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RFID Based Trolley System for Supermarket Automation

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Abstract: The Internet of Things is designed using Arduino Uno. Purchasing and shopping at big malls are becomes a daily activity in metro cities. There will be huge rush at malls on the weekends and holidays. Customer will have to purchase various products and keep them into the trolley. After total purchase one needs to go to billing counter for the payments. At the billing counter the cashier prepare the bill using barcode scanner. Which is a time consuming process and it will results in long queues at the billing counters. To avoid this waiting in long queue we introduce a system called smart trolley.

The aim of this system is to reduce the waiting of the customer in a long queue. The system consists of a RFID tag, RFID reader, WIFI module. All the products in the supermarket are equipped with RFID tags. When the customer put products in to the trolley its code will be detected and then the product details such as product name, product weight and number of each product will be displayed on LCD. After completing the purchase the customer needs to send the data to the billing software by pressing the corresponding switch in the smart trolley. Then the total bill data will be transferred to PC by wireless RF modules and then the purchasing details will be stored in the memory.

Keywords: RFID Scanner; smart trolley system; supermarket automation

I. INTRODUCTION

In the world of Internet of things [IoT] is a major technology by which we can produce various useful internet applications. Basically, IoT is a network in which all physical objects to be controlled remotely across existing network infrastructure. IoT is a very good and intelligent technique which reduces human effort as well as easy access to physical devices. This technique also has autonomous control feature by which any device can control without any human interaction. There has been a lot of IoT experimentation on various applications such as smart homes, e-health frameworks, wearable gadgets, and so on. IoT has brought a new revolution in industrial, financial and environmental systems and triggered great challenges in data management, wireless communication and real-time decision making. Also, numerous security and protection issues have risen and lightweight cryptographic techniques are in high demand to fit in with IoT applications. This paper is around a shopping framework based on Radio Frequency Identification (RFID) technology. All things available to be purchased are embedded with an RFID tag, so they can be tracked by any gadget outfitted with a RFID reader in the supermarket.

II. PROPOSED SYSTEM

The proposed system consists of RFID tag, RFID reader, WIFI module, Arduino Uno and LCD display. All the products in the supermarket are embedded with RFID tag. When the customer put any products in to the trolley it will scan the product. . Then it will display all the product details such as product name, product weight and the number of each product in the LCD display. Thus the billing will be done in the trolley itself. At the billing counter the total bill data will be transferred to PC by wireless RF modules.

2.1 Advantages of proposed system

- In the proposed system the items can be scanned manually.
- Customers can know the price of products instantly.
- RFID readers at exit door verifies the payment

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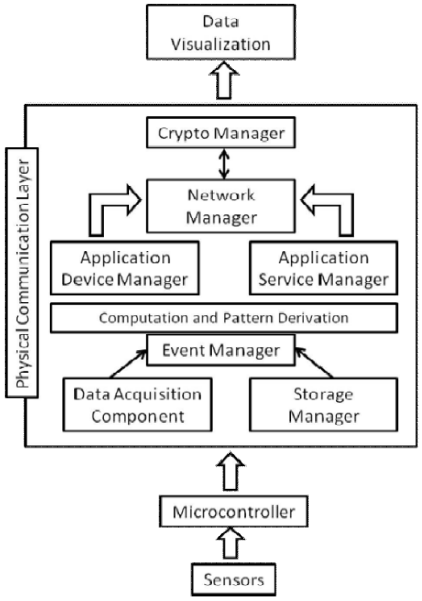
III. SYSTEM ARCHITECTURE



IV. MODULE DESCRIPTION

The system components are

- MICRO CONTROLLER
- LCD
- RFID
- SWITCH
- PC
- ESP8266

ARDUINO UNO:

The microcontroller used here is an Arduino UNO. The UNO is a Microcontroller board based on ATMEGA 328P which has a 32Kb of flash memory for storing code. The board has a 14 digital input and output pins, 6 analog inputs, 16 MHz quartz crystal, USB, an ICSP circuit and a reset button. The UNO can be programmed using the software Arduino IDE.

ESP8266 WIFI:

The ESP8266 Arduino compatible module is a low-cost Wi-Fi chip with full TCP/IP capability. This little board has a MCU (Micro Controller Unit) integrated which gives the possibility to control I/O digital pins via simple and almost pseudo-code like programming language.

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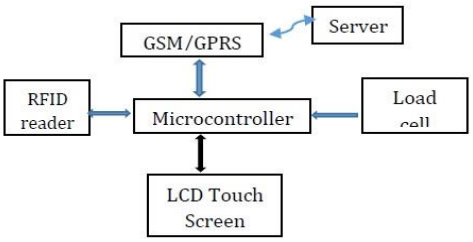
SENSORS:

A sensor is a device or a machine or subsystem whose purpose is to detect events or changes depends upon transducer in its environment and sent the information to other electronics, frequently a microcontroller. A sensor is always used with other electronics.

3.1 MODULE DIAGRAM



3.2 MODULES

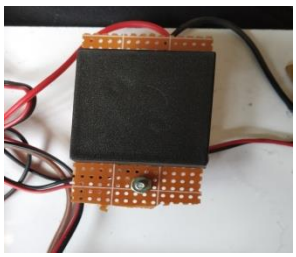
➢ **There are 3 modules:**

(i) Input: Scanning Products
(ii) Display Product Details
(iii) Transferring data to the cloud

MODULE 1: SCANNING PRODUCTS

Radio-Frequency Identification (RFID) is the use of radio waves to read and capture information stored on a chip attached to an object. RFID tags are embedded to items in order to track them using an RFID reader and antenna. RFID tags transmit data about an item through radio waves to the antenna when the tag receives the transmission from the reader. RFID tags can be read out of the line of sight and at distances ranging from a few centimetres to over 100 meters. They also enable individual items to be given a unique identification number, rather than just a product code. The retailers and wholesalers are expected to use these RFID tags to track the package of goods between stores and warehouses. In this futuristic billing trolley system environment, each product will contain the passive radio frequency ID tag which is bearing a unique electronic product code. This electronic product code provides the information about the product that is its name and price and weight As soon as the customer puts the product in the smart trolley, radio frequency ID reader scans the tag then generating the electronic product code number. The fetched data is passed to the microcontroller where further processing takes place.

RFID Reader scans the RFID tag on products.



RFID Reader

RFID Tag

MODULE 2: DISPLAY PRODUCT DETIALS

The system will display the product details such as product name, product weight , number of each products and it will also show that whether the product is expired or not.

LCD display shows the product details:

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MODULE 3: TRANSFERRING DATA TO THE CLOUD

In order to view the list of purchased items by the store administrator and customer via website, the following steps are involved.

SEND SENSOR DATA PRIVATELY TO THE CLOUD

There are sensors all around in our homes, smart phones, automobiles, city infrastructure and industrial equipment. Sensors detect and measure information on all sorts of things like temperature, humidity and pressure. They communicate that data in some form, such as a numerical value or electrical signal.

COLLECT DATA IN THINGSPEAK

Sensors, or things sense data and typically act locally. Thing Speak enables sensors, instruments, and websites to send data to the cloud where it is stored in either a private or a public channel. Thing speak stores data in private channels by default, but public channels can be used to share data with others. Once data is in a Thing speak channel, you can analyse and visualize it, calculate new data, or interact with social media, web services and other devices.

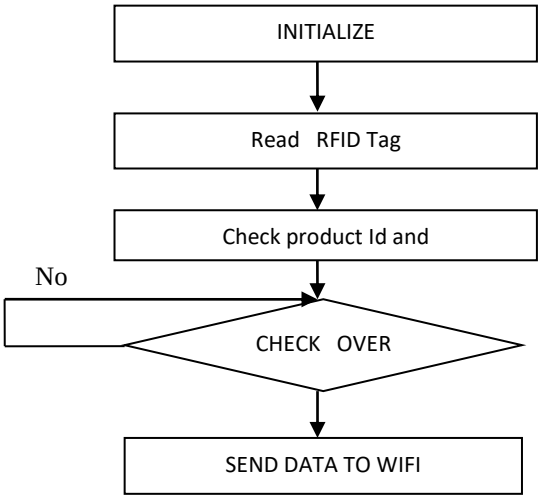
ANALYZE AND VISUALIZE YOUR DATA WITH MATLAB

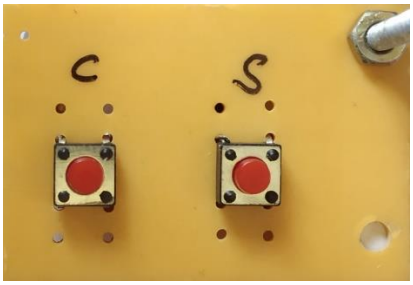
Storing data in the cloud provides easy access to your data. Using online analytical tools you can explore and visualize data. You can discover relationships, patterns, and trends in data. You can calculate new data. And you can visualize it in plots, charts, and gauges. Storing data in the cloud provides easy access to your data. Using online analytical tools, you can explore and visualize data. You can discover relationships, patterns, and trends in data. You can calculate new data. And you can visualize it in plots, charts, and gauges

TRIGGER A REACTION

Acting on data could be something as simple receiving a sensor (specified in Block) from Arduino and data send to web server via WIFI module

Data flow chart of the trolley





Switch

Here the switch S is used to send data to the cloud. Switch C is used to clear the data on the LCD display
The WIFI Module is used to transfer the data to the cloud.

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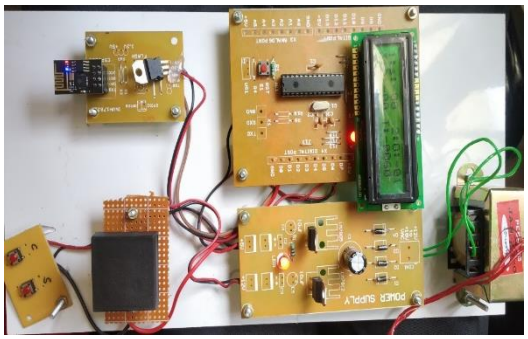
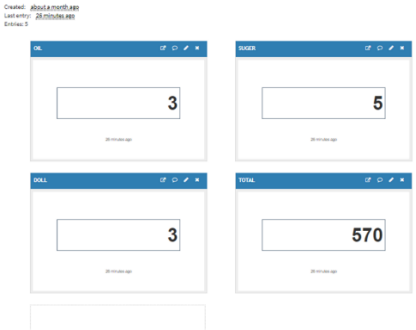
V. OUTPUT

The data uploaded to the cloud can be viewed in the PC at the counter and payment process is done there. The sample view of the website result is shown in the below figure.



Website Result



Smart Trolley Kit

VI. CONCLUSION

In this proposed paper a secure smart shopping system utilizing RFID technology is employed in enhancing shopping experiences and security issues. The smart shelves are able to monitor the items on the shelves by reading the RFID signals from the tags. The smart carts are able to read and retrieve information of the items inside the carts and finally, the checkout points can validate the purchase made by a customer.

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