Rfid Based Smart Trolley for Automatic Billing System

G Manmadha Rao, K Preethi, A Sai Krishna, Afreen Firdaus, Ch Lokesh

Abstract—The modern technology has increased the standard of living for the humans and the large crowds are seen at shopping malls. To save time for the customers,it is important to reduce the process of the billing time. This is done using smart shopping system based on RFID. Items that are put in a smart shopping cart are read one by one and the bill is generated and displayed. After the final bill is generated, the customer pays the bill by using their Pre-charged cards provided by the shopping mall. The aim is to reduce the time consumption needed for the billing system.

Key words—RFID, HC-12transmitter, HC-2receiver, Precharged cards

I. INTRODUCTION

In the present-day shopping system, one of the difficulties is waiting for long time in a queue for billing of the products which is time consuming. The main aim of this project is to reduce the time for billing in order to avoid huge crowding in the billing area. So that the customer can reduce the time in making payment and can have ease in his shopping. Another added or extended feature of this project is customer could pay their bill by their pre-charged customer card provided by the shop.Finally,the whole information will be sent to central PC of the shopping mall.

II. LITERATURE SURVEY

We can hardly find papers that contribute to the application of automatic shopping trolley for shopping malls. The automated shopping trolley for shopping mall is introduced by Sainath[6], he made use of barcode for billing of products, in which consumer picks a product and scans the product's barcode by using barcode readers. The main constraint of using barcode is,it requires straight shot for scanning and it should be fixed within its boundary. Internet of things based intelligent trolley for shopping mall by Dhavale Shraddha [7] used the concept of RFID for billing in shopping malls and utilized the feature of ESP module which comes is an IOT device.But the drawback of using ESP module is that it has short distance range and long range communication is not possible. Another drawback is interference. Server will be busy during huge crowds and internet connection should be made available for finishing the process of billing and also server maintenanceis not an easy task and it should be maintained efficiently. Smart shopping trolley using RFID and zigbee, in this bill is generated by scan of products in the reader and bill is transmitted to central billing unit. The drawback of using zigbee is it is having low range connectivity. Smart shopping cart with customer-oriented service by Hsin-Han chiang[9] accomplished a concept of automated shopping trolley with automated billing in which they used face recognisation for customer authentication, It is not an easy task, we cannot get accurate results in huge crowds.The model proposed by Prateek Aryan[12]is smart shopping cart with automatic billing, in this bluetooth is used .The details of shopping is transferred to the registered mobile by using bluetooth where the drawback is bluetooth has low range and connectivity issue. Automated smart trolley with smart billing using arduino by suganya[13], developed a model of automatic shopping with arduino and an android application which again requires network to be connected always. Android mobiles may or may not present with every customer. So there is a need for alternative method.

We have adopted a new methodology in which there is no need of server and there is no issue with connectivity and communication upto 1.8Km .This methodology also provided the facility of paying bill at the cart itself. We are using HC-12 transmitter for communication upto 1.8Km and RFID technology is used for fast and accurate scanning of products.

III. DESCRIPTION

An RFID tag (of frequency 125khz) is attached to every product in the mall and the reader (EM-18) is attached to the trolley. At the time of purchase, the tag attached to the product is scanned by the reader. Each tag has a unique EPC.Based on the EPC received by the Arduino, the information of the product is displayed on the LCD along with the updated cost. This information is also sent to central PC with the help of HC-12 transmitter at the trolley and HC-12 receiver at the PC.If the customer wants to remove the added product, the product should be scanned again. Then the cost of the corresponding product will be deducted from the bill. The push button is provided at the trolley to indicate the end of the shopping.

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On pressing of push button, the final bill is displayed on the LCD and the payment through precharged card can be done. Recharged cards are unique RFID tags provided for each customer. These cards contain the information such as the customer identification number and the balance available in the card.by scanning precharged cards, payment is done at the trolley itself. Finally, LCD shows the balance available in their card .This whole information is available on the serial monitor of central PC.
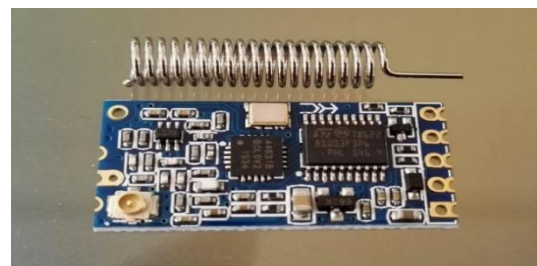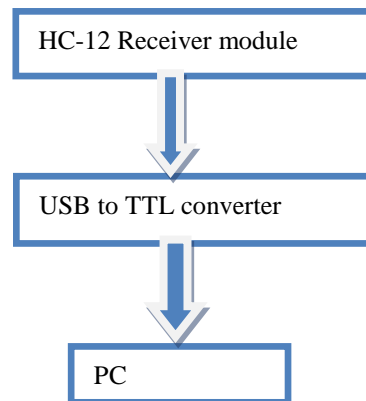
A. FLOWCHART
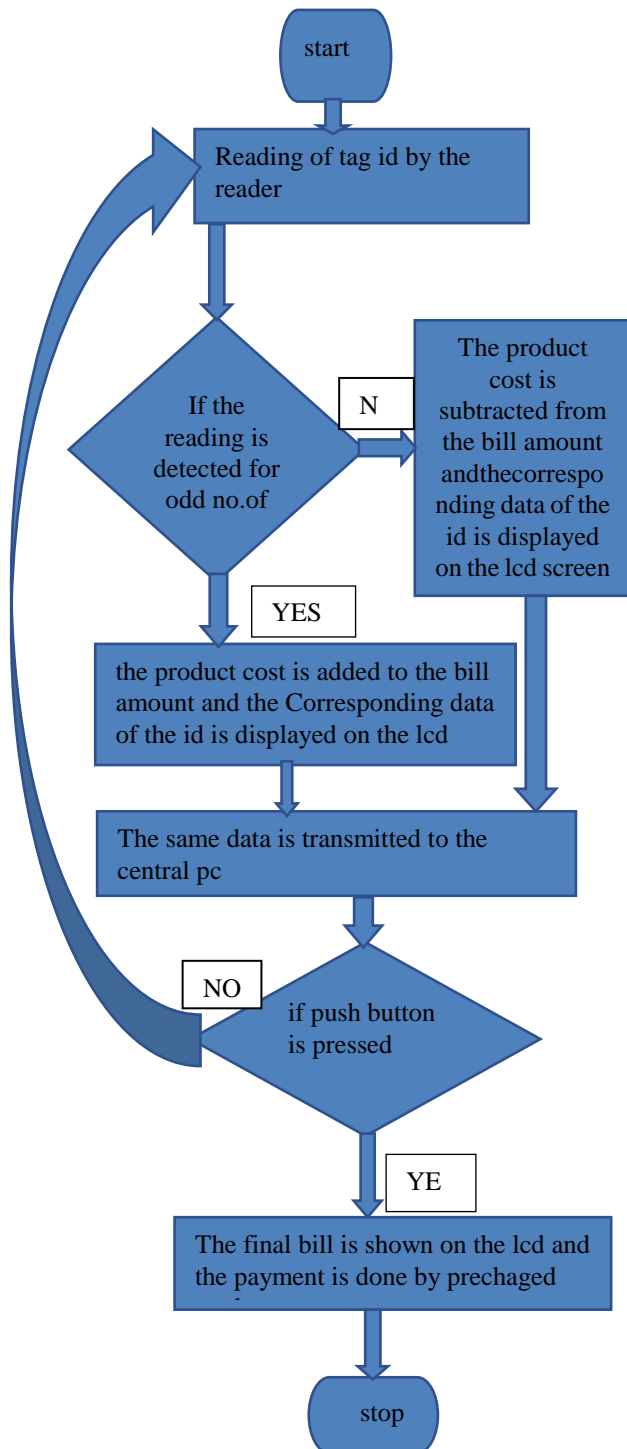
## B. TRANSMITTER
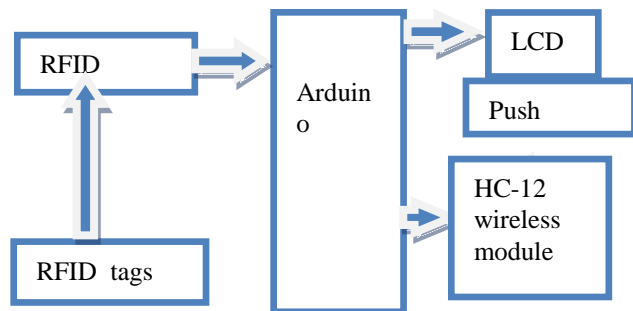
C. RECEIVER

IV. SOFTWARE TOOLS

A. ARDUINO

The arduino(IDE) is an open source software.It is user-friendly to write code in programming languages like c.It runs on any operating systems such as winows and Linux.To run code and view results we have serial monitor in this software.To view results, arduino board should be connected.

B. INSTALLATION

In this work Arduino 4.0 is installed. We can choose between the Installer (.exe) and the Zip packages. If you use the installer,drivers come in hand. If we use Zip package drivers has to be installed separately. For portable installation, zip files are recommended.

After the download and the installation, allow the driver installation too.
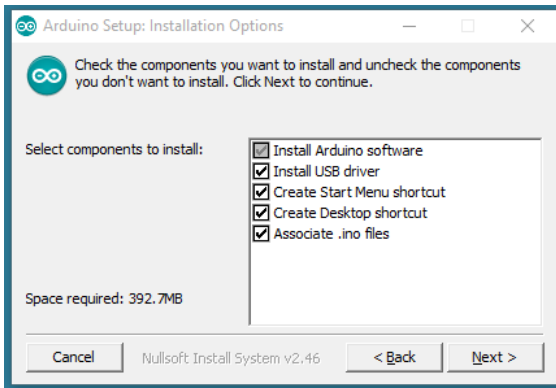
Components to be installed are chosen the installation directory is selected(the default one). The process installs the arduino software and related files for further use.
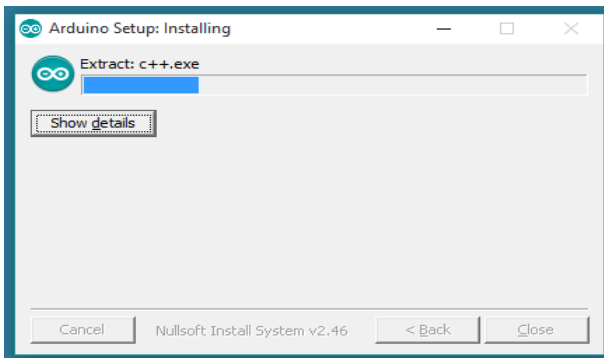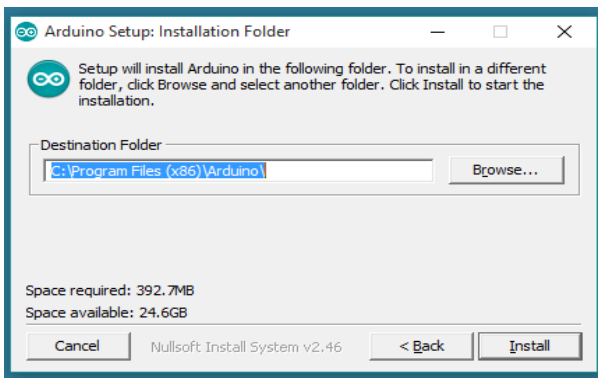
C. SOFTWARE SERIAL LIBRARY

In arduino, the serial communication is done through pin0 and pin1. A hardware piece UART is present which is a native serial port.64 byte serial buffer is present in the arduino.So the reception of serial communication is allowed until it is filled. To use even other pins of arduino for serial communication, we need this library.This software is installed to induce same functionality(hence it is called softwareserial).
#include <SoftwareSerial.h> has to be included to use this. This can be installed in arduino ide using library manager (contains all libraries)

D. LIQUID CRYSTAL I2C LIBRARY

To control LCD on the basis of a defined chipset(a compatible one),we have to install this library on the arduino (IDE).It works either in 4-bit or 8-bit mode.
#include <LiquidCrystal.h>has to be included to use this. This can be installed in arduino ide using library manager (contains all libraries).

V. HARDWARE TOOLS

In this paper, the arduino nano is used i.e.,microcontroller ATmega328 of operating voltage 5Vis used.It has 14 digital I/O pins and 8 analog input pins and clock speed of 16MHz. Power Mini-B USB cable is used to power the arduino board.The highest voltage source is being selected(either from pin 30 or pin 27) as the power source automatically .

A. LCD (LIQUID CRYSTAL DISPLAY)

LCD is a simple panel like display.In this project,LCD is provided at the trolley to display the product details when added or subtracted and also to show the updated bill details.To display the required content,the commands to LCD is given through the code written.

B. EM-18 RFID READER

EM-18 RFID reader is used to read 125KHz tags. It operates on low power and the reading distance is upto 10cm.It has small form factor and it is easy for usage. UART and Wiegand26 are the available communication formats. It can be directly interfaced with microcontrollers using UART and with PC using an RS232 converter.
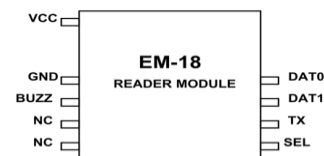
C. RFID TAG

RFID tag of 125KHz range is used in this project.RFID tags are durable and capable of withstanding high temperatures and harsh environments.These are reusable. The information exchange takes place between tag and reader in the form of radio waves. Each RFID tag has EPC(a 12 Byte unique Identification number).

D. HC-12 TRANSCEIVER

In this project,HC-12 communication module is used to establish wireless communication between trolley and the central PC of the shopping mall.This module is generally used to transmit and receive digital data.It does half duplex communication.Its frequency band is 433.4-473.0MHz with 100 channels.Its range is upto 1.8Km.

E. PUSH BUTTON

A push button is a simple switch which is normally open or normally closed.it is made of either plastic or metal.It is placed in circuits to control any process manually.On pressing the button,it gets closed.otherwise,it is in open state.

VI. RESULTS

Initially before entering into the shopping mall ,smart shopping trolley is taken and entered into the mall. When no products are placed in the cart it shows the number of items as 0 as in figure2.

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When we are adding the products after scanning of the RFID tags, the number of items and price will be updated as in figure4. The removal of undesired product in the cart can be done by scanning the respective item's RFID tag again.The number of items and price will be reduced correspondingly as in figure7. Once the shopping is done,the customer presses the push button which indicates end,then the total cost and number of products are displayed on the LCD as in figure8. Payment is done through pre-charged card.Pre-charged card is also a RFID tag whose information is with the shopping mall.When the customer scans his pre-charged card,the bill amount will be debited from the total amount that the card has and the billing details will be updated at the central PC.Now the cart is ready for the next customer to shop on pressing the reset button.

Figure1.Initially when the shopping is not yet started

Figure 2.when no products are placed in the cart

Figure 3.when a RFID tagged product is scanned and added

Figure 4.Number of items in the cart and total bill.

Figure 5.when another RFID tagged product is added into the cart
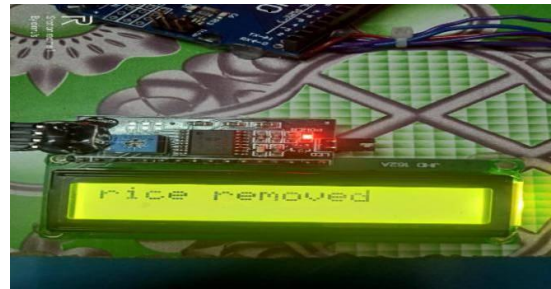
Figure 6.After adding 3 items

Figure 7. Removal of undesired product

Figure 8.Remaining products and cost

Figure 9.After pressing push button ,final bill payment is done through pre-charged card.

Figure 10. Now the cart is available for next customer for shopping.

VII. CONCLUSION

The Work is done with the help of RFID technology, EM-18 reader, RFID tags and Arduino. It's aim is to reduce the time of billing for the customers and to ease the process of shopping so that the customers gets benefited. It can be implemented in shopping malls where there is a large crowd and huge rush into malls. In the world of Automation. This technology will replace the present barcode system which is present being followed. Hence this technology can help people to make their shopping easy and time saving too without any much human intervention. This also reduces manpower and shopping mall maintenance.

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