

Smart Retailing Using IOT

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Abstract - This paper describes about smart retailing based on IOT (Internet Of Things). Now days inventory management becoming more complex. The biggest problem faced by store owner is increased sales & reduced operational costs. Not only the store owner but also customer can face problem that is searching product and unavailability of product. To solve this problem we use IOT technology. IOT aims at integrating networked information systems to real world entities. It connects objects such as Smart Phones, Sensors with cloud where the data is stored. With the help of this system owner can maintain inventory information also place the order of inventory. Customer can easily see the product information like expiry date, price, nutrients, etc. They can also see whether the product is available in store or not. Customer can also share sales list to others as well as they get notification of offers.

Key Words: Internet of things, RFID Technology, Smart Phones, Cloud platforms, Data mining

1. INTRODUCTION

Internet Of Things (IOT) has gained widespread acceptance in various walks of life. Internet of Things forms a network of objects that are interconnected and capable of communicating with other objects in the network. IoT is a system of interrelated computing devices, digital machines, objects which are provided with unique ID and they have the ability to exchange data over the IoT devices without requiring human or machine interaction. Trust is the main factor in IoT devices to function properly in both physical world or in cyber world. There are huge number of applications being developed under IoT tree which includes e-health, smart city, Air pollution check in the city and so on [5].

With the development of our society, supermarket has been part of our daily life. Due to the wide variety of commodities in the market, we can buy anything we want. Customers may waste a lot of time on searching what they need. The program is intended to allow customers to feel the convenience that the Internet of things smart supermarket brought about to people's lives and understand what is Internet of things and how does it affect people's lives really and truly. In the smart supermarket, we will never hear customers complain about queuing up for shopping and checkout. [6].

RFID technology, as the core of IoT, acts as the link of process flow data and physical asset data. All the physical asset data can be associated with the process nodes based on

RFID. For example, RFID-equipped machine tools can monitor the physical asset data. As to the operating mechanism, RFID tags are attached to the products. [1].

2. IOT Component:

Sensors: Sensors are the eyes and ears of the system as they detect occurrence of events, surrounding conditions and transmit the collected information. The work of the sensors is to monitor and perceive events or phenomena that take place in the physical world. Every sensor can be categorized on the basis of three parameters namely, sensor type, methodology and sensing parameters. Sensor type defines which type of sensor it is i.e. whether it is a homogeneous or a heterogeneous sensor or it is a single dimensional or a multidimensional sensor. Methodology talks about the ways in which a sensor gathers information. It can be either active or passive in nature. Sensing parameters are the number of parameters which a sensor can sense.

Gateway: All the information that has been sensed and gathered by the sensors is transmitted to the gateways. Gateways act as a common point of contact wherein diverse kinds of information coming from heterogeneous types of sensors gets collected. It is the gateway which is responsible for the global addressing of each store by making use of IPv4 addresses. Each gateway is allotted a coverage area, wherein each store has been given an IP address thus facilitating efficient identification of products being sold at that store. Every gateway is allocated more than one store so as to enhance the granularity of store identification. The gateway also keeps track of its neighboring gateways along with the total number of stores functioning in its area. Finally the gateway transmits all forms of unstructured information to the subsequent cloud servers.

Cloud: It acts as the storage and processing unit for the entire system. All requests coming from the customer are addressed at the cloud end [6]. It also keeps track of all the stores located in a shopping complex along with the details of every product being available at respective stores. It maintains database where information pertaining to every product such as product ID, product name, date of manufacture, name of manufacturer, cost of the product, any special discount being offered on that product, shelf life, payment info and its RFID tag serial number. During the process of purchasing a product, scanned serial numbers are sent to the cloud along with their payment details. Once the purchase has been made RFID readers are informed about it and asked to update the product status of respective products.

Mobile Device: It acts as a representative for a customer. It is the mobile device which allows the customer to search and purchase products on a real time basis. Any notification or special offer pertaining to a particular product is directly communicated to the mobile device in wait of an appropriate response.[2].

3. EXISTING SYSTEM

In shopping mall the retailer have to go and check products quantity after some particular time. If product in supermarket is out of stock is not recognized by retailers until they check that's why the big loss of retailers and this process require staff. For customers also if they want any product they will go to store and check availability of products which is time consuming. Also they didn't know the actual price, nutrition, expiry date until go there.

This project is aimed at developing an IOT system which can be controlled remotely by using an Android App. It includes automatic inventory management with a Load sensor and RFID tag attached to it.

4. LITERATURE SURVEY

1 RFID-based production Data Analysis in an IoT-enabled Smart Job-shop.

In this paper RFID is used to analysis the production in IOT-enabled Smart job-shop. In manufacturing environments production and production transparency is done .It generates increasing production data that are sometimes discrete ,uncorrelated and hard to use.So RFID based production data model is built to formalize and correlate the heterogeneous production data. With this judge the process command execution because RFID tags are attached to the WIPs(Work in Progress) for forming smart WIPs.

2 IOT based interactive shopping ecosystem.

In this paper an interactive shopping model along with an amalgamation of IOT and cloud computing and provides efficient access, ordering, monitoring of products. The aim of system would be to create an interactive shopping ecosystem where customers need not waste time in searching for a particular product .The system would act as guide for the customer.

3 Enhancing and Speeding-Up Real Tim shopping using and indoor map, intelligent suggestions and Calculations, built upon a smart1 phone application.

This paper focused on real time shopping and it would guide the customers to quick track the goods they want to in a store. Customer have indoor map also. Suggestions based on buying patterns of customers ,locations of shelves and total price of goods calculated before they goes to counter would be provided in order to enhance the shopping experience of

the customers as well as promotion of goods in store whatever updating are required done by retailer.

4 Cloud based online retail management framework: a different aspect.

This paper is to give such a platform for a vendor where they can put up their shops and deal with customers according to themselves. This is only platform no logistics related transactions will be1 done by the website owners .This website will act as the cloud to store information of shops where customers can search shops details which they want.

5. PROPOSED SYSTEM

The main aimed of project is using IOT technology solve the real life problem face by retailer and customer using the android App. In proposed system retailers knows that quantity of products remains in market .Basis of that If product are less in quantity we send warning Message to retailers desk for refill the products or order the new one from vendor. By customers side there is app which will help to detect the product is available or not and if available then it show the actual price, nutrition, expiry date etc. related to that product which save the time of customer.

In Proposed system if the product are less in quantity then system give warning message to server or administrator and server receive the warning message and take action as per requirement. If Product are less then administrator refill it else give order for new product. It also give the map of the system which will help the customer to search the product and purchase it. For customer also it give option like list, discount, which help the customer to make list of product which want purchase by them also customer create their own list.Administrator can have rights to add or remove product from supermarket. Which will update instantly in mobile application.

6. SYSTEM ARCHITECTURE

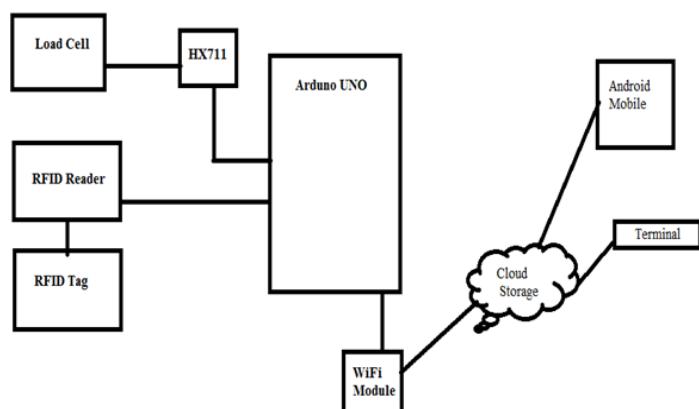


Figure1.System architecture

Figure 1 shows the Software architecture of the system in this two input are given to arduino UNO from HX711 and RFID Reader where Load Cell give analog input to HX711

and it convert it into digital and give to arduino and RFID tag give information about product to RFID reader and it give to arduino. This all information process by arduino processor and using WiFi Module it store on Cloud.

All Store information in cloud access by using Android App and Server and produces certain result. Each RFID tag will store different different product information in it therefore it is necessary to keep right RFID tag with right product. And then this information is read by RFID reader and send to arduino for processing.

In this mobile device use to control mobile application which one handle the simple operation from customer side like view product list , view map of product, search for product, product nutrition's, product expiry, etc. all related thing shown to customer. Using that customer create its own list of product and also see the discount rate of product.

For administrator login they perform different application like add or remove product, see user list , keep track on product purchase, etc.

Mobile application also give warning message if product are less in quantity and after getting warning message administrator make order of inventory using web server. For making order they use the web server. Web server show the detail info about all product which are connected to cloud. This System architecture is base on the input gain from arduino and providing output by arduino after some operation. If any hardware is fail between the process the it will affect the system and provide wrong information to cloud. This wrong information access by android device and web server and perform operation on that wrong information. Therefor it is necessary to always keep track on hardware device maintained properly.

7. FLOW Diagram

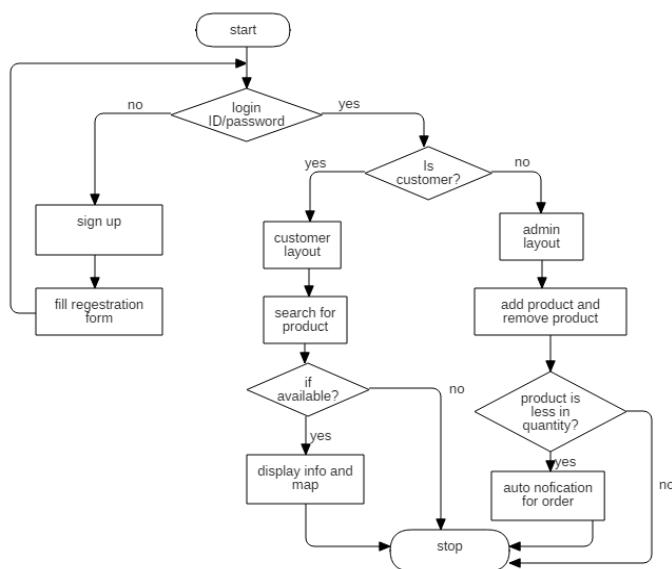


Figure 2. Flow diagram

1.Customer

The customer is the mainly focused user in this system. The application is designed targeting the customer. The customer can perform the following:[3]

- Make a list of item.
- View the list.
- Search the products in store.
- Get the details of the product.

2.Retailer

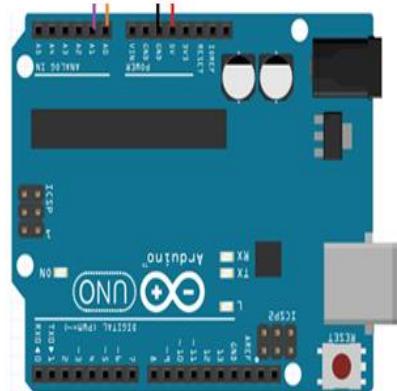
Administrator has privileges database. The shop owner is to access and manipulate the the Administrator and he is perform following operation.[3]

- Login
- Manage the administrator profile
- Add/Delete/Update Product.
- Logout

8. IMPLEMENTATION

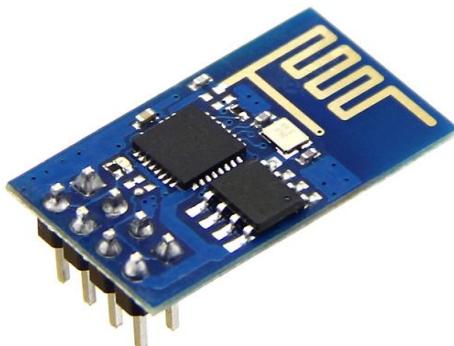
Hardware requirement

Microcontroller : Arduino UNO

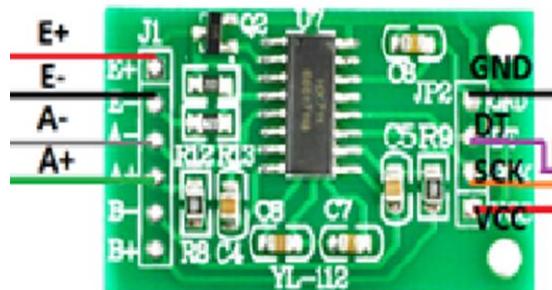


Arduino Uno use for building Digital devices and interactive objects that can sense and control objects in the physical world. It has 14 Digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

ESP 8266-01 (Wi-Fi module)



HX711 (weighting sensor module)



The ESP8266 WiFi Module is a self-contained with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all WiFi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

Load Cell



A load cell is described as a "weight measurement device necessary for electronic scales that display weights in Figure its." However, load cell is not restricted to weight measurement in electronic scales. Load cell is a passive transducer or sensor which converts applied force into electrical signals. They are also referred to as "Load transducers".

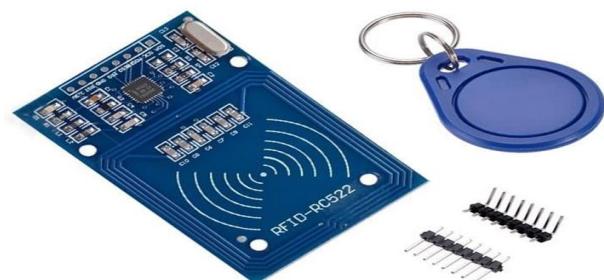
However, the only load cells which are prevalent are the load cells based on strain gages. The reason behind the wide adoption of strain gage-based load cells is their characteristics:-

Small size compared with other types of load cells. Long operating life due to lack of moving parts or any parts that generate friction.

Ease in production due to small number of components.

Weight Sensor Module is based on HX711, which is a precision 24-bit analog-to-Digital convertor designed for weigh scale and industrial control applications to interface directly with a bridge sensor. Compared with other chips, HX711 not only has a few basic function, also contains high integration, fast response, immunity, and other features. The chip lowers the cost of the electronic scale, at the same time, improving the performance and reliability.

9. RFID Reader and Tag



RFID is an acronym for "radio-frequency identification" and refers to a technology whereby Digital data encoded in RFID tags or smart labels (defined below) are captured by a reader via radio waves. RFID is similar to barcoding in that data from a tag or label are captured by a device that stores the data in a database. RFID, however, has several advantages over systems that use barcode asset tracking software. The most notable is that RFID tag data can be read outside the line-of-sight, whereas barcodes must be aligned with an optical scanner.

RFID signifies to tiny electronic gadgets that comprise of a small chip and an antenna. This small chip is competent of accumulating approx. 2000 bytes of data or information.

10. ALGORITHM

Function Functionality

Start()	It marks the start of the entire system
Controller()	It orchestrates the flow of information and controls the working of the entire system.
Product_Info()	It is used to keep track of all the information regarding a particular product such as Product Code, Product Price, Product Name, Price, Expiry date of the Product, etc.[2]
Mobile_Application()	This function represents the mobile application. All queries relating to searching or purchasing of a product are carried out through this function.
Reader()	Reader is read the product information.
Alert_Warning()	This function give alert message if product less in quantity.

Step 1: Start()

Step2: Controller()

Step 3: Product_Info()

Step 4: Mobile_Application()

Step 5: Start() → Mobile_Application()

Step 6: Mobile_Application() → Controller()

Step 7: Controller() → Mobile_Application()

Step 8: Tag() → Mobile_Application()

Step 9: Mobile_Application() → Reader()

Step 10: Reader() → Controller()

Step 11: Controller () → Reader()

Step 12: Reader() → { Tag(), Alert_warning() }

Step 13: Alert_Warning() → Product_Info()

Step 14: Controller () → Product_Info()

Step 15: Controller () → Stock_Mgmt()

Step16: Stock_Mgmt() → Investment_Ratio(), Order_level()

Step 17: Stop()

Step 18: End[2]

11. ADVANTAGE

- It reduces time and effort.
- User friendly.
- Easily access the product information.

- Cost efficient.
- It is feasible to use.

12. LIMITATIONS

- The user should have an Android smart phone to use this application.
- The system depends on the timeliness of the administrator in order to be accurate always.
- The administrator must enter the valid username and password to login to the system.
- The administrator should update the system when necessary.
- The user should be in the shopping premises in order to receive live data via RFID tags.(not applicable to the current version of the application)
- The user's phone should have the capability of reading RFID tags or he should have a device connected via internet in order to receive live data.[3].

13. DEPENDENCIES

- Most of the customers use Android smart phones.
- Most of the shop owners use Android smart phones.
- All users have the basic knowledge to operate a mobile smart phone.
- People would like to fit into the new technology without any hesitation.
- All users know the language English, as the User Interface will be provided in English.
- Most of the Android smart phones would have the facilities to run this application.
- The System can access the Database with ease.
- There won't be any issues in reading RFID tags.
- The memory load would be affordable by the memory card in the smart phone.[3]

14. CONCLUSION

This application automatically manages the inventory which is very efficient to storeowner in economic manner. It will give notification to storeowner of product when product is less in quantity so that they can refill that product in rack. This can save man power and time as well as all operation can be done by android app so it is very user friendly.

With this application customer can easily see the availability of product and information of product like nutrients, price, quantity. Also see the where is actually product is using the MAP function in the system which will help customer to guide the path of product and save time of customer .

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