



Customer Friendly Shopping Cart

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Shop Smartly

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Abstract-- Nowadays world is well developed and making human life easier, thus so far with every passing time we are using technology almost everywhere. A shopping mart is a place where many customers look in on every day. People purchase different items and put them in cart. After total purchase one needs to go to billing counter for payment. At the Point Of Sales (POS) there is a bar code scanner which is a time consuming process and results in long queues at POS. Based on the a research, it shows that the highest element feedback from customers is budget control.[1] This paper intends to overcome the complexity of shopping by making the billing automated while the user is shopping, just as to reduce the queue at the POS and it reduces the man power as well. This virtual cart contains a screen on it which keeps displaying the total amount of the items being shopped. It also allows the user to keep checking on the cart screen if he/she is going over the estimated budget. Developing a virtual cart for the comfort of people while shopping is another step towards the technology and to groom our society.

Keywords— IoT, ZIGBEE, RIFID, camera module, Raspberry Pi, firebase database.

I. INTRODUCTION

Huge amount of evolution in the field of Internet Of Things shortly called as “IoT” has been made for new applications and different domain. In the world of IoT, interactions among physical objects have become a reality.[2]. The concept of IoT is to connect the devices to the internet without the interaction of human in it. It has become very

common for the real world objects to connect to the internet and reduce the man power. Any device or an object that has the switch on/off system in it can use the IoT concepts to make it work more efficient using internet connectivity as the device connected to internet works more efficiently than that of operated by a human. Consumer applications are nowadays working more on IoT by making application to application communication through internet using databases or cloud systems with which the user is more convenient to work on. Accessing and manipulating the database information shared by the IoT devices consumes lesser time and man power than that of the manual way that humans do themselves.

Nowadays, the system which is going on in the supermarkets is very common for years. They may have several POS but they could not make any way to reduce the long queues of customers at the POS which would save their man power and customers’ precious time as well. There must be a proper system to be introduced to resolve this issue as many customers get irritated waiting in long queues after hours of shopping and it consumes so much of their time and energy as well by waiting. While doing survey we found that most of the people prefer to leave the shopping mall instead of waiting in long queues to buy a few products [3] Our major objective was

to reduce the customer's waiting time, by generating an automatic bill[4]

The main purpose of this paper is to illustrate a system that automates the billing process at the supermarkets using virtual cart which meets the concepts of IoT. This IoT based Virtual Cart presented here is easy to use and does not require the special training to customers.[5] The virtual cart has a smart system fixed on it operated via a touch screen. A user will be able to scan products using barcodes through our system which will fetch data in real-time and display on the user's screen. At the same time, the change is reflected on the POS where POS cashier can see the product being added. All the items in the cart are being stored in the cloud and in real-time, hence the cart is called a Virtual Cart. The Virtual Cart comes with all the traditional services including scanning an item to check for price and details [6. By using this mechanism, the tedious work of scanning and billing every single product at the cash counter will also be avoided [7]

The module we were going to implement before in the system was RFID module which would scan the products and display their information on the virtual cart screen but as we did more research on this scanning feature, we found out that RFID is not that convenient for the super marts and secondly RFID reads based on RFID tags which means using individual tags on each product which will increase the cost for the super marts so we came to this solution that we would implement a camera module with Raspberry Pi which will act as a barcode scanner to scan the products' barcode. Secondly, we were going to use ZIGBEE module for data transfer from virtual cart system to the web application. ZIGBEE technology is used to transfer small amount of data over short distance i.e. 10 to 30 meters for usual applications and it consumes very less power. It's data transfer speed can go up to max 250kbps which is lower than even the lowest speed that WiFi offers. After comparing ZIGBEE with WiFi, we found that WiFi in our system would work more efficiently and we needed internet also to access the database i.e firebase in real-time and also Raspberry Pi B+ has built in feature for WiFi so we decided to replace the ZIGBEE module with using WiFi which will transfer the information more quickly as compared to ZIGBEE and will access the database and fetch the data on the both the screens

i.e virtual cart screen as well as the web application's POS in real-time.



Figure 1 *“PI with Camera Module”*

II. SYSTEM ARCHITECTURE

This virtual cart system is designed to automate the billing process. In this scheme, the item can be read by the reader and the total of the item is showed on the LCD screen [8]. It will enable the client to monitor the aggregate cost also, when things are added to the shopping cart. The client will be aware of his budget while shopping[9].This virtual cart contains a Raspberry Pi B+ in it, a camera module fixed on it and a touch screen module with which user can interact like scroll down or up to review the items they are buying, select and remove any item they do not want to buy. This smart system on the virtual cart is connected to a Web Application as well which is for the counter side. That Web Application will be displaying all the information that is being displayed on the screen which is placed at the virtual cart so that the bill will be generating automatically on the POS as well with the cart number so that when the customer comes to the counter, their bill has already been made at the POS as well on the Web Application. So, the customers just have to select the product, scan it and put it in the trolley and after they are done with the shopping they just to head over to the counter, and their bill has already been made.

A. Web Application (Software):

The front-end of the website would use Reactjs. React is a javascript library to design and develop user interfaces of a web application. React may sometimes be referred to as a framework as it is used to build single page web applications. We have used create-react-app to start the development of the web application. In this, we have used HTML, CSS and TypeScript

to display the data in a series of tables and to monitor the real-time information of the items being shopped.

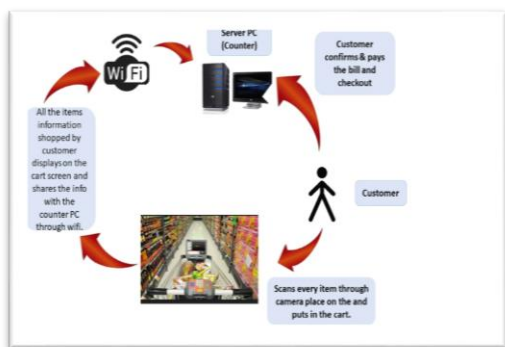


Figure 2 “System Architecture”

- **Html** – Basic Html5 coding is used to create the home page and basic Html coding on the billing table.
- **CSS** – CSS is used to style the different components in the web application
- **Bootstrap** – Bootstrap gives access to design templates for typography, forms, buttons, navigation and other interface components.
- **TypeScript**– It is basically the superset of JavaScript. TypeScript provides optional static type casting in addition to JavaScript. A TypeScript language written program is finally transcompiled to JavaScript.

Database:

The data would also be saved into a Firebase database so that a record of each item is created to be accessed.. The data is sent from the hardware in continuous form and need to be updated instantaneously. Such data bases require real-time access which hence Firebase provides the best approach to handle such amount of data. It is a NoSQL Cloud Database. Firebase allows the data to remain in sync across all the users in real-time and the data is still available when your app is not online. The Firebase Realtime Database exists as a cloud technology which means the data is always online. Data is stored as JSON which allows easy structuring of the data. All the hardware information is thus saved in this database allowing swift performance to record and store the information of each item.

B. Virtual Cart Application:

Since Raspberry Pi natively supports Python,

we used Pyqt-5 for developing the GUI for our application. When our camera detects a barcode, which is running on a different thread, the data is fetched from Firebase of the product and then GUI is updated accordingly.

III. EXPERIMENTS & RESULTS

As we needed to design a system for the virtual cart which could act user friendly because the customer would have to use that system so the customer must not face any difficulties with scanning the product, reviewing the bill being made, selecting and removing the desired items i.e using the application on the screen, so we designed a small box-typed system having Raspberry Pi and a touch screen connected with it which could easily be fixed in front of the cart.



Figure 3 “Cart Screen”

We connected this system with WiFi and then we tried scanning products through the camera module to see how much time it takes to display the product’s information on the screen. Our camera failed to detect the barcode if we pass the product through it quickly, or if we place in front of it from a different angle. This camera we are using is of 5 mega pixels which requires the product to be still for a second or two to detect its barcode.

This application has different features, the customer can review during shopping by scrolling up and down what items have been added to their cart and all the information related to every item, he can remove any item he does not want to buy by selecting and tapping on cross sign, he can increase or decrease the quantity of any item very easily.

A database has been designed which contains all the data about all the products in the

supermarket, the customer scans the product, the system goes into that database, fetches the information of that product and displays it on the virtual cart screen as well as on the web application's POS which is controlled by the staff on the counter. The database contains a products named collection which includes the product's name, id, quantity, price and its expiry date.

The web application first displays a Login screen for the staff of the supermarket to be logged into that system to access the trolleys' behaviour with their trolley id. The web application's POS gets updated every time the customer scans a product, this updation here is real-time updation and the total bill also keeps getting calculated in parallel with the virtual cart screen application.

IV. CONCLUSION

This Virtual Cart incorporates with the latest technologies and methodologies that were learnt while researching for this project. We looked into a common problem that most of the people face while shopping so we thought of inventing something creative using today's world IoT technologies to deal with the common man's issues. This project provides us with an edge of working on a project where research is less comparatively to other projects that we thought of. In future, we would further proceed this project to make it more efficient by using the advanced camera module for the better detection of the barcodes, its version 2 has 8 mega pixels which would detect the barcode more quickly and perfectly.

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