International Journal of Advanced Technology in Engineering and Science
Vol. No.7, Issue No. 05, May 2019
www.ijates.com
ijates
ISSN 2348 - 7550

Iot Based Smart Self Billing Shopping Trolley

Suresh Kumar R[1] ,Yogananda O[2],Madhu Kumar M R[3],Manjula G Hegde[4]

[1,2,3]*Students, Department of ECE, Sambhram Institute of Technology, Bangalore, India*

[4]*Assistant professor, Department of ECE, Sambhram Institute of Technology, Bangalore, India*

Abstract

Shopping malls allow the customers to shop variety of products under one roof. Since it does not need the customers to go to various shops to buy different products. So beside this big advantage, there is a major disadvantage of long billing queues taking much longer to bill the purchased products. So if there were a system to generate the bill of shopped products simultaneously then it could save the billing time thereby revoking any need to stand in long queues. Hence a solution is provided via technological way by implementing RFID scanners which scans the product which is being added to the cart or removed from the cart and a Load cell is used to monitor the total weight of the purchased product and the proposed system also included Rack section where products are placed for sale, customers can locate the required product in mart by its rack number via Shopping App, implementing IoT technology in the system the Shopping App also keeps a track on purchased product, locating the product, and total bill details, shopping cart movements can also be moved/operated via App.

Index Terms- RadioFrequency Identification, RFID tags, Microcontroller,Audio chip,Load cell,Wi-Fi module(ESP8266),Database,H-bridge,buzzer,LCD.

I. INTRODUCTION

Human beings have always developed technology to support their needs ever since the beginning of mankind. The basic purpose of innovation in technology, irrespective of the domain, has been in simplifying tasks and making everyday chores easier and faster. One quotidian task that human beings spend considerable amount of time is in shopping. According to a survey conducted by US Bureau of Labour [5], on an average, human beings spend 1.4 hours every day on shopping. A large number of customers will tend to walkout of a queue if the line is too long. The current Shopping environment can be simply be classified it into two categories (1) Shopping in-person and (2) Shopping in absentia. Shopping in absentia is supported in numerous ways including online shopping, tele-shopping, etc. wherein a shopper does not have to be physically present in the shopping area. Shopping inperson involves a personal visit to the place of shopping and selecting the productsbased on various factors including need, convenience, brand,

etc. [4]. The proposed Iot Based Smart Shopping Trolley system intends to assist shopping in-person that will minimize the time spent in shopping as well as locate the desired product with ease.It is also aimed in aiding the store management with real time updates on the inventory.The proposed system is based on(i) RFID tags for product identification (ii)Wi-Fi module(ESP8266)for achieving wireless communication with Server (iii)Load cell for weight calibration (iv) Integrating System with display for billing and inventory management (v)Audio Chip for voice output instruction (vi)H-bridge for controlling the motion of wheels. All of these are discussed in detail in different sections.One of the critical design decisions has been in developing a novel approach to dynamically detect the location of the shopping cart and integrating it suitably into a useful low cost embedded system. Widely used location determination technologies including Global Positioning Systems (GPS) does not augur well for solving the proposed problem. Some demerits include, higher implementation cost, movement of cart in an enclosed area, and location accuracy. In this paper, we discuss the System Design, Working, Testing, and Conclusion. In conclusions we discuss about opportunities of improving the cart to make it into a commercially viable product as an excellent way to help customers reduce the time spent in shopping by displaying the list of products, their cost and automatic billing [2].

II.LITERATURE SURVEY

Dr.Suryaprasad J in "A Novel Low-Cost Intelligent Shopping Cart" [1] proposed to develop a low-cost intelligent shopping aid that assists the customer to search and select products and inform the customer on any special deals available on the products as they move around in the shopping complex.

Amine Karmouche in "Aisle-level Scanning for Pervasive RFIDbased Shopping Applications" [2] proposed to develop a system that is able to scan dynamic and static products in the shopping space using RFID Reader antennas. Instead of conducting the RFID observations at the level of individual carts, aisle-level scanning is performed.

SatishKamble in "Developing a Multitasking Shopping Trolley Based on RFID Technology" [4] proposed to develop a product to assist a person in everyday shopping in terms of reduced time spent while purchasing. The main aim of proposed system is to provide a technology oriented, low-cost, easily scalable, and rugged system for assisting shopping in person. Mr. P. Chandrasekar in "Smart Shopping Cart with Automatic billing System through

RFID and ZigBee" [5] proposed to develop a shopping cart with a Product Identification Device (PID) which will contain a microcontroller, a LCD, an RFID reader, EEPROM, and ZigBeemodule. Purchasing product information will be read through a RFID reader on shopping cart, meanwhile product information will be stored into EEPROM attached to it and this EEPROM data will be send to Central Billing System through ZigBee module. The central billing system gets the cart information and EEPROM data, it access the product database and calculates the total amount of purchasing for that particular cart.

III. SYSTEM DESIGN

Objective: To develop a low-cost intelligent shopping aid that assists the consumer to locate and select products and inform them on the product/s details dynamically as they move in the shopping arena. Additionally, with each product identified uniquely and usage of centralized server, support billing and inventory updates.

A. SYSTEM ARCHITECTURE

In the development and discussion of the proposed smart shopping cart, it is assumed that the shopping arena is organized in aisles/bays as indicated in Figure 1, and each aisle is sufficiently wide enough for customers with shopping cart to move [1].RFID tags are used to uniquely identify products, each tags will have separate unique codes which is identified by RFID scanners installed in cart. Wi-Fi module ESP8266 is used to transfer the data to the central server for processing, ESP8266 acts as both transmitter and receiver.

Figure1. Aisle based organization of shopping arena.

Load cell here used for calibrating the weight been added into cart and for checking the unauthorized load been added or not into the cart.

Figure2 depicts a block diagram containing the subsystems of smart shopping cart. Each subsystem is interfaced carefully to form a whole unit.

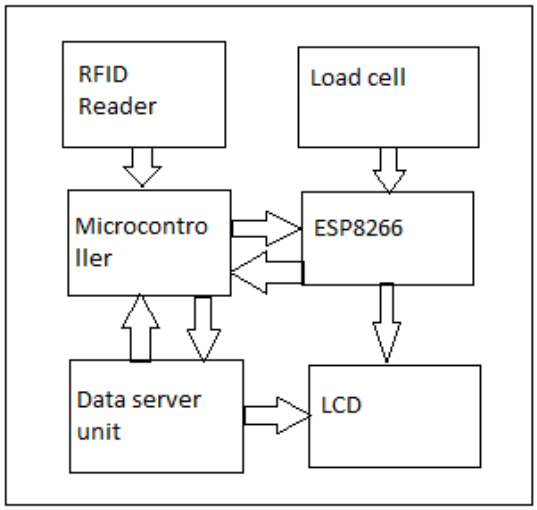

Figure 2:Block diagram of all subsystems.

The data sent is the aisle number. At the server end, the database is quereied based on the aisle number. All the products and their respective details stored in that particular aisle are retrieved and sent back to the shopping cart. The information received from the server is temporarily stored in the shopping cart memory and then displayed on the display unit affixed on the cart. The customer can then select the product with the information being shown on the display unit. Every product is uniquely identified using RFID tags.As the products are selected and added into the cart, the RFID reader will identify the product, the price and weight will be added in cart and also will be updated into shopping app.

B. WORKING

The proposed system is to avoid long queue system followed to pay bills in shopping mart where mart billing employees scan each product and bill it, hence this is a long process and queue followed will be increasing since the process of billing is time consuming when number of product purchased by each customer is more, hence we are developing a system where we introduce a Smart self billing trolley and a Shopping App for customer and mart management authority which together helps the customer during shopping period and guides him to search product and also bill is generated online for purchased ones giving a smooth shopping experience by avoiding billing queues and many other facilities are offered as follows.

The system consists of 2 major modules as follows.

1] Smart Shopping Trolley:

a] Self-billing unit:

Customer during his shopping period will collect the smart shopping trolley from the mart authority and using his smart phone to connect with the trolley, once he is connected with the trolley then all the data will be sent to online central server via IoT implementation.

During purchase of product the customer will scan the product in RFID scanner which is installed on trolley and then the scanned product can be added into the cart, as soon the product is scanned the load cell will expect the weight of that particular scanned product, if anything is added into the cart without scanning then that weight is considered as un-scanned product and a buzzer alert is triggered. Customer can also remove the scanned product from the cart as per his wish by pressing remove

product button and then scan the product again which is to be removed, in this way the product can be successfully removed from the cart.

When customer is scanning the product to purchase then all the product details are added into the online billing database automatically using IoT technology implementation where online central database is maintained. When customer removes the product from the cart by scanning it again then it will automatically update the bill by removing the product from the billing database. In this way final amount of bill to be paid will be displayed on LCD which is installed in trolley and also in Shopping App all the details of product purchased and total bill amount will be displayed.

Mart employees on Shopping Management App will just enter the unique number of trolley and final amount to be paid by the customer will be displayed directly with product purchased list.

Here mart employees are not scanning the each product of customer since each product is already been scanned and bill is also generated accordingly as per above procedure, the Shopping Management App is also connected to online central server to fetch all the details.

Shopping App with customers will also help them find the product when it is searched on app by locating it with unique Rack number where product is placed by mart employees.

b] Audio help for blind:

Shopping experience is also made easy for visually impaired persons by giving an audio voice output on headphone attached to trolley when product is scanned on trolley which will give audio details of product so that they will know details of product before purchase.

c] App controlled trolley:

When number of items purchased increases simultaneously the weight of overall trolley will increase which will be difficult to move for long distance till exit of mart by old-age people or disabled people so this feature will enable the person to control the movement of trolley via Shopping App making it easy to move.

2] Product Rack Unit:

a] Locating Product:

Single Rack unit is divided into various smaller sub-sections to place different product for sale, mart employees can arrange any product in any sub-section of the rack as per there convenience. But each sub-section of rack will have an RFID scanner which is used to register the product by scanning it. Register scan is done when product is being placed first time for sale in that sub-section, so initial scan is done for one product and that sub-section of rack will be dedicated for that product only, which can also be changed later by re-scanning the different product in register scan process. Once the product is scanned that location of rack by its rack ID and its sub-section as sub-section ID is

registered into the online central database, when customer via his app will search for the product then the Rack ID and Sub-Section ID of that particular product will be displayed on his app. This will help the customer locate the product with the ID's.

b] Customer help button:

Each Rack unit is also installed with customer help button which when pressed by any customer a notification is raised in the shopping management app so that they can send the mart employee for customer help.

The whole mechanism of product register scan and customer help button works on IoT implementation where all the data is updated in the online central server and it can be accessed via App.

IV. TESTING

Testing was a very crucial component of this project [1]. Unit testing of various modules was performed independently followed by integrated system testing.It includes(a) Entry and Exit status of the cart from Aisle. (b)Shopping cart and server communication using the wireless module unit. (c) Identifying items based on RFID tags and synchronizing with central database. (d)Weight calibrating is done (e) Automatic billing.

Table:1 provides a sample database that was used to test theIot based smart self billing shopping cart.

Product name	Weight	Price
Biscuit	132	30
Noodles	264	35
Soap	156	40
Salt	396	20

Table: 1

Based on the above list the product details is added for shopping and also sent into the shopping app through the Wi-Fi module connected to it.(a) The customer picks the products and scans the RFID tags in the cart. (b)Load cell is matched with given weight (c) Unauthorized load match is found if any product is not scanned. (d)Then all the data are sent to data server. (e)Audio chip is installed for voice output. (f)Cart movements is also controlled via app.(g) Update inventory in the central system upon each purchase of a product. All test cases were successfully tested. The system developed is user friendly and no special training is required to use the cart.

V. CONCLUSION

The intended objectives were successfully achieved in the prototype model developed. The developed product is easy to use, economical and does not require any special training. Though the project showcases the proof of concept, there area few aspects that can be included to make the smart shopping cart more robust. To begin with, in this project the latency time of the wireless communication with the server may need to be considered. Secondly, the communication is not very secure. Another WiFimodule operating at the same frequency can easily intercept the transmitted data. This issue will have to be resolved specifically with respect to billing to promote consumer confidence. Further,

a more sophisticated micro-controller and larger display system can be used to provide better consumer experience. By overviewing above all literature survey, we propose 'Iot Based smart Self Billing Shopping Trolley' to overcome all the above drawbacks.

REFERENCES

[1] Dr.Suryaprasad J, Praveen Kumar B O, Roopa D Arjun A K, A Novel Low-Cost Intelligent Shopping Cart, Proceedings of the 2nd IEEE International Conference on Networked Embedded Systems for Enterprise Applications, NESEA 2011, Perth, Australia, December 8-9, 2011. [2] Swati Zope, Prof. .MarutiLimkar, "RFID based Bill Generation and Payment through Mobile", International Journal of Computer Science and Network (IJCSN), Volume 1, Issue 3, June 2012. [3] G. Roussos and B. College, "Enabling RFID in Retail", Computer, IEEE, vol. 39, no. 3, 2006, pp. 25-30. [4] Cisco Internet Business Solution Group survey document, My Shopping My Survey Findings. http://www.cisco.com/web/about/ac79/docs/retail/Mashop-surveymetricsUNITED STATES.pdf. [5]American Time Use Survey http://www.bls.gov/tus/charts/ [6] http:// www.rfidjournal.com. [7] http://en.wikipedia.org/wiki/zigbee [8]Zeeshan Ali &ReenaSonkusare "RFID based smart shopping and billing" IJARCCE 2013. [9]Ganesh Deshmukh, BhagyashreeBhumkar,TejasviniChangal "Automatic Billing Trolley using RFID and ZigBee with Android Application Rewarding system"IJARCCE 2016. [10]Martin Mayer&NorbertGortz "RFID Acquisition via Compressed Sensing