SMART SHOPPING CART USING RFID TECHNOLOGY

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***Abstract*—**The time we spend in the shopping mall increases if we have to wait in the queue for a long time at billing counters and we don't know details about the product we buy.The proposed system will give the customer a quick shopping experience by providing the product details on the customer's smartphone using machine learning algorithms, and will display total bill amount on the display screen attached to the cart using RFID technology. RFID is used to identify each product details not only by its type but also knowing its location.This will make sure to the customer whether their shopping is under budget or not.

Keywords **—**RFID tags, Frequent Item Set Mining, Machine – Machine communication, RFID Technology.

I. INTRODUCTION

Now a days, the immense use of embedded systems, inexpensive sensors, and wireless sensor network has boost the growth of Industrial Internet of Things (IIoT).It implies to the integration of intricate devices and objects with high-end applications or software and networked devices and sensors.The IIoT empowers businesses to analyze value or data after collecting and aggregating them from sensors embedded to devices.It maximizes efficiency of the machine and throughput entire operation.

Applications of IIoT include predictive maintenance, smart grid, motion control, big data analytics, smart medicine, and M2M. M2M communication system allows the machines and devices to exchange data or sensor values with each other separately. Key components in M2M are devices attached to sensors or actuators, RFID technology, wireless network and autonomic computing systems, programmed to service networked devices to interpret data and make decisions.

The way to attract customers and employees in supermarket is to implement M2M system.Daily necessities like groceries,food,products,electrical appliances,clothing, etc are provided by supermarkets or retail system to the people.The problems they face during shopping include not knowing complete information about the product discounts.Existing billing system requires endless progressing.The flexible system for shopping malls that improve customer experience is achieved by combining RFID technology with M2M system.This inexpensive and small sized RFID is in the line to replace the barcode system.RFID technology is used to provide solution for waiting in the queue for a long time and saves the time of customer and cashier.

II.LITERATURE SURVEY

A. MACHINE TO MACHINE TRANSMISSION

The most promising technology for future generation is M2M communication system.This provides a universal communications system with full computerized machines. These machines and devices are largely connected to each other using wired or wireless links, without the direct involvement of human.

B. ASSOCIATION RULE MINING (ARM)

ARM algorithms are composed of following characteristics: (a) Design Approach such as, bottom-up approach, top-down and hybrid approaches, (b) Candidate Generation, (c) Layout: Two types of layouts are mainly used in Frequent Itemset Mining: Horizontal and Vertical, (d) Interestingness Measure: There are two Interestingness measures: Descriptive measure and Probabilistic measure, (e) Database: In Database, data are classified into certain and uncertain. The certain database includes data in the form of transactional, unstructured and semi-structured. The uncertain database includes data like GPS, Sensor values, Weather etc. (f) Frequent Itemsets.

C. ENCOURAGING SALES BASED ON CUSTOMER BEHAVIOR

By sensing values from the shopping cart and taking appropriate decisions by the server, this application comprises the data collection.This system arouses customer's purchasing desire by helping the customer to select the products.To provide the better customer experience two ordinary actions or behaviors of a customer regarding the handling of the cart is observed.Holding the handle of the cart, and motion of the cart.These two actions are combinely observed and used by the author to provide nine possible cases to analyze the customer behavior.Also, depending on the number of times he visits the same shelf it decides whether the customer requires any assistance or not. In addition, to save energy of the cart's battery, the cart's system is put into standby mode, depending on the time the cart is idle or in use.

D.FREQUENT ITEMSET MINING

Several techniques have proposed to generate redundant itemsets to mine association rules efficiently. The methodologies of generating redundantitemsets are divided into two procedures

1) Apriori algorithm.
2) Projected database: For eg. FP- Growth algorithm.

1.APRIORI

This algorithm follows breadth-first search procedure where the traversing of the tree is processed one level in a single pass. Apriori works with a two-pass approach for identifying frequent itemsets. This approach is used for all levels. In the first scan, a list containing candidate itemsets is generated and supersets of infrequent remaining itemsets are pruned at each level. In the second scan, the support values are calculated for the itemsets that are pruned from first scan and further those itemsets having a support below the threshold defined by the user are pruned. There are ways to calculate support for all the itemsetsare,for each itemset, count the total number of transactions present in the database or as an alternative by traversing all the transactions,or by counting the itemsets belonging to each transaction.

2. FP GROWTH

Frequent pattern growth (FP-Growth) is implemented by using a tree to store in the form of actual baskets, instead of storing candidates like Apriori stores. The FP-Growth's tree structure provides a vertical view of the itemset. To connect all similar nodes, the header table holds a linked-list through the tree. The header table provides FP-Growth a horizontal view of the data, along with the vertical view provided by the tree.

Apriori is an easily comprehensible frequent itemset mining algorithm. Hence, Apriori is a well-known beginning stage for studying about frequent itemset mining. Though, compared to FP-Growth algorithms, Apriori has serious scalability issues and exhausts existing memory more rapidly. To avoid this situation, for large datasets Apriori algorithm should not be used. Those applications having large database should use FP-

Growth algorithm to find frequent itemsets. The FP-Growth algorithm is more complex for implementation. However, it gives considerably better performance.

E. ANALOGY OF BARCODE

QR-code and RFID System Automatic identification and data collection (AIDC), refers to numerous technologies that help to reduce labor and time and eliminate human errors by replacing manual techniques of data collection and data entry. Barcode and similar technologies such as QR code, and RFID technologies are one of the several AIDC technologies. Barcode refers to an optical machine-readable parallel lined representation used to represent data about the product attached to it. Unlike barcode system, RFID Technology uses radio frequency, also called electromagnetic waves to transfer information from an RFID tag attached to a product or device to the RFID reader.

Quick Response (QR) codes display a small bit of information very conveniently, that is simply scanned and processed usually by smartphones. This allows physical objects to become less interactive, by providing information that is easily scanned like a website URL or any advertising material.The author has compared the all three technologies using various factors. Compared to other similar technologies, RFID technology is being proved to be a fostering technology.

F. ELECTRIC BILLING SYSTEM

The purpose is to facilitate an electric billing system which is implemented using two technologies namely, RFID and ZigBee technology. This system avoids the waiting time in queue for billing at billing counters of supermarkets. To avoid the stealing of products,these supermarkets are installed with anti-theft bars at exit gates.

III. PROPOSED SYSTEM AND STYLES

The proposed system aims to provide an automatic billing system attached to the shopping cart and gives a sales promotion on the customer's smartphone. This system is implemented using machine learning algorithms and RFID technology. RFID technology is used to implement the automatic billing system, whereas frequent itemset generation algorithm is used for sales promotion.

A.SCHEME OF THE PROPOSED MODEL

Transmission of data between microcontroller and master computer is done by using a wireless router.The customer will scan the required item and will add to cart. Recent scanned item's amount is deducted from the total amount if the customer presses remove button on the cart. A bill will be generated by a master computer for the respective cart if the customer presses the checkout button. The cart's total amount will become zero if customer presses reset button. As per the bill generated by a master computer the customer has to pay bills at the checkout counter. Customers will use smartphones to view the sales promotion, sent by the master computer.

B.PERFORMANCE OF SYSTEM

The proposed system is divided into two main modules: Sales Promotion on the smartphone of the customer, and Automatic Billing System. It involves instant display of offers,and recommended products based on products already dropped into the cart.

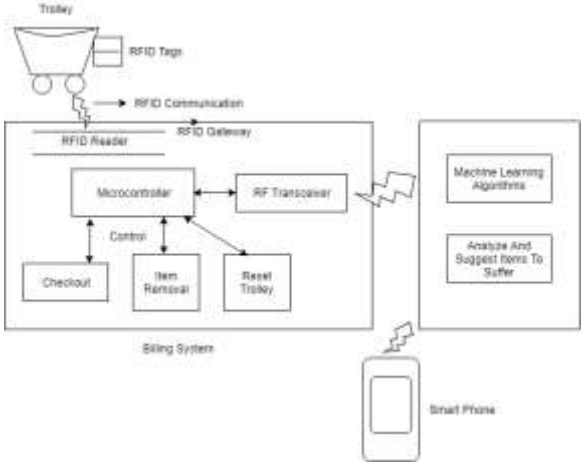

Fig 1: System implementation

Each cart is provided with a unique QR code sticker. The customer has to connect his/her smartphone to mall's Wi-Fi access point. The customer scans the QR code, a URL with the unique cart code is displayed on the smartphone.Customer opens the provided link using any browser. He/she will be able to see offers, top selling products, and recommended products on his/her smartphone.The server shouldrun Association Rule Mining algorithm i.e. Frequent Itemset Algorithm, on the master

computer using a database of billed items per transaction, to generate frequent itemsets and rules.Find the missing products in the cart using those generated frequent itemsets and rules.Recommend those missing products to the customer on the connected smartphone.

Automatic Billing system shows an instant display of updated bill on the display screen of the cart as soon as customer scans the product to add to the cart or remove from the cart. RFID tags and reader will be used to implement this module. Every product in the mall will have an RFID tag on it. Each Cart will contain a SISC system attached to it. If the product is added to the cart or removed from the cart, it must update the bill on the LCD screen. There will be a centralized server system called master computer to process the bill. After the payment of money, the cart gets reset.

IV. CONCLUSION

According to the previous work of the Smart Cart system, product navigation, sales promotion depending on customer behavior, Automatic billing system, has been added as a feature of the smart cart. By association rule mining algorithms sales promotion by recommending products in online shopping websites is normally achieved. This will be the first smart cart offline retail system, that will recommend products to customers based on the products dropped in the cart by customers. In this system, the combination of frequent itemset generation algorithm and automatic billing system using RFID technology will give the customers ease of automatic billing and sales promotion based on their product purchase. For implementing this system in real time, barcode system needs to be replaced by RFID system.

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