IOT Based Smart Trolly Using RFID

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Abstract: In the contemporary retail landscape, managing large crowds efficiently within shopping malls is a persistent challenge. To address this issue, this paper proposes an innovative solution utilising Arduino microcontrollers to develop a Smart Shopping Cart system integrated with RFID technology. The core of the system revolves around Arduino microcontrollers, which serve as the brains of the smart shopping carts. These Arduino boards are equipped with RFID readers and sensors, allowing them to detect and scan items placed inside the cart in real-time. Each item in the cart is tagged with an RFID tag, which contains unique identification information. As customers navigate through the store, the Arduino-powered smart shopping cart continuously reads the RFID tags of the items placed inside. This data is then transmitted wirelessly to a central processing unit, where it is aggregated and processed to update the virtual cart in real-time. The Arduino microcontroller communicates with the central system using IoT protocols, ensuring seamless integration and data exchange. Upon completion of shopping, customers can review the items in their virtual cart on a built-in display. The final bill is automatically generated, consolidating all scanned items along with their respective prices. To facilitate payment, customers can utilise pre-charged cards provided by the shopping mall, with the Arduino system seamlessly interfacing with the payment gateway for swift and hassle-free transactions. The utilisation of Arduino microcontrollers offers several advantages, including cost effectiveness, versatility, and ease of integration with RFID technology. By leveraging these capabilities, the proposed Smart Shopping Cart system enhances retail efficiency by reducing billing time, minimising queues, and improving overall customer satisfaction. 6 In conclusion, the integration of Arduino-based Smart Shopping Carts with RFID technology represents a promising solution for streamlining retail operations and enhancing the shopping experience. As retailers seek to embrace digital transformation and meet the evolving needs of consumers, the adoption of such innovative technologies is paramount for staying competitive in the modern retail landscape.

l.INTRODUCTION

Project objective: In the present-day shopping system one of the difficulties to follow queue through the billing process which is time consuming. Hence this project aims to reduce the average time spent by the customer at the shopping mall by implementing automatic billing system using Rfid technology. To develop an automatic billing system utilising RFID technology aimed at reducing customer wait times during the shopping process. This project seeks to streamline the billing process by enabling customers to complete transactions directly within their shopping trolleys, minimising the need for queueing at traditional checkout counters. The system will allow customers to swiftly scan items into their trolleys and view the finalised bill before payment, utilising pre recharged customer cards for transactions. Additionally, the system will integrate with the central PC of the shopping mall to ensure seamless data management and tracking.

Project outline: The main aim of the project is to satisfy the customer and to reduce the time spent on the billing process which is to complete the billing process in the trolley rather than waiting in a queue even for one or two products. The customers must add the products after a short scan in trolley and when the shopping is done the finalised amount will be displayed in the trolley. Customer could either pay their bill by their pre-recharged customer card provided by the shop. Finally, the whole information 13 will be sent to central Pc of the shopping mall.

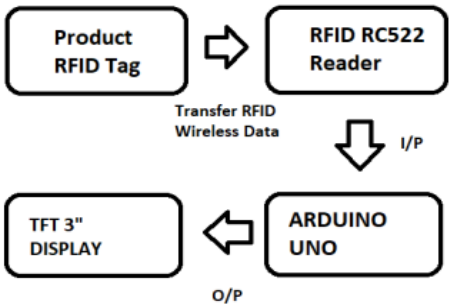
ll. PROBLEM STATEMENT

The traditional retail stores use complete manual interaction to carry out all the processes. They deploy certain helpers at different sections to help customers and also the customers need to carry a trolley throughout the store as they continue to shop.

lll. PROPOSED SYSTEM

project module Our proposed system represents an innovative approach to modern retail through the integration of an IoT-based smart cart system with RFID technology. Each product within the retail environment is equipped with a unique RFID tag, facilitating the seamless automation of the entire retail process. With the smart cart's RFID integration module, customers can effortlessly navigate through the store, adding items to their carts without the need for manual scanning. This automation not only streamlines the shopping experience for customers but also delivers significant benefits for business authorities. By eliminating the need for manual product scanning and billing, the system saves valuable manual resources, allowing staff to focus on other essential tasks. Additionally, customers experience reduced wait times at checkout due to the fully automated billing process, enhancing overall satisfaction. Moreover, the system ensures enhanced billing accuracy by eliminating the potential for manual errors associated with traditional checkout processes. Through the synergy of IoT and RFID technologies, our proposed system revolutionises the retail landscape, offering efficiency, convenience, and accuracy to both customers and business owners alike.

lV. BLOCK DIAGRAM



V. HARDWARE COMPONENTS

ARDUINO UNO R3

The Arduino UNO is a standard board of Arduino. Here UNO means 'one' in Italian. It was named as UNO to label the first release of Arduino Software. It was also the first USB board released by Arduino. It is considered as the powerful board used in various projects. Arduino.cc developed the Arduino UNO board. 16 Arduino UNO is based on an ATmega328P microcontroller. It is easy to use compared to other boards, such as the Arduino Mega board, etc. The board consists of digital and analog Input/Output pins (I/O), shields, and other circuits. The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms.

RFID RC522

An RFID or radio frequency identification system consists of two main components, a tag attached to the object to be identified, and a reader that reads the tag. A reader consists of a radio frequency module and an antenna that generates a high frequency electromagnetic field. Whereas the tag is usually a passive device (it does not have a battery). It consists of a microchip that stores and processes information, and an antenna for receiving and transmitting a signal.When the tag is brought close to the reader, the reader generates an electromagnetic field. This causes electrons to move through the tag‟s antenna and subsequently powers the chip.The chip then responds by sending its stored information back to the reader in the form of another radio signal. This is called a backscatter. The reader detects and interprets this backscatter and sends the data to a computer or microcontroller.

TFT DISPLAY

The 3.5-inch TFT Display colour screen supports 16 BIT RGB 65K colour display and displays rich colours. 320x480 resolution for clear display? 8-bit parallel bus transmission for fast transfer speed. On-board 5V/3.3V level-shifting IC is compatible with 5V/3.3V operating voltage.

OVERVIEW OF HARDWARE COMPONENT

The RC522 RFID reader module is designed to create a 13.56MHz electromagnetic field and communicate with RFID tags (ISO 14443A standard tags). The reader can communicate with a microcontroller over a 4-pin SPI with a maximum data rate of 10 Mbps. It also supports communication over I2C and UART protocols.The RC522 RFID module can be programmed to generate an interrupt, allowing the module to alert us when a tag approaches it, instead of constantly asking the module “Is there a card nearby?”. The module‟s operating voltage ranges from 2.5 to 3.3V, but the good news is that the logic pins are 5-volt tolerant, so we can easily connect it to an Arduino or any 5V logic microcontroller without using a logic level converter.

VI. RESULTS

Through proactive inventory management, efficient checkout experiences, and enhanced security measures, retailers can improve operational efficiency, reduce losses, and enhance customer satisfaction. Moreover, the insights derived from IoT-enabled trolleys empower retailers to make informed decisions, optimize store layouts, and tailor marketing strategies to meet customer preferences effectively.

VII. CONCLUSION

In conclusion, the integration of Internet of Things (IoT) technology into shopping carts, as demonstrated through the concept of Smart Trolleys, presents a significant opportunity to address the myriad challenges faced by the retail industry. By providing real-time inventory tracking, streamlined checkout processes, enhanced security measures, and valuable data analytics capabilities, IoT-enabled trolleys promise to revolutionise the retail landscape. Through proactive inventory management, efficient checkout experiences, and enhanced security measures, retailers can improve operational efficiency, reduce losses, and enhance customer satisfaction. Moreover, the insights derived from IoT-enabled trolleys empower retailers to make informed decisions, optimise store layouts, and tailor marketing strategies to meet customer preferences effectively. As we continue to witness the evolution of IoT technologies, the potential for Smart Trolleys to transform the retail experience is immense. By embracing this innovative approach, retailers can not only stay competitive in an increasingly digital market but also create more engaging and personalised shopping experiences for their customers. In essence, the convergence of IoT and retail holds the promise of a more connected, efficient, and customer-centric future for the industry.

REFERENCE

[1]. The automated shopping trolley for supermarket billing system implemented by Sainath (2014)
[2]. Cash register lines optimization system using RFID technology by Budic (2014)

[3]. Smart shopping trolley using RFID by KomalAmbekar (2015)
[4]. Smart RFID based Interactive Kiosk Cart using wireless sensor node by Narayana Swamy (2016)
[5]. RFID enabled smart billing system by Vanitha Sheeba and Brindha Rajkumari(2015)
[6]. Tharindu Athauda, Juan Carlos Lugo Marin, Jonathan Lee, Nemai Karmakar,"Robust low-cost passive UHF RFID based smart shopping trolley"in IEEE Journal of Radio Frequency Identification,Issue in 2018.
[7]. Rajlakshmi Badi, Bashirahamad Momin,"SISC: Sensor-based IntelligentShopping Cart" in 3rd International Conference for Convergence in Technology (I2CT),Apr 06-08, 2018 India.
[8]. Chandrashekhar P, Ms.T. Sangeetha ―Smart shopping cart with automaticcentral billing system through RFID and zigbee‖,IEEE,2014