billing items. Another difficulty lies in pulling the trolley from rack to rack and collecting items and the customer has to keep track of the items purchased in order to fit within his budget. In order to avoid such headache of pulling the trolley, waiting in a queue for billing, thinking of budget, we propose a system which makes shopping much easier and reliable. Our aim is to design a smart trolley which follows a customer while purchasing and all the billing operations are performed in the trolley itself. By using RFID technology the product is scanned and the purchased product information will be sent to the central billing system through zigbee module. At the billing section the customer has to tell the trolley number and pay for the items purchased. The proposed system prevents theft and also facilitates the users in case if the product is dropped unknowingly in the cart by cautioning them.

Keywords: RFID Technology, Zigbee, Central Billing Unit, Automated Trolley

I. INTRODUCTION

Shopping mall is a place where people from all walks of life purchase their daily necessities like food products, apparels, groceries, gardening tools, clothing, electrical appliances etc. The numbers of shopping malls keeps on increasing now a days throughout the world due to the increasing demand of public. In this busy scheduled life, people are not ready to spend even a minute uselessly. But the customers have to face a lot of problems in shopping malls like standing in a long queue for billing the items purchased thereby wasting time unnecessarily at the counter, headache of pulling the trolley from rack to rack while purchasing, worrying about the amount for which they purchased etc. In order to provide their customer a good shopping experience, shopkeepers are ready to welcome any smart machines that automate the billing process to reduce manpower at billing counter and the time consumed during the billing process. RFID and wireless networks are emerging technologies which makes the conventional method of shopping easier and effective. The proposed work not only facilitates the customers but also eliminates the need for more man power at the billing counter.

II. LITERATURE SURVEY

- 1) The automated shopping trolley for supermarket billing system by Sainath (2014), used a barcode system for product billing, where the customer scans the product using barcode technology. The bill will be sent to the

central billing system where customer will pay them by showing unique id. The limitation of his work is that without a clear line of sight, the scanner may be unable to read the barcode and it should be fixed within its boundary.

- 2) RFID based Automatic Billing Trolley by Jadhav Rahul Shankar, Avale Pradeep Nandkumar, Tarali Shivkumar Vajjanath and Prof. Pawar S.U (2015) used a RFID technology to scan the products and the purchased product information is transferred to the billing computer via Xbee protocol. The main drawback of the system is that the trolley is fully operated by humans which involves headache of pulling trolley throughout the entire shopping process.
- 3) Automatic Trolley Human Follower by Vikas, Vikash Kumar, Vikram Kumar and Umesh Nath (2017) designed a trolley which follows a human and is controlled by a PIC 16F877A microcontroller that can follow the user automatically with integrated circuit of ultrasonic and IR sensor. Their work is only on following and the billing part is not performed.
- 4) Smart Shopping Using Smart Trolley by Ghatol Sonali Digambar, Mrs.V.S.Jahagirdar and Pratiksha Dattatraya Khamitkar (2018) used RFID technology for scanning products and Bluetooth for transferring purchased information to the main computer. The main drawback is the headache of pulling trolley everywhere and the bluetooth provides only short range wireless communication.

III. PROPOSED SYSTEM

The proposed system consists of two batteries which are connected in series to supply for two motors which helps for the trolley movement. The person is identified with the help of IR sensor fitted to the trolley. The system uses the RFID technology for scanning the products. LCD display is used for displaying the total number of products purchased and the total amount for which the product is purchased. All the controlling operations are performed by atmega 8 microcontroller. The system provides an option for removing the products from the cart if person desires. The proposed system is also designed to alert a person in case if any of the product is unscanned. The wireless communication about the purchased product information to the billing computer is performed via zigbee network.

IV. SYSTEM DESIGN

The proposed system consists of microcontroller atmega 8A, Liquid Crystal Display, RFID tag, RFID reader, Infrared sensor, battery, dc motor, buzzer and zigbee network.

The block diagram of the proposed system is shown in figure 1.

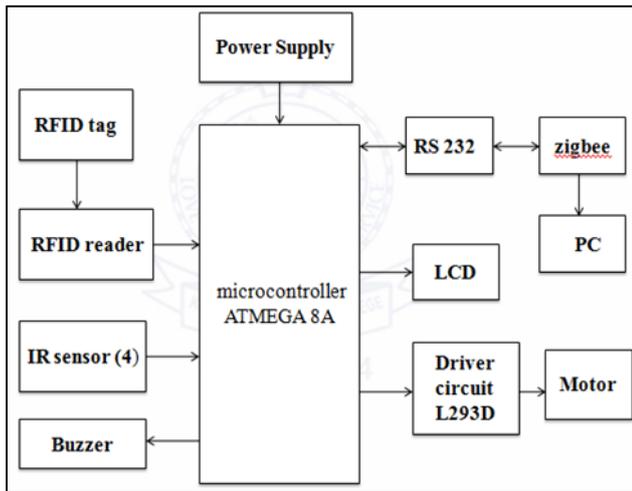


Fig. 1: Proposed block diagram

A. Radio Frequency Identification:

Radio frequency identification (RFID) is a technology that uses radio waves to transfer data from an electronic tag, called RFID tag or label, attached to an object, through a reader for the purpose of identifying and tracking the object. Some RFID tags can be read from several meters away and beyond the line of sight of the reader. The three main parts of RFID are RFID tags, RFID reader and a processor or controller.

1) RFID Tags:

A Radio Frequency Identification Tag (RFID tag) is an electronic tag that exchanges data with a RFID reader through radio waves. Most RFID tags are made up of at least two main parts. The first is an antenna, which receives radio frequency (RF) waves. The second is an integrated circuit (IC), which is used for processing and storing data, as well as modulating and demodulating the radio waves received/sent by the antenna.

2) RFID Reader:

The RFID reader has a radio transmitter and receiver inside. It is also called as an interrogator. The reader transmits radio frequency signals continuously upon powering. When an RFID tag is placed inside the range area of a reader, it energizes the tag through electromagnetic induction and collects the information from it

B. IR Sensor

IR sensors use infra red light to sense objects in front of them and gauge their distance. A pulse of infra red light is emitted from the emitter and spreads out in a large arc. If no object is detected then the IR light continues forever and no reading is recorded. However, if an object is nearby then the IR light will be reflected and some of it will hit the detector. This forms a simple triangle between the object, emitter and detector. The detector is able to detect the angle that the IR light arrived back at and thus can determine the distance to the object.

C. ZIGBEE:

ZigBee is a IEEE 802.15.4 based, low power, low data rate supporting wireless networking standard, which is basically used for two-way communication between sensors and control system. It is a short-range communication standard

like Bluetooth and Wi-Fi, covering range of 10 to 100 meters. ZigBee Technology supports transfer of simple data like that from sensors. It supports low data rate of about 250 kbps. The operating frequencies are 868 MHz, 902 to 928 MHz and 2.4 GHz. ZigBee Technology is used mainly for applications requiring low power, low cost and low data rate .

D. Liquid Crystal Display:

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

E. Motor Driver Circuit:

A motor driver IC is an integrated circuit chip which is usually used to control motors in autonomous robots. Motor driver ICs act as an interface between microprocessor and the motors. L293D is a dual H-Bridge motor driver, So with one IC we can interface two DC motors which can be controlled in both clockwise and counter clockwise direction. L293D has output current of 600Ma and peak output current of 1.2A per channel.

V. WORKING

The working of the project is discussed in the following two sections.

A. Following Section:

The system consists of IR sensor fitted to the trolley by which the object (human) is detected and with the help of battery assisted motor fitted to the trolley wheel, the trolley follows the human. There will be three IR sensors fitted to the trolley. One in the left, the next to the centre and the last to the right. In case if the person turns towards right, the signal to the left IR sensor is cut down and the trolley turns towards right and follows person. Similar response occurs if the person turns to the left. Likewise the trolley follows a person. Thus our project eliminates the headache of pulling trolley.

B. Billing Section:

Each shopping trolley is provided with a unique number, RFID reader, LCD, Zigbee, Buzzer and IR sensor. When the customer shows the RFID card attached to the product to the reader, the information in the card is read by the RFID reader and is transferred to the microcontroller for processing. Now the LCD will display the item and corresponding cost of the item purchased. Likewise all the items gets scanned and amount gets summed up which is displayed in LCD. The item which is scanned and put into the cart is sensed by IR sensor fitted to the cart. In case if the person fails to scan the item, then the IR sensor senses the unscanned item which is put into the cart and alerts the customer by sounding the buzzer. If the customer wants to remove any item from the cart, he can scan

that item to the reader once again and the item and its corresponding cost is reduced from billing. All the purchased products information are sent to the billing computer via zigbee network. Now the customer goes to the billing section where the bill is already kept ready by collecting information from billing computer. Thus our project eliminates the long queue in the billing section.

VI. EXPERIMENTAL RESULTS

Three IR sensors are fitted to the trolley for object (human) identification and trolley movement occurs by motors fitted to the trolley wheel. Another IR sensor is fitted to the trolley to detect whether the product is dropped into the cart without scanning. By this the theft gets avoided in the supermarkets and the system alerts the customer if he forgets to scan the products and accidentally dropped it into the trolley. The product scanning is performed using RFID technology which is far better compared to the conventional barcode scanning. The entire hardware set up is shown in figure 2.



Fig. 2: Hardware setup

VII. CONCLUSION AND FUTURE SCOPE

In our project, Different parameters such as products name, products cost etc. are continuously displayed so that the person need not always keep track of purchasing the items to fit within the budget as the cost gets summed up after scanning each product. The customer can easily fit within his budget and need not worry at the billing counter if the purchased amount goes beyond his budget like in the conventional method of shopping. Thus with the help of our project the billing process in the super markets and megamalls gets much easier and simpler and the time spent at the billing counter gets reduced. We conclude that it will take the customer to the different level of shopping experience. The Concept can be further expanded in future by online money transfer for the purchased products through mobile application which provides complete automated shopping, auto identification of product identification in malls etc.,

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