

RFID AND IOT BASED INVENTORY CONTROL IN SUPERMARKETS WITH THEFT DETECTION: A SurveyJ.Arumugam ¹, S.Vijaya Kumar ², N.Venkat Sai Rohith ³, S.Ragupathy ⁴, Dr. N. Danapaquame⁵Assistant Professor¹, B.Tech Student ^{2,3,4}, Assoc. Professor⁵

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Abstract—Shopping at big supermarkets is becoming daily activity in metro cities. After completion of purchases, one needs to go to the billing counter for payments. The cashier prepares the bill using bar code reader, which is a time consuming process and results in a long queue. To overcome this, the proposed system is developed using RFID technology in supermarkets. This describes how to build an automated and time saving system for the world of retail, which will make shopping experience customer friendly and secure. The theft detection is also done at the time when consumer comes for billing. Hence, a IOT and RFID based supermarket billing system with theft control is proposed.

Keywords— Internet of Things (IoT), Radio Frequency Identification (RFID), Global System for Mobile communications (GSM).

1. Introduction

IoT is simply the network of interconnected things/devices which are embedded with sensors, software, network connectivity and necessary electronics that enables them to collect and exchange data making them responsive. Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags have a local power source such as a battery and may operate at hundreds of meters from the RFID reader.

1.1 Architecture

The system consists of mainly two sections namely smart web interface based product tracking and RFID based theft control. In smart web interface based product tracking section, all the product tracking related work is done. There are several functions performed here namely user item query, admin entry, admin log for data mining, etc., The RFID Inventory Control system is equipped with a RFID reader that is capable of effectively detecting and capturing response signals transmitted from the RFID tags attached on each item that passes through the scanning zone. The RFID tag informs the RFID reader which item is being purchased by the customer. Information is transmitted from the reader to the computer by sensing the tag, reading it and information

read is sent to the software. The number from the tag is interpreted by the software and matches it with the numbers of the type of commodities or products they represent. The software is a computer based system for tracking sales, product level, orders, bill of material and deliveries. This helps the store owner to keep track of sales and inventory keeping the store updated of which items are selling. After collecting the products, customer arrives at billing section. Before performing the billing action, customer will go through door. There is RFID reader placed at door. If tag is detected at door, that particular customer will be defined as thief. Theft detection will be indicated by beep as well as message will be displayed at billing computer. If tag is not detected at door, then that customer goes through billing process. If theft is detected, it checks the product database to see which product is stole by the person and it also processes a theft complaint which contacts the security database gateway. This gateway in turn alerts the security control room by sending a message via GSM module. Section[1] describes the Internet of Things, RFID and the supermarket billing system with theft control. Section[2] deals with the related works. Section[3] deals with the research directions and the proposed system. Section[4] deals with the discussions and the Section[5] contains the conclusion.

2. Related Works

You-Chiun Wang, Chang-Chen Yang proposed that nowadays, shopping has played a key role in our economic activity. It deserves investigation how to provide smart shopping by promptly interacting with customers in supermarkets. The paper proposes a sensor-based smart shopping cart (3S-cart) system by using the context-aware ability of sensors to detect the behavior of customers, and respond to them in real time.

A prototype of 3S-cart is implemented by encapsulating modularized sensors in a box to be put on shopping carts. Thus, 3S-cart is lightweight and easy to deploy. We also demonstrate two supermarket applications by 3S-cart. In the sales-promotion application, each cart checks if its customer has interest in some products and shows sales information at once to increase the purchasing desire. In the product navigation application, a customer asks the system to find an unhindered, shortest path to comfortably obtain the desired product. The paper contributes in exploiting the sensor technology to provide interactive shopping in supermarkets, and addressing the prototyping experience and potential applications of the proposed 3S-cart system. Amine Karmouche, Yassine Salih-Alj and Jawad Abrache proposed the emergence of new wireless technologies opened new opportunities to develop more efficient information systems. RFID is among those technologies, which extended the potential of wireless identification, and represent a potential replacement to old-fashioned identification systems such as the barcode system in retail sales. This paper presents a new RFID-based cost efficient approach for pervasive retail sales. The suggested new system architecture is based on aisle-level scanning and new event management procedures at the level of RFID middleware. It also discusses the impact of deploying such systems in retail stores, and more specifically supermarkets, on the supply chain. The motivation behind such approach is not only reducing the number of RFID readers compared to existing RFID based systems, but providing customers with an interactive shopping experience and fast checkout and bill payment, making this new approach transparent, efficient and cost effective.

3. Research Directions

RFID reader is limited by its frequency. If the frequency of RFID reader is increased the range for detection of tag is increased. And multiple scanning of products is possible. In today's era the products manufactured by the companies are packed and dispatched to dealers. For this purpose, the human resource is involved to mark and identify the products along with its quantity. This is a time consuming process. There is a possibility of miscount of products by the workers. To prevent these problems, a tag can be attached to product while manufacturing itself. This will help to segregate products easily at various stages of dealing. The correct count can be determined and the man power required for it also can be reduced. RFID reading range will be improve, hence distance will also increase. This will help for housekeeping the entire mall more efficiently. It is also possible to pass the collected objects by the customer at the billing section using conveyor belt thus providing automation. Thus, using RFID reader with high frequency and attaching tags to products during manufacturing is beneficial in future. Professional thieves can bypass this system using foil-lined shopping bags, RFID tags are a good option to discourage the majority of shoplifters.

4. Discussions

This project uses more enhanced approach of "RFID based automatic billing system", RFID provides capability to uniquely identify an object within a supermarket area, while agents are able to establish a channel of communication which can be used to facilitate communications between a RFID device and supermarket back-end system. The designed smart cart uses RFID technology for shopping and billing, thus it is customer friendly. And now with this automated system retailers will recognize the value of tagging

individual pieces of merchandise that will overcome the problem of the product being in the Line of Sight (LOS) of the reader.

5. Conclusion

In previous days, maintaining records along with the details of items, cash memos, billing action was done manually for inventory control operation in a shop or mall. With advancement in technology it was replaced by barcode and RFID tags. It was seen that the barcode were getting damaged so scanning of it was not possible. The basic drawback of barcode was line of sight reading was essential. To overcome this, the current system is developed using RFID technology in malls. RFID is a versatile technology, capable of being used by business. It facilitates inventory control along with accurate billing operation. Along with the operational time reduction, the man power requirement will be reduced. An additional advantage of the system is theft detection. It is possible to detect and indicate the theft in malls only with the usage of RFID. Simultaneous data updation regarding the items will be done at the store when billing of the products will be done. So the cost involved in the management of all supply chains can be drastically reduced. Only initial cost for manufacturing the packaging material with RFID tags, reader, communicating media, two PCs will be required. A tag can be attached to product while manufacturing itself. This will help to segregate products easily at various stages of dealing. The correct count can be determined and the man power required for it also can be reduced. RFID reading range will be improve, hence distance will also increase. This will help for housekeeping the entire mall more efficiently. It is also possible to pass the collected objects by the customer at the billing section using conveyor belt thus providing automation. Thus, using RFID reader with high

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References

[1] Luo Zhengshan, Wang Hongchao, "Research on intelligent supermarket architecturebased on The Internet of Things technology", Proceedings of 8th International Conference on Natural Computation (ICNC 2012).

[2] Masaki Kitazawa, Masakazu Takahashi, "Analyzing Supermarket Shopping Paths fromIndirect Observation and Simulation Study", Proceedings of International Conference on Signal-Image Technology & Internet Based Systems (2013).

[3] Y. C. Wang, "Mobile sensor networks: system hardware and dispatch software," Published in ACM Computing Surveys, vol. 47, no. 1, pp. 12:1–12:36, 2014.

[4] L. D. Xu, W. He, and S. Li, "Internet of Things in industries: a survey," Published in IEEE Transactions on Industrial Informatics, vol. 10, no. 4, pp. 2233–2243, 2014.

[5] J.Suryaprasad, B.O.P. Kumar, D. Roopa and A.K. Arjun, "A Novel Low-Cost IntelligentShopping Cart", Proceedings of IEEE 2nd International Conference on NetworkedEmbedded Systems for Enterprise Applications, pp.1-4, 2011.