E-Cart Shopping System

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Abstract - In this project we have done such a shopping system that can be very helpful for the customer and that can also save the time of the customer and make their shopping easy. In this system customer scans the QR Code of the products and add product into the cart. Bill is a generated automatically which saves the time waiting in a queue. As a result customers don't have to hold up in long lines at checkout. This system brings new innovation than existing shopping system. The main purpose of this project is to provide centralized and automated billing system using QR code. Along with the automatic billing some special features incorporated are budget setting and Product recommendation based on the special offers and discount along with product details with an anti – theft mechanism. We use new term that is Market Basket Analysis.

Key Words: **Cart, QR-CODE, Billing System, Security, Market Basket Analysis, Barcode, Smart shopping.**

1. INTRODUCTION

1.1 Overview

"E CART SHOPPING SYSTEM" is the android based application will provide the QR code system which will help to consume shopping time of customer. We are using QR code system .Using this QR code user can get every information about the shop. For purchasing any product, user has to scan QR code of the product and add it into the cart. After adding product into the cart all the information about that product as well as recommended product will be display on the screen. When customer will add another product into the cart he has to scan product's QR code and add it into the cart. Automatically bill will generate on the screen, it will help customer to plan about the shopping. As per the customer requirement he can add or remove the product from the cart .For billing, customer has to go to the counter, and for payment cashier will scan the QR of the customer. After scanning QR code of customer without any efforts bill will display on the cashiers system. With the help of net banking, customer can pay the bill. Hence it will reduce the time of cashier as well as the customer. For future shopping customer doesn't need to register again. He can purchase anything in his future shopping. If any recommended products are available for customer related to their previous shopping will be notified them. The QR code will be attached to each product which, when we will add product into the cart, it will automatically calculate the bill. As a result, billing can be conducted from the shopping cart itself, preventing customers from waiting in a long queue at checkout. Additionally, it will provide the information about product. To validate the feasibility of such a system, in this work we identify the design requirements of a smart shopping system, build a prototype system to test functionality, and design a secure communication protocol to make the system practical. Customer will be notified all the time when he will be at home. Recommended products and information about previous shopping will be indirectly send to the customer's handset.

1.1 Motivation

The real motivation behind the smart shopping cart system project is to make the shopping easy for the customer in the supermarket and can save the time of the customer waiting in the queue as the bill is already made in the customer's screen by individually scanning their product and add into their cart. We always see that in a big Shoppe the customer fond to be hard to find the products they need to ask for the helper or the owner of the Shoppe and also, they need hold up in the line in the billing counter.

Sometimes might be finding products is easy than waiting in the billing queue because it consumes more time of the customer. So now by taking the motivation of this scenario which was regularly done in all the Shoppe we are designing this system which can be benefited for the customer in all the means and also it was benefited for the Shoppe owner also. So, we design a system by this, the customer can know their bill while adding the items in the cart. This system is benefited for the customer as they not exceed their monthly budget and our system can save the time of the customer in the billing counter too. It can make the shopping easy for the customer in the market.

1.3 Objectives

- To develop such a system using which things put into a smart shopping basket can read QR Code using camera and complete posting of items and data show the on the smart truck/cart.
- To implement smart shelves that are additionally arranged with QR Code. All are able to monitor the stocked items and send item status updates to the server. At the point when things wind up sold out, the server can inform workers to restock.
- To generate automatic bill going on the shopping cart thus the customer knows exactly how much amount he he/she has to pay.

- To provide faster service at the checkouts this in the advantage for shop owners is that they will require fewer cashiers, which will result in a huge reduction in their cost.
- To develop a system which allows customer to pre decided budget and only buys the essential commodities actually needed by him, also the system aids.
- To remove the long queues at the billing counter.
- To develop the profitable system for the shopping centers this reduces the number of billing counters and in turn will help in reducing employee costs significantly.

2. METHODOLOGY

2.1 Problem Definition

To develop a smart shopping cart system that assists the customer to locate and select products & inform them on the products details in the shopping arena. Additionally, with each product identified uniquely and support billing and inventory updates. We develop smart shopping system for the customer that assists the customer to locate the shelves where the product.

In addition, we are attaching the QR Code to the shelves by scanning QR Code list of product and quantity of product available in shelves is shown thus to reduce the queue of customers at billing counter by atomicity of smart shopping system.

Also by using the concept of market basket analysis we can solve the problems of the customers to find the items related to that product. The best and most useful example of this market basket analysis is that if a customer purchases bread then he will also purchases the related items that is either butter using these concepts we can make customer to purchase the related products.

By using the GSM technology automatic bill transfer can be done from carts monitor to the bill counter. Also after the payment of bill the customer gets the message on his cellphone for successful payment of bill. Thus, the problem for searching for the product is thus solved and thus allows customers to do shopping or make payment without waiting in the queue.

2.2 Proposed Approach

At present or traditional shopping system in any shopping mall or super market is time consuming and tired. Customer goes to shopping mall and make their shopping. After this customer goes to billing counter and customer have to wait there in queue where the billing is generated by scanning bar code of each and every product then and only then bill is generated at billing counter this process is more time consuming and lengthy. To overcome such drawbacks we design an E-Cart Shopping System.

The methodology of project is consist of four modules Android Application, shopping panel, admin panel, billing counter. If the customer enter into shopping mall and want to shopping for shopping customer should have the QR Code as a login ID. The QR code is generated on Android application for this customer have to register their self by filling registration form on android application. The QR code is generated by using a QR code generator algorithm. The QR code is save on android application which is used for shopping any time. After the login is successful the customer is able to view their previous shopping details.

After the registration process is done the customer have to scan the generated QR code on shopping cart. Then and only then the login process on cart is done for this we mounted a monitor on cart and a camera for scanning purpose. After the login process customer search for the products that they want to buy and select it, customer scan the QR code of selected product the scan product automatically get added to billing, the details are shown on cart monitor along with price. We create the price along with its GST (Goods Service Tax). We implemented the new concept which is Market Basket analysis. It is nothing but a recommendation of product. For this we created a category of product according to category the product get recommended. Suppose customer buy a product which is belong to category of oil, then he can get all product list which is belong to oil category. Apart from this customer can set up their budget as price is display on screen he/she can add or deduct any product. If customer is not familiar with any product he/she get details about product on clicking product detail button. The total no of product available on mart is shown on cart monitor.

After finishing the shopping customer goes to billing counter where he/she just want to scan there QR code and the generated bill on shopping cart get transfer to billing counter via gateways. After clicking on bill generation the bill is generated and the one SMS (short Message Service) is send to customer mobile number. Which he/she mention on registration form. . In such way digital bill is transfer there is no need of paper work there.

Admin panel, admin mentions the total stock details, customer details, product details. Admin added the product generate the QR code for that product as well as for category's. The total data is stored in data base of shopping mall or shopping mart.
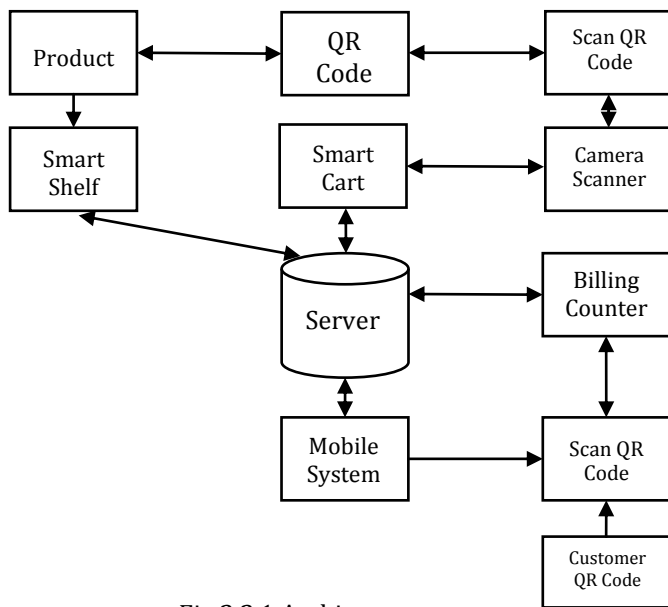
Fig 2.2.1 Architecture

Algorithm:

QR Code Generation Algorithm

1. The process (and high-level algorithm) for generating a QR Code symbol is as follows:
2. Choose the text or binary data to encode.
3. Choose one of the 4 error correction levels. A higher ECC level will yield a barcode that tolerates more damaged parts while preserving the payload data, but will tend to increase the version number.
4. Encode the text into a sequence of zero or more segments. A segment in byte mode can encode any data, but using alphanumeric or numeric mode is more compact if the text falls into these subsets.
5. Based on the segments to be encoded and the ECL, choose a suitable QR Code version to contain the data, preferably the smallest one.
6. Concatenate the segments and add a terminator. The result is a sequence of bits.
7. Add padding bits and bytes to fill the remaining data space.
8. Reinterpret the bit stream as a sequence of bytes, then divide it into blocks. Compute and append error correction bytes to each block. Interleave bytes from each block to form the final sequence of 8-bit code words to be drawn.
9. Initialize a blank square grid based on the version number.
10. Draw the function patterns (finders, alignment, timing, version info, etc.) onto the appropriate modules. This is formatting overhead to support the QR Code standard, and does not encode any user data.
11. Draw the sequence of (data + error correction) code words onto the QR Code symbol, starting from the bottom right. Two columns at a time are used, and the scanning process zigzags going upward and

downward. Any module that was drawn for a function pattern is skipped over in this step.
12. Either manually or automatically choose a mask pattern to apply to the data modules. If masking automatically, then all 8 possibilities are tested and the one with the lowest penalty score is accepted. Note that the format information is redrawn to reflect the mask chosen.
13. We are now finished the algorithmic parts of QR Code generation. The remaining work is to render the newly generated barcode symbol as a picture on screen.

K-Mean Algorithm

The *k*-means algorithm (MacQueen, 1967; Anderberg, 1973), one of the mostly used clustering algorithms, is classified as a *partitional* or *nonhierarchical* clustering method (Jain and Dubes, 1988). Given a set of numeric objects X and an integer number k ($\leq n$), the *k*-means algorithm searches for a partition of X into k clusters that minimizes the within groups sum of squared errors (WGSS). This process is often formulated as the following mathematical program problem P (Selim and Ismail, 1984; Bobrowski and Bezdek, 1991):

Fig 2.2.2 QR Code

$$\text{Minimise} \quad P(W,Q) = \sum_{l=1}^{k}\sum_{i=1}^{n} w_{i,l}\, d(X_i, Q_l) \quad (1)$$

$$\text{subject to} \quad \sum_{l=1}^{k} w_{i,l} = 1, \quad 1 \leq i \leq n$$

$$w_{i,l} \in \{0,1\}, \quad 1 \leq i \leq n, 1 \leq l \leq k \quad (2)$$

where W is an $n \times k$ partition matrix, $Q = \{Q_1, Q_2,..., Q_k\}$ is a set of objects in the same object domain, and $d(\cdot,\cdot)$ is the squared Euclidean distance between two objects.

Problem P can be generalized to allow $(w_{i,l})^{\alpha}$ where $w_{i,l} \in [0,1], \alpha \geq 1$ (Bobrowski and Bezdek, 1991). The generalized form is referred to as fuzzy clustering (Ruspini, 1969, 1973), which is not considered in this paper.

Problem P can be solved by iteratively solving the following two problems:

Problem P_1: Fix $Q = \hat{Q}$ and solve the reduced problem $P(W, \hat{Q})$.

Problem P_2: Fix $W = \hat{W}$ and solve the reduced problem $P(W, Q)$.

Problem P_1 is solved by

$w_{i,l} = 1$ if $d(X_i, Q_l) \le d(X_i, Q_t)$, for $1 \le t \le k$

3. $w_{i,t} = 0$ for $t \ne l$ and problem P_2 is solved by

$$= \frac{\sum_{i=1}^{n} w_{i,l}\, x_{i,j}}{\sum_{i=1}^{n} w_{i,l}} \quad q_{l,j}(4)$$

for $1 \le l \le k$, and $1 \le j \le m$.

The basic algorithm to solve problem P is given as follows (Selim and Ismail, 1984; Bobrowski and Bezdek, 1991):

Choose an initial Q^0 and solve $P(W, Q^0)$ to obtain W^0. Set $t = 0$. Let $\hat{W} = W^t$ and solve $P(\hat{W}, Q)$ to obtain Q^{t+1}. If $P(\hat{W}, Q^t) = P(\hat{W}, Q^{t+1})$, output $\hat{W}, Q^t$ and stop; otherwise, go to 3.

Let $\hat{Q} = Q^{t+1}$ and solve $P(W, \hat{Q})$ to obtain W^{t+1}. If $P(W^t, \hat{Q}) = P(W^{t+1}, \hat{Q})$, output W^t, Q and stop; otherwise, let $t = t + 1$ and go to 2.

Because $P(\cdot, \cdot)$ is non-convex and the sequence $P(\cdot, \cdot)$ generated by the algorithm is strictly decreasing, after a finite number of iterations the algorithm converges to a local minimum point (SelimandIsmail,1984). The computational cost of the algorithms $O(Tkn)$ where T is the number of iterations and n the number of objects in the input data set. The k-means algorithm has the following important properties:

It is efficient in processing large data sets.

It often terminates at a local optimum (MacQueen, 1967; Selim and Ismail, 1984).
It works only on numeric values.
The clusters have convex shapes (Anderberg, 1973).

3. IMPLEMENTATION DETAILS

3.1 Software Requirement

- Backend Database: XAMPP server 7.1.32
- Android Application: Android Studio 3.5
- Cart Framework: .Net framework 4.5.2
- Other: PHP v 7.1, MYSQL

3.2 Hardware Requirement

- Android mobile phone v 8.1.0

- Intel core processor v i3
- Webcam
- Shopping Cart
- Laptop as monitor

4. RESULT AND DISCUSSION

In figure 4.1, Android Application is shown which shows the user homepage, previous shopping, QR & Shopping Bill and Logout.

Figure 4.1: Android Application

Figure 4.2 shows the products, stocks and availability let us know the quantity.

Figure 4.2: Cart Application

In figure 4.3, Shopping Panel is shown. This panels gives us product name it's price and the quantity after we scan the product code after which we can add or delete it from cart.

Figure 4.3: Shopping Panel

In Figure 4.4, this is customer's panel where they scan the code and product with their quantity and price is shown along with the total price and the bill is generated.

Figure 4.4: Bill System

In figure 4.5, a text message is generated and send to the user as soon as the QR of user is scanned at the counter along with the total and payment type.
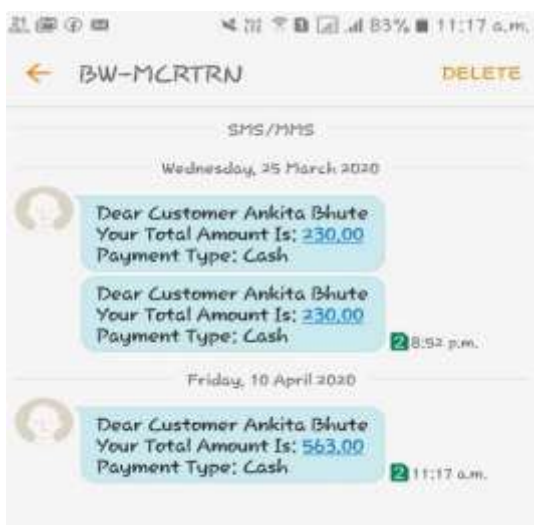

Figure 4.5: Generated Bill

5. CONCLUSIONS

In this undertaking to grow such a framework utilizing which things put into a shopping crate can peruse QR Code utilizing camera and complete posting of things and information demonstrate the on the keen cart.. All can screen the loaded things and send thing notices to the server. Right when things end up sold out, the server can educate laborers to restock. Smart cart produces programmed bill going on the shopping basket in this way the client knows precisely how much sum needs to pay. It gives quicker administration at the checkouts this in the favorable position for shop proprietors is that they will require less clerks, which will result in a colossal decrease in their expense. E cart shopping framework which enables client to pre decided spending plan and just purchases the fundamental wares really required by him, additionally the framework helps. It focuses on a smart shopping system based on gateway Technology which thus helps in automatically generating bill to bill counter. In such a system, all items for sale consists of QR Code so that they can likewise be utilized to scan the particular product on shelves. For example, a smart shelves.

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