IoT powered Intelligent Retail

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Abstract- **Internet of things is one of the main raising megatrends in technology. These smart devices give a ground to application in many areas. IoT connected devices can enhance user experience by taking deep insights to customer preferences and path they purchase. By real time data analysis and designing store layout accordingly, effective merchandising can be done. At the same time, it can elevate store management and improve operational efficiency. This paper proposes a retail shop scheme based on Internet of Things (IoT), and using computer vision and Artificial Intelligence algorithms, aiming to evolve retail stores into smart stores having digital infrastructure. This can enable retailers to predict customers behavior and provide them services they want.**

Keywords- Internet of Things (IoT), retail, digital infrastructure, management, marketing, computer vision, Artificial Intelligence (AI)

I. INTRODUCTION

Internet of Things (IoT) describes the network of physical objects that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. It is concept which has influenced many aspects of human life.

There has never been a more exciting time to be at the intersection of retail and technology. IoT powered intelligent retail provides a sophisticated digital infrastructure for retail stores. IoT connected devices such as video cameras, beacons, smart shelves provide access to huge amount of data on customer activity and present more opportunities for sophisticated customer data insights and immersive customer engagement. IoT devices can be used to measure effectiveness of store layout, can track path customer purchases the products and deep insights to customer preferences.

This data can be used to elevate customer engagement, measure success, identify customer desire and deliver them content they want. Retailers can exceed customer expectations, build loyalty and can measure operational efficiency.

This paper proposes a scheme in which customer has to just install a mobile phone application, which is linked with IoT. While entering in the shop, customer has to just scan the code on the app and start shopping. Smart carts can detect which thigs are taken and calculate total amount of the things in the cart. While exiting there are no checkouts. Stock administration can be done using RFID.

II. DEVICES AND TECHNIQUES

A. Microcontrollers

A microcontroller is a small and low cost micro-computer, which is designed to perform specific tasks like displaying microwaves information, receiving remote signals, etc. Although they are slower than microprocessors but they consume less power. It interprets data it receives from I/O peripherals using central processor.

B. Beacons

Beacon is small, wireless transmitters that send signals to the smart devices nearby. They connect and transmit information making location-based searching and interaction easier and more accurate

C. RFID

Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. The labels contain electromagnetically put away data. RFID is a technique for automatic identification and data capture (AIDC).

D. Video Cameras

It can observe, analyze and act on provided information. It can be used for smart video surveillance which uses internet for various purposes like recording activity of the person, counting number of persons present in premises, etc.

E. Digital Signage

Digital signage is a centrally controlled, content distribution platform by which to playback digital content to one or many displays. It provides a way to entertain, educate, communicate with customers.

III. METHODS

A. Smart Cart

It is a shopping cart having RFID reader, LCD screen attached to it. It eliminated the need of long waiting queues in the shopping malls for billing. This cart automatically counts number of objects inside it, identifies items and shows total amount at screen. Customer can also attach shopping list on the screen.

a. LCD screen

It is attached to the cart to show number of products inside and the sum of all prices of things inside the cart.

b. RFID reader

RFID pursuer is used as optical standardized tag. We utilize RFID pursuer to examine every item while putting in cart. RFID pursuer stores more data of item as manufacturing data of product, expiring date, total cost, etc.
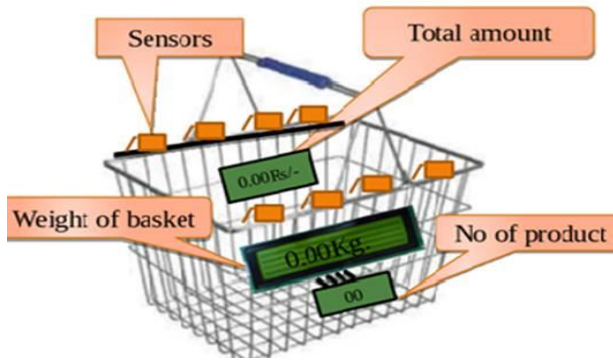

Fig.1. Smart Basket

B. Smart Shelves

- Inventory management has been time consuming tasks for employees. Smart shelves help them track inventory and inform whenever running low or item is placed in another shelf incorrectly.

- Smart shelves depend on 3 key elements: RFID tags, RFID readers and antennas.

- RFID tags can be found on product which transmit data to a RFID reader.

- Information collected is sent to IoT devices. Later, data is stored and analyzed.
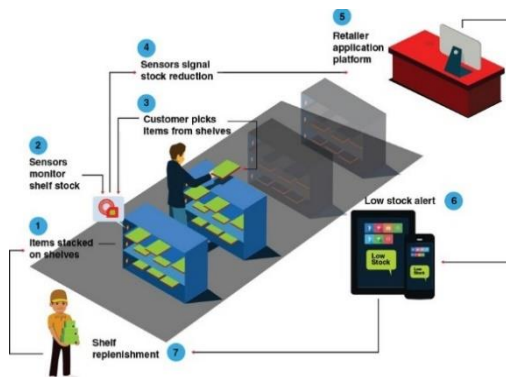

Fig.2 smart shelves

C. Automated Checkouts

Spending hours at store checkouts always been a pain point. By automated checkouts, the total amount will be automatically deducted from customer's account, from which he has logged in.

Fig.3. Automated checkouts

- It would make customers happy and will them to visit again.

D. Store layout optimization

Store layout can be optimized for retailer. By tracking paths customer purchase and by making deep insights to customer preferences, effective layout can be made.

By keeping least popular products in front of popular products, using digital signages gives exposure to promotions. By analyzing we can track product interaction and increase the sale of products.

E. Beacons

By using beacons customers can be informed about discounts, attractive offers, special events, etc. Retailers can put it anywhere in the store.

IV. DESIGN

A. Architecture of System

Logical architecture of proposed system is as follows:

- It is designed for 4 layers: front-end layer, background layer, the server and service layer and the database layer.

- The front end is composed of cameras, IoT devices, which directly interact with customer. These instruments are interconnected with servers through IoT control unit.

- The background program is a shopping management platform. It implements VIP management, order management, SKU management and payment service.

- The server and service layer consist of algorithm servo middleware, which implementation connection between the background program layer and algorithms and Apache server which undertakes basic HTTP service.

- The database layer is composed of MySQL and file storage services.

B. Digital Infrastructure

Fig.4. model of system

- Customer needs to just register on the app and scan the QR code on the entrance.

- Smart carts are provided on entrance. Shopping list can be attached to cart and will be displayed on screen of the cart.

- If customer picks an item from the shelv and put in the cart, the product details and price will be displayed on screen.

- If stalk is low , it will be conveyed to retail managers , and refilled.

- Value added services , marketting can be done using real time data analysis.

- At check outs, total amount of items in the cart will be deducted from customer account.

V. BENEFITS FOR RETAILING

General customers insights provide access to huge amount of new data on customer activity and present more opportunities for sophisticated customer insights and immersive customer engagement.

Fig.5. IoT driving retail

A. Marketing

- Elevate customer engagement
  - Digital assistance allows customer to find items on their list, interest them in new products.
- Identify customer preferences
  - By doing data analysis, identify the preferences of the customers and accordingly do selected promotions and also save money.
- Deliver curated content
  - Identify customer desire
- Measure campaign success
  - Arrange campaigns for marketing products and based on the data, measure the success

B. Merchandising

- Design store layout
  - IoT data is used to hack effectiveness of store layout and exposure to promotion
- Track product interaction
  - Find the products to which customer interacts and make offer schemes so that customer engagement will increase.
- Real Time data analysis
  - The data is analyzed in real time to create immersive experience and take deep insights to customer preferences and path they purchase.

C. Operations

- Plot service level matrix
- Operational efficiency
  - Schedule staff efficiency through cognitive intelligence.
- Build customer loyalty
  - Check that customer expectations are met at every service point
- Exceed customer expectations
  - From data analysis, find what customers really want and offer them what they want.

VI. CONCLUSION

This paper is expected to present the use of the Internet of Things in the Intelligent Interactive retail market framework administration and clients shopping. The IoT is right solution to handle the tremendous shift in customer behavior. Today's customers don't want to passively spend their money. They want information, personalization, socialization and more.

In light of our estimation, execution of this venture will bring about extraordinary sum measure of income for both clients and entrepreneurs. Retailers will be able to offer customers what they want through a digital and personalized experience. It will save a lot of time of customers and also

retailers will be benefited by maximizing profit. Programmed office will keep away from line in registration procedure so that better shopping experience can be made. It's clear that IoT has power to improve customer experience as well as increase brand loyalty.

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