

Smart Shopping Cart

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Abstract—The Smart Shopping cart is a smart system that makes the shopping easier with the use of Internet of Things. It is a centralized system that will track the details of the products such as the product code, Product Name and the Discounts on every product. The Sensors used in Palm sized smart card and each product sections to get details about the discounts as well as used for easier checkouts.

I. INTRODUCTION

In Smart cart system, each product section is consisting of a RFID tags which also has a unique product code for every product section. As the customer brings the smartcart near to the RFID tag of any product section, the product will automatically added into the cart. The smartcart will have a reader through which it will identify. The reader attached with the smart cart used to add the products in the smartcart. Furthermore, each product section consists of a unique product code. Secondly, a mobile application is made to get the product details based of particular product. There are two buttons in the Mobile Application such as Check My cart and Check Product Price. So by entering the cart id and product id the customer get the details about the product added into the cart with total billing price and the discount details, actual price and the discounted price. These all details a customer can view into the Mobile Application. The centralized system need to be updated to view the latest or updated discount offers. The smart cart should be return at the checkout counter. A bill is generated at the checkout counter as per the products added into the cart. It simple saves time by not scanning each product as well as from the long lines.

II. MODEL AND METHOLOGIES

A. Hardware:

Firstly, One smart cart which is Intel Edison Board with Wi-Fi shield powered by Yocto Linux. This smart cart is powered by low power yocto Linux which sends data to web server using TCP protocol. This smart cart connected with RFID reader and it is battery operated. So it provides

portability to easily carry the smart cart. The RFID has frequency of 125 kHz and it can access within the distance of 50 mm. This RFID reader will use to read product tags that contain item number as per each product. When the smart cart near to the tags attached in each product section the product details such as product id will added into the smart cart which is further send to the server using Wi-Fi connection. The server will add those product details in to the database. As a backend server we have used Java Web server and as Database we used MySQL.

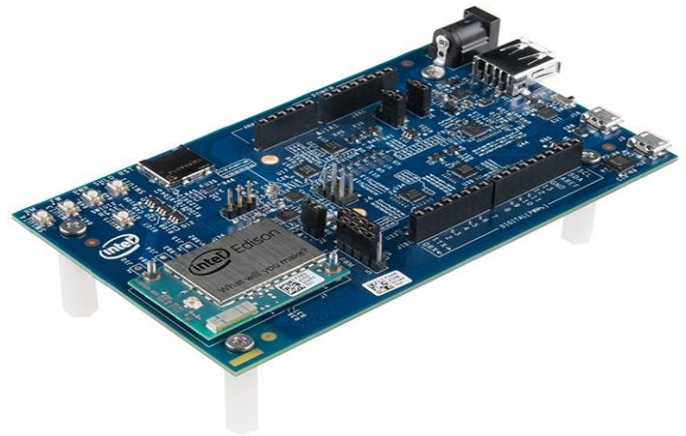


Fig. 1 Intel Edison Board

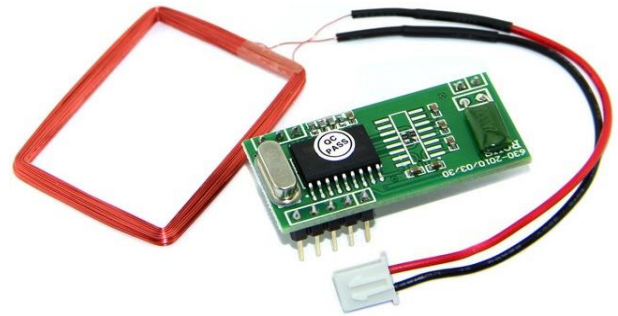


Fig. 2 RFID Reader with 125 kHz frequency

B. Hardware Connections:

A smart cart is connected to battery. A smart cart will transfer 5 volt of power to the RFID reader. The RFID is connected to the Rx and Tx to send and receive the data in smart cart. The tags with 125 kHz frequency are there in which one tag contains the product id which denotes one particular product of particular quantity. For example, There is a product Milk of two types that is the whole Milk and Low Fat Milk whose Prices are different. So that as the prices are different the product id of both are different.

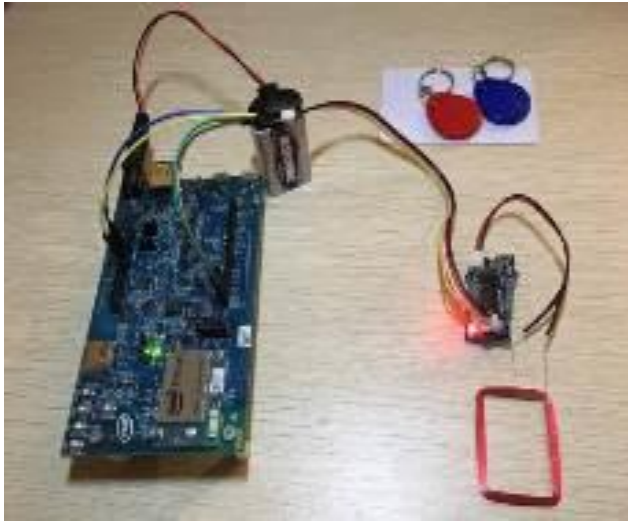


Fig.3 Hardware Connection

C. Software

At software side we have created a database **cartdb** which contains two tables such as Usercart and discount. In Usercart table, it will maintain User Cart information like Cart Id, Product Id, Quantity and Unit Price. The Discount table maintain the Product information like Product Id, Product Name, Price and Discount Percentage.

The Mobile Application was developed in CORONA SDK. On Home Page there are two buttons display. First is 'Check My Cart' button. When the Cart Id is entered, the web service is called which we developed in php to get information like Product Name, Product Quantity and Price (Discounted Price). Based on this, we can calculate total Cart Price and show it to the User. Web Service returns data in JSON Format which is processed in Corona.



Fig. 4 Corona Application Home Screen

Now, as shown in above screenshot, there are two buttons. When a user puts the Smart Cart near the Product RFID tag, the product gets added to the Cart. To check, what products are added into the cart, what quantities are added into the cart and what is the per unit price and total price, all a user needs is Cart Id. By entering card id as shown below, a User can check the Cart details.



Fig. 5 Enter Cart Id to access the Cart

Once, a user submits after entering Cart Id, the Cart details will be shown as below.



Fig. 6 Cart details shown to the user

Similar to Check Cart button, the Second button is 'Check Product Price'. By entering Product ID, another Web Service is called which gives details like Product Id, Product Name, Product Price, Discount Percentage and Discounted Price.



Fig. 7 Entering Product Id to get Product Information

As all discounts are managed by centralized system, discounts are calculated in real time using web service and displayed to the mobile application.

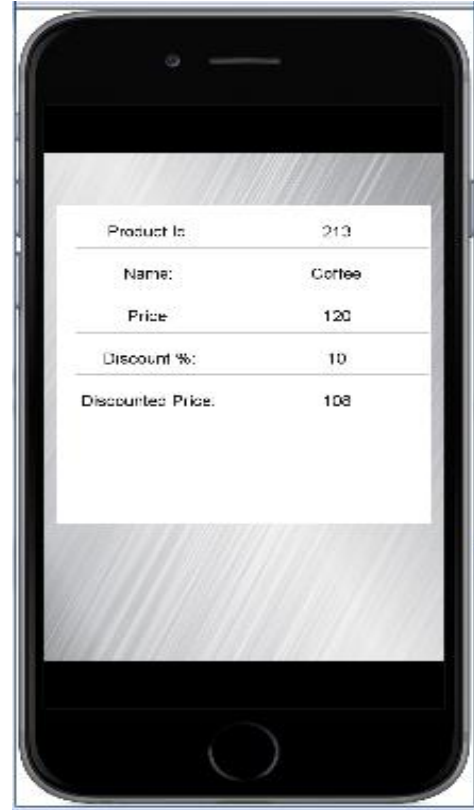


Fig. 8 Product Details shown to the user

D. Web Server and Database

As architecture we have use Java Web Server and PHP web services that communicate with mobile application. This webserver is concurrent in nature so any number of users can be handled by this server. Initially it will check for data of smart cart. When customer brings the smartcart near to the RFID tag attached to particular product section, the product will added into the smartcart and that data of added product will further sended to the webserver by using the Wi-Fi. For communication between smartcart and webserver, we used HTTP protocol to transmit data. HTTP over transmission provides inherited security protocols which can be used to enhance authentication. Current smartcart system uses GET request type to handle data, but it can be changed to POST request type.

```

Attempting to connect to SSID: Bhevy
Connected to wifi.
SSID: Bhevy
IP Address: 172.20.10.5
Signal strength (RSSI): -29 dbm
Item number 194 with price 100 is added to cart.

Starting connection to server...
connected to server
Request->
GET /smartcart?item=194&price=100 HTTP/1.1

disconnecting from server.
client available?>
0
Cart total:
100
-----
Item number 213 with price 120 is added to cart.

Starting connection to server...
connected to server
Request->
GET /smartcart?item=213&price=120 HTTP/1.1

disconnecting from server.
client available?>
0
Cart total:
220
-----
Item number 215 with price 230 is added to cart.

Starting connection to server...
connected to server
Request->
GET /smartcart?item=215&price=230 HTTP/1.1

disconnecting from server.
client available?>
0
Cart total:
450
-----

```

Fig.9 Smartcart code

As server receives data from smart cart, it sends purchased product details to MySQL database.

```

Problems Javadoc Declaration Search Console Debug
WebServer [Java Application] C:\Program Files (x86)\Java\jdk1.8.0_101\bin\javaw.exe (May 8, 2017, 11:32:35 PM)
Webserver starting up on port 80
(press ctrl-c to exit)
Waiting for connection
Connection, sending data.
Connection, sending data.
Connection, sending data.

```

Fig.10 Webserver sending data to Database

Each Smartcart has unique identification number associated with it. As MySQL is relational database, it can easily define relationships between multiple tables. Along with Usercart details, discount details also stored in database. When any discount is available, any authenticated person can change

discounts from database directly and product discount will be updated in real time.

SELECT * FROM 'usercart'				SELECT * FROM 'discount'	
Show all Number of rows: 25				Show all Number	
+ Options				+ Options	
cartid	itemnumber	price	quantity	itemnumber	discount
12345	194	100	9	215	50
12345	215	230	3	213	10
12345	213	120	6		

Fig. 11 Usercart and Discount tables in Database

III. OPEN PROBLEMS

- A proper understanding of this system is needed by user to properly access this Smart Shopping Cart. If the customer will not understand the system before using it, it may possible that she/he will not access all the featured implemented in the System.
- In a case when a User brings the smartcart near to a RFID tag of any product section but will not put that product in cart. In that case the product will be added into the smartcart even when user doesn't take that product.

In this kind of scenario the added item will display while checkout section if the user pay attention otherwise user will pay for the item that he actually did not buy.

IV. CONCLUSION

The Smart Shopping Cart is the smart system which makes the shopping faster and gets rid of the long checkout lines. The main purpose of this system is to make shopping faster by using Internet of Things. In this system the customer will have a palm sized smartcart which contains reader. Secondly, each product section will contains the RFID tag .So when the customer brings the smartcart near to the RFID reader the

particular product will added into the cart and like this the customer can add the entire product she/he wants to purchase. Moreover, to increase the quantity of any product customer needs to bring the smartcart near to the RFID tag as per the quantity. While the products are added into cart the price of the products added and the total price will display in Mobile application. Customer can check that by entering the cart id. Moreover, if there is any discount on particular product, customer will check it by entering the product id in the Mobile Application. While customer will reach to the checkout section the smartcart will scanned and the bill is generated as per total products added into the cart and the price. Like this way customers can get rid of the long checkout lines. It will also makes the checkout faster than the current scenario.

V. FUTUTRE WORK

In Future, The size of the Smart Cart will be reduced. Secondly, we can use the barcode stickers in this system with RFID tags and Smartcart. When the barcode sticker of

smartcart will scanned the whole cart will open in the application and user can view the entire product added into the cart. Moreover, when the barcode of the RFID tags will scan the product price and the discount details will display. Lastly, the Add edit, Delete and clear cart buttons will be providing into the Mobile Application. So when the user bring the smartcart near to the RFID tag the product added into the Mobile Application will be deleted .Customer can also edit the quantity in the Application and also clear the whole cart.

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