SMART SHOPPING CART

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Abstract- The Internet of things (IoT) is the network of physical devices, vehicles, home appliances and other things embedded with electronics, software, sensors and property that allows this stuff to attach, collect and exchange information. IoT involves extending Internet connectivity beyond standard devices. The main problem while shopping is the delay in paying bill because of the long queue at checkout. Inorder to eliminate this problem a new system is proposed in which an inexpensive RFID tag can be attached to each product which when placed into smart shopping cart is automatically read using RFID reader. Each shopping cart is implemented with a Product Identification Device (PID) that contains microcontroller, android phone, an RFID reader. Billing can be done in shopping cart itself. Inorder to provide easy convenience to customers whole process is controlled using smart phone. Movement is also controlled using a smart phone. Billing system is done using Arduino UNO.The smart cart should be able to accurately read items put into or removed from the cart. An item put into one cart should not be read by another cart nearby. The server should maintain the state of items in the store. With RFID readers installed on the shelves, the items can be monitored and the item stock can be updated to the server. We propose installing RFID readers before the exit door, which can scan all the items in the smart cart, and check with the server if everything in the cart has been paid. If a dishonest customer tries to leave the store without making a payment, he will not pass the verification.

I. INTRODUCTION

Internet of Things (IoT) is the networking of physical devices that contain electronics embedded inside their design to communicate and sense interactions amongst one another or with regards to the external atmosphere. Within the coming years, IoT-based technology can provide advanced levels of services

and practically change the approach of individuals. Advancements in drugs, power, gene therapies, agriculture, smart cities, and smart homes are few of the explicit examples where IoT is powerfully established. IoT is a advanced automation and analytics system that deals with computing, sensor, networking, electronic, cloud electronic messaging etc. to deliver complete systems for the product or services. The system created by IoT has larger transparency, control, and performance. The embedded devices are the objects that build the unique system. These systems may or may not connect to the web.

In this paper we are focusing on a main problem ,while shopping the delay in paying bill because of the long queue at checkout. Inorder to eliminate this problem a new system is proposed in which an inexpensive RFID tag can be attached to each product which when placed into smart shopping cart is automatically read using RFID reader.Billing can be done in shopping cart itself. Every product in the shop or a mall will have an RFID tag on it .Each Cart will have an RFID reader,Bluetooth module,WIFI module embedded in Node MCU implemented on it .There will be a Centralized Server System. After the payment of money, the Cart must get into reset mode. There will be online payment procedure for billing . If the product is removed, it must be deleted from the bill too. Product Info, Expiry Date and Better Alternatives are displayed.

An embedded device system usually runs as a single application.However, these devices will be connected through the internet connection, and will communicate through alternative network devices.TheArduinoUNO is widely used microcontroller board supported by ATmega328P microcontroller and developed by Arduino.cc. The board is supplied with sets of digital and analog input/output pins which will be interfaced to various expansion boards and alternative circuits.Node MCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. Gear motors are complete motive force systems consisting of an electrical motor and a reduction gear train integrated into one easy-to-mount and -configure package. This greatly reduces the complexness and price of planning and constructing power tools, and appliances calling for top torque at comparatively low shaft speed or RPM.

Radio frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags connected to things.The tags contain electronically-stored information.Passive tags collect energy from a nearby RFID reader's interrogating radio waves.

Bluetooth is a wireless technology standard for exchanging data over short distances from fixed and mobile devices, and building personal area networks.L293D is a dual H-bridge motor driver integratedcircuit (IC).Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal.

This higher current signal is used to drive the motors.LCD (Liquid Crystal Display) screen is an electronic display moduleand find a wide range of applications. A 16x2 liquid crystal {display|LCD|digital display|alphanumeric display} display is incredibly basic module and is incredibly usually utilized in numerous devices and circuits
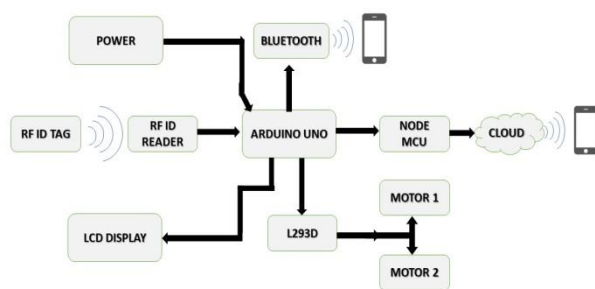
II.HARDWARE IMPLEMENTATION AND DESIGN OF CART

Figure 1: Hardware Implementation of cart

A .Microcontroller

The Arduino UNO is an open source microcontroller board based on microchip ATmega328P microcontroller and developed by Arduino.cc.The board is equipped with sets of digital and analog input/output (I/O) pins that will be interfaced to varied growth boards (shields) and different circuits.

Figure 2: Arduino UNO

The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable.

It can be powered by a USB cable or by an external nine volt battery, though it accepts voltages between seven and twenty volts.

It is also similar to the Arduino Nano and Leonardo. The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet).

It has 14 digital input/output pins (of that 6 are often used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack,an ICSP header, and a reset button.

It contains everything needed to support the microcontroller simply connect it to a pc with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it doesn't use the FTDI USB-to-serial driver chip. Instead, it options the Atmega8U2 programmed as a USB-to-serial converter.

The "Uno" means that one in Italian and is known as to mark the forthcoming release of Arduino 1.0.

The Uno and version 1.0 are the reference versions of Arduno, moving forward.

The Uno is the latest in series of USB Arduino boards, and therefore the reference model for the Arduino platform.

B. Node MCU

Node MCU is a WLAN SOC (system on a chip) created by Espressif Systems.It is based ESP8266 -12E WiFi module. It is an highly integrated chip designed to provide full internet connectivity in a small package.It can be programmed directly through USB port using LUA programming or Arduino IDE. By straightforward programming we will establish a WLAN association and outline input/output pins according to your wants specifically like arduino, turning into a web server and a lot more.

NodeMCU is the WiFi equivalent of ethernet module. It combines the features of WiFi access point and station + microcontroller.These options build the

NodeMCU extraordinarily powerful tool for WLAN networking.It is used as access server or connect with internet to fetch or transfer information.

D. Bluetooth Module

Bluetooth SPP (Serial Port Protocol) module, designed for clear wireless serial connection setup.The HC-05 Bluetooth Module is utilized in a Master or Slave configuration, creating a good answer for wireless communication.

This serial port bluetooth module is absolutely qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband.

It uses CSR Bluecore 04-External single chip bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature).

Figure 3: Node MCU

It's a programable WiFi module.It can be programmed with the simple and powerful LUA programming language or Arduino IDE.It is USB-TTL included, plug & play. It has 10 GPIOs, D0-D10, PWM functionality, IIC and SPI communication, 1-Wire and ADC A0 etc. all in one board.It can be used as access point or station, host a web server, connect to internet to fetch or upload data.It is Event-driven API for network applications.

C. RFID Reader

A radio frequency identification reader (RFID reader) is a device used to gather data from RFID tag, that is employed to trace individual objects.

Radio waves are used to transfer information from the tag to a reader.

RFID is a technology similar in theory to bar codes.

However, the RFID tag doesn't got to be scanned directly, nor will it need line-of-sight to a reader.

The RFID tag must be within the degree RFID reader, that ranges from 3 to 300 feet, so as to be scanned.RFIDtechnology permits many things to be quickly scanned and permits quick identification of a specific product,even once it's enclosed by many different things.

RFID tags have not replaced bar codes because of their cost and the need to individually identify every item.

RFID technology uses digital data in RFID tag, which is made up of integrated circuits containing a tiny antenna for transferring information to an RFID transceiver.

The majority of RFID tags contain a minimum integrated circuit for modulating and demodulating frequency and an antenna for sending and receiving signals.

Frequency ranges vary from low frequencies of 125 to 134 kHz and 140 to 148.5 kHz, and high frequencies of 850 to 950 MHz and 2.4 to 2.5 GHz. Wavelengths in the 2.4 GHz range are limited because they can be absorbed by water.
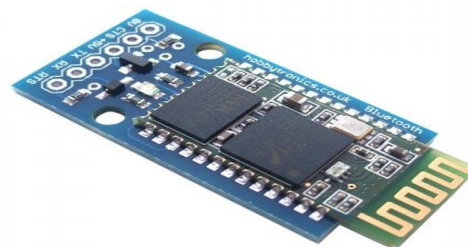
II.   Pin Description

Figure 4:Bluetooth Module

The HC-05 Bluetooth Module has 6pins. They are as follows:

A.ENABLE: When enable is pulled LOW, the module is disabled which suggests the module won't activate and it fails to communicate.When enable is left open or connected to 3.3V,

the module is enabled i.e the module remains on and communication conjointly takes place.

B. Vcc: Supply Voltage 3.3V to 5V

C. GND: Ground pin

D. TXD & RXD: These two pins acts as an UART interface for communication

E.STATE: It acts as a status indicator.When the module isn't connected to / paired with the other bluetooth device, signal goes Low.

At this low state, the led flashes continuously which denotes that the module is not paired with other device.When this module is connected to/paired with the other bluetooth device, the signal goes High.

At this high state, the light-emitting diode blinks with a relentless delay say as an example 2s delay that indicates that the module is paired.

F.BUTTON SWITCH: This is used for switching the module into AT command mode.

To enable AT command mode, press the button switch for a second.

With the help of AT commands, the user will change the parameters of this module however only if the module isn't paired with the other Bluetooth device.

If the module is connected to the other bluetooth device, it starts to communicate with that device and fails to work in AT command mode.
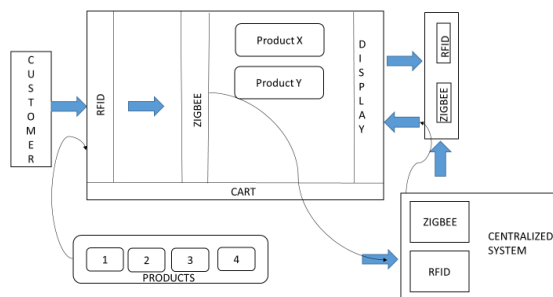
III. Block Diagram

Figure 5: Block Diagram

Every product in the shop or a mall will have an RFID tag on it. Each Cart will have an RFID reader and ZigBee Transceiver implemented on it.There will be a Centralized Server System. After the payment of money, the Cart must get into re55set mode. There will be online payment procedure for billing .If the product is removed, it must be deleted from the bill too. There must be an RFID reader at the exit door for anti-theft. Product Info, Expiry Date and Better Alternatives are displayed.

IV. Working

We start our process by entering the product details and storing their information in the database which is meant to be the initialisation step.Next we scan the RFID tag provided on each of the products.When we choose an item, if the tag is RFID , then read the data from the memory and display the details of it on the smartphones of the customer.If the product is being purchased by the customer, then add the cost of it. Similarly all the price of the purchased items are added to the cart.If the customer wants to put a product back to the rack,then the item is removed and it's cost will be reduced from the total amount and this will be displayed on a smartphone.This process of adding and removing items to the cart is done according to the satisfaction of the customer.The total amount after the purchase is calculated and the bill is generated.The customer can pay the bill online or offline according to his will and hence the smart cart purchase is done.
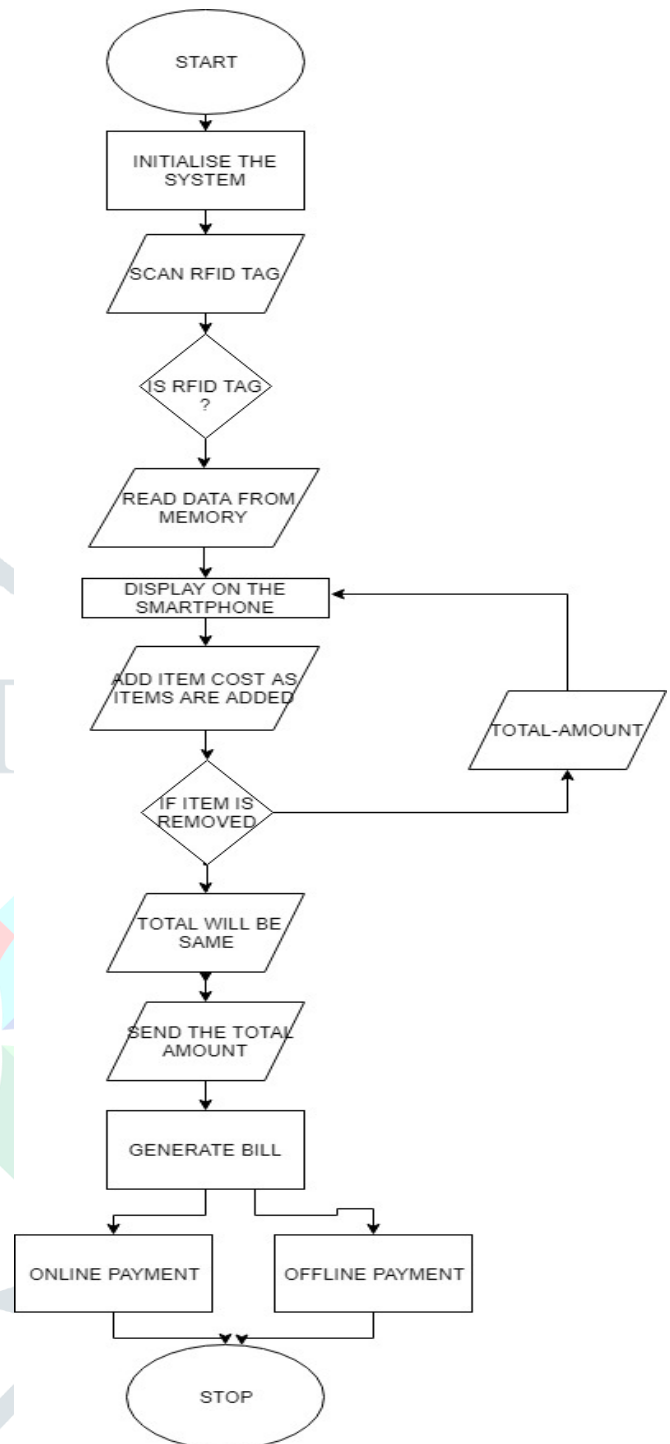
V. ARCHITECTURE

Figure 6: Flow Chart

CONCLUSION

The proposed smart shopping cart is implemented using RFID technology. The cart contains within it an RFID reader and a zigbee transceiver making it smart. The RFID reader reads the id of the shopping items within the specified range. The process of purchase is made easy and user friendly using the smartphones. Implementation of centralised system is done within which the product details, expiration, price, available stock, similar products within the same price range are stored, which will eventually be displayed on the smartphone when the customer does his purchase. Automatic billing system makes the customer purchase within his budget

and also avoid long queues in front of the billing counters. We propose controlling the movement of the trolley using smartphone which at times is difficult for the customer to do alone . Also the customer can pay the cash both online and offline according to his choice.

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