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IoT based retailed shopping system using NFC

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ABSTRACT

In current retail shopping systems, one witnesses long queues at the counter primarily due to limited barcode scanners for production identification and billing system. This causes inconvenience to the customers as well as can be regarded as a waste of time. Furthermore, the barcode system is getting outdated due to memory constraints. In the present paper, the concept of an IoT based retail shopping system using NFC is proposed that is time-saving. It combines the concept of Near Field Communication (NFC) and Radio Frequency Identification (RFID) with the Internet of Things (IoT). Software technologies like Atmel Studio, PHP, Eagle, and Extreme Burner have also been employed in the project. In this system, each product will be assigned a near field communication (NFC) tag which consists of all the product information. Wireless techniques and electronic tag have been used for product identification. To access this information, NFC readers will be used which come inbuilt in all the new smart phones. This system would be mounted on the trolley so that the bill can be easily generated based on the products placed on the shopping cart, using an Internet of Things (IoT) framework. Design of a novel shopping cart equipped with NFC reader and wireless module is presented which serves as a connection between the cart and the server using IoT framework. The proposed design of cart consists of an LCD, RFID reader, and EEPROM. The payment can then be made either online or through cash. Thus there remains no requirement of manual intervention and with the introduction of NFC enabled smartphones, these processes can be made automated.

Keywords: *IoT, NFC, Raspberry Pi, Shopping Cart, Wifi ESP8266.*

1. INTRODUCTION

In last two decades, the supermarket is becoming part of our daily life. Majority supermarkets are covered by barcode system, in bill payment cashier scans one by one product to the bill, which takes too much time. Due to this, people are discouraged to buy when bill counter has a big queue. Disadvantages associated with current technologies are as described below.

- Manager cannot review product information quickly.
- It takes more time to scan each product barcode while billing.
- In bill payment, we have seen long queues due to these techniques.

A considerable solution to this problem would be using NFC equipped smartphone and trolleys to lessen the scanning time and for faster checkout. Another possible advantage would be detailed product information available to the customers and online bill payment option.NFC technology is now inbuilt on many smartphones. Now a day's retail shopping, all products are enabled with digital information and theft protection. And digital information allows customers to get more detailed information about the product and make customer satisfy with their purchase. And even it helps storekeepers to get informations and manage all products accordingly. Using IoT (Internet of Things) when we go with online payments or mobile integrated payments where enabling NFC, these technologies allowed new features to the customer like virtual e-wallets. For management of retail shops, these technology increases the convenience and simplicity. IoT is the revolution using internet technology. IoT is the emerging technology which is going to be important in next few years. By 2020, around 50 billion objects will be connected by IoT. NFC is a subset branch of RFID technology. It operates at 13.56 MHz. Near Field Communication (NFC) is a short-range, wireless connectivity technology that uses magnetic field induction to enable communication between electronic devices in close proximity. NFC enables simplified transactions, data exchange, pairing, wireless connections, and convenience between two objects when in close proximity to one another (up to 10 cm apart). So it's very much useful to understand how the IoT & NFC works and based on it smart shopping system applications can be developed. Because of the recent emergence and importance of the IoT & NFC Technology the topic is

selected by me. The main aim of this project is to make fast checkout by reducing long queue at billing counter. This system replaces old barcode system with NFC technology. By this, one can improve the satisfaction of the customer. In this system, I have undertaken the particular case of supermarkets, where my design based on NFC technology & IoT. It is used to address the following issues:

- Long waiting time for check-out process causes customer dissatisfaction.
- Involvement of a lot of man-power, which is expensive.

In order to achieve this, I have come up with a design that automates the billing procedure and saves the customers' time. Following three main benefits of this system,

- It engenders a better shopping experience for the customers by preserving their time.
- It minimizes the man-power required at the retail shopping store, as the customer can checkout very expeditiously.
- It handles cases of deception if any, thereby making the system alluring not only to the customers but additionally to the retailers.

The main objective is to develop a generic solution by unifying the infrastructure and architecture of different shopping systems to a standardize Common Application Infrastructure. Development of such a cart which are low cost, easy to use, easy to maintain, capable to identify the different object with NFC Protocol, communicates with the server via Wi-Fi Network, Server consist of database and gateway to the internet.

2. BLOCK DIAGRAM

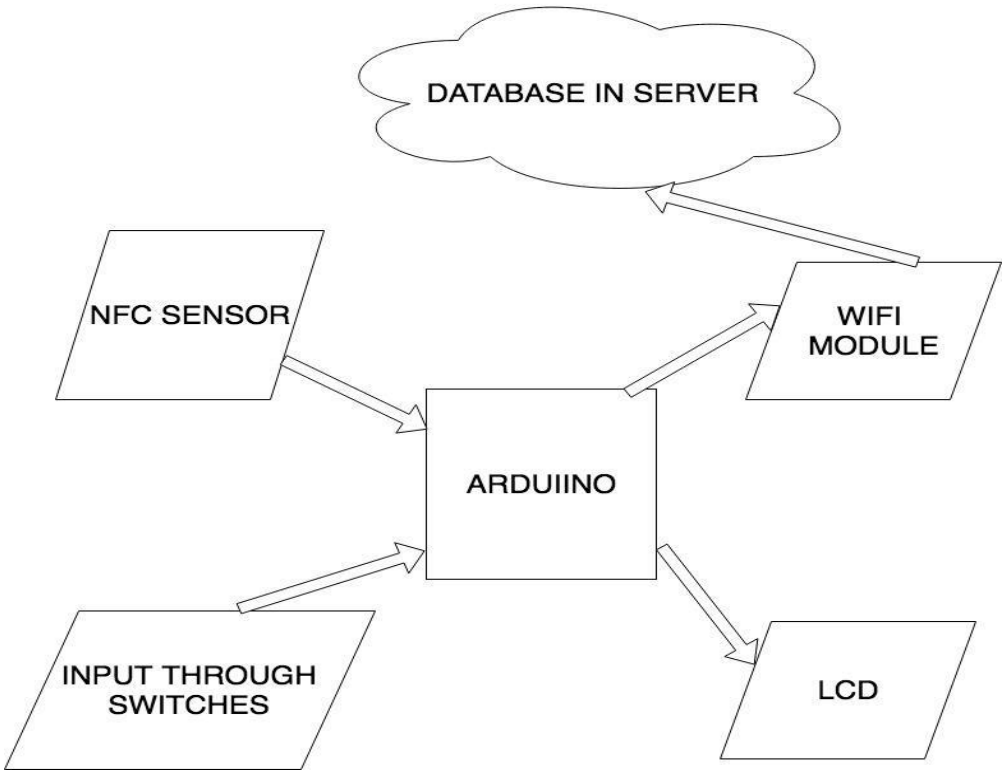


Chart 1: Block Diagram

2.1. Microcontroller

CMOS 8 bit ATmega328P microcontroller gives high performance and low power consumption. This type of microcontroller based on the AVR RISC architecture. It is 32 kilobyte of In-system programmable Flash with Read-while-write capabilities. Moreover, it has 1 kilobyte EEPROM and 2 kilobytes internal SRAM memory. Atmel offers the QTouch® library for embedding capacitive touch buttons, sliders, and wheels functionality into AVR microcontrollers. By executing powerful instructions in a single clock cycle, the ATmega328P achieves throughputs close to 1 MIPS per MHz. The device is manufactured using Atmel's high-density non-volatile memory technology. The On-chip ISP Flash allows the program memory to be reprogrammed In-System through an SPI serial interface, by a conventional non-volatile memory programmer, or by an On-chip Boot program running on the AVR core.

2.2. RFID/NFC READER AND TAGS

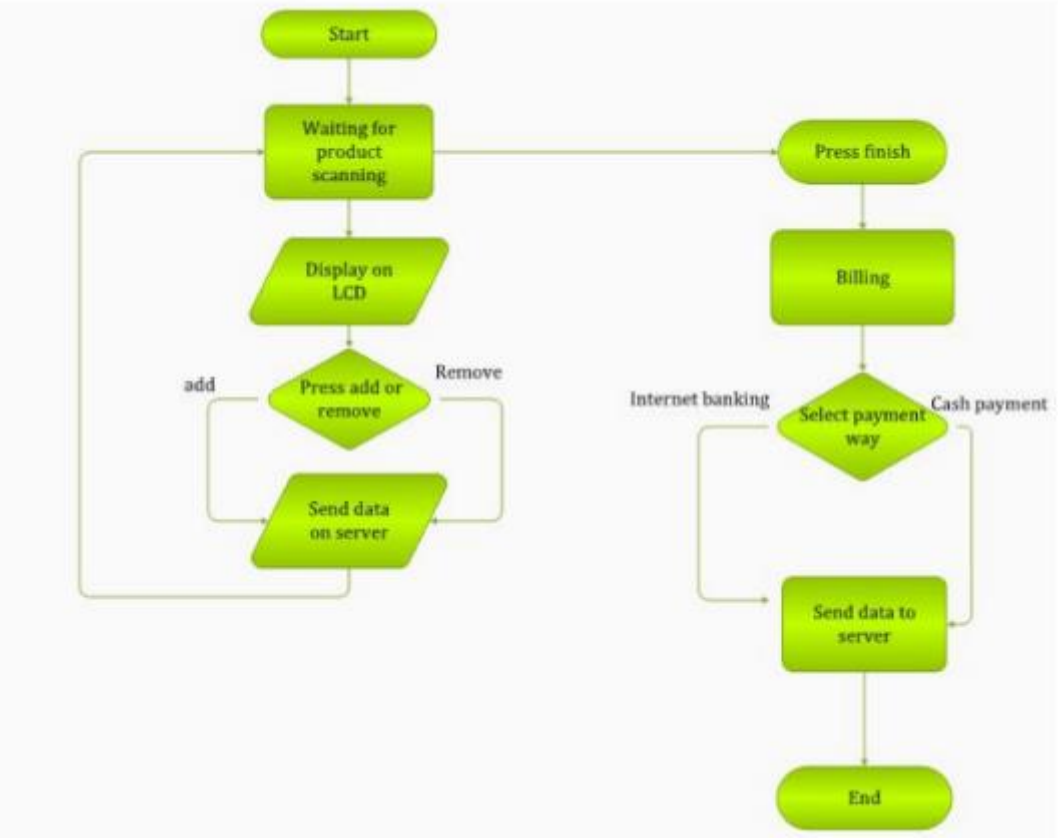
A Passive RFID system using Induction coupling method: In this approach, the RFID tag gets power from the reader through inductive coupling method. The reader consists of a coil connected to an AC supply such that a magnetic field is formed around it. The tag coil is placed in the vicinity of the reader coil and an electromotive force is induced it by the virtue of Faraday is the law of induction. The EMF causes a flow of current in the coil, thus producing a magnetic field around it. By the virtue of Lenz law, the magnetic field of the tag coil opposes the reader is a magnetic field and there will be a subsequent increase in the current through

the reader coil.The reader intercepts this as the load information. This system is suitable for very short distance communication. The AC voltage appearing across the tag coil is converted to DC using rectifier and filter arrangement.

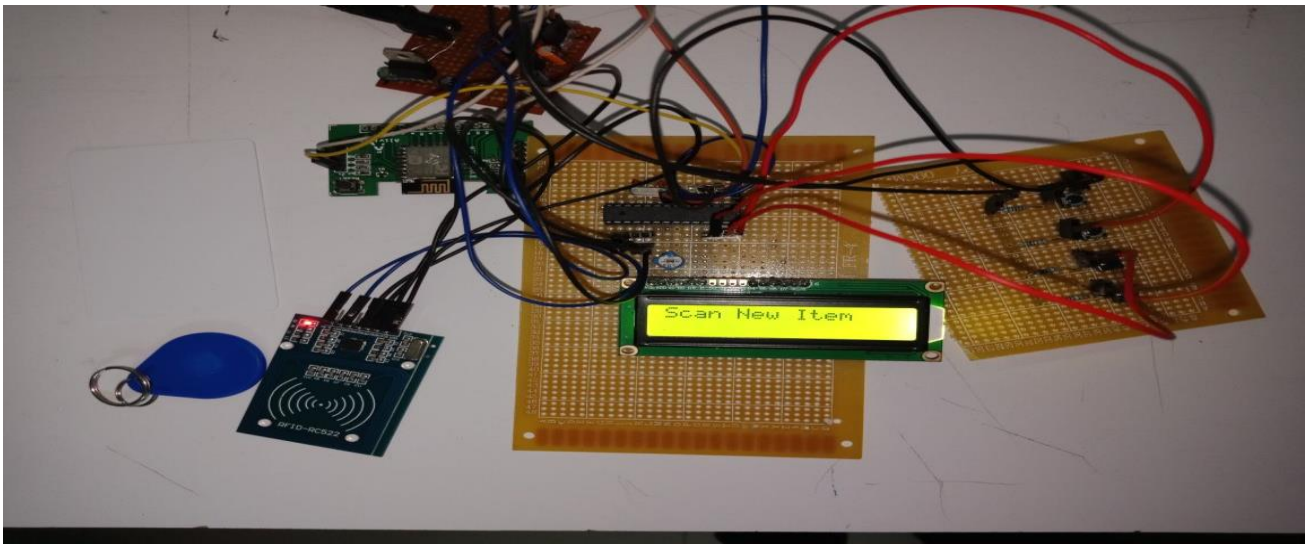
2.3. WIFI – ESP8266

The **ESP8266** can be controlled from your local Wi-Fi network or from the internet (after port forwarding). The ESP-01 module has GPIO pins that can be programmed to turn an LED or a relay ON/OFF through the internet. The module can be programmed using an Arduino/USB-to-TTL converter through the serial pins (RX, TX).The **ESP8285** is an ESP8266 with 1 MB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi.Processor: L106 32-bit RISC microprocessor core based on the Tensilica Xtensa Diamond Standard 106Micro running at 80 MHz.[†]

3. FLOW CHART



4. RESULT



5. CONCLUSION

"IOT BASED SMART SHOPPING SYSTEM" will be very helpful for reducing long stalls and unnecessary wastage of time at billing counter and making purchase experience satisfactory. Moreover, trolley equipped with NFC reader display is suggested to

maintain a running total. In addition to this, use of IoT to connect all trolleys with the central server and providing provision of online payment would add more positivity to shopping experience suggested.

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