TROLLEY USING SMART BILLING SYSTEM

D. Akila[1], R.Vishnu Priya[2], M.Jeevitha Priya[3], Mr. B. Arockiasamy[4], M.Priyanka[5]
Post Graduate Student [1,2,3,5] Assistant Professor[4] Department of Electrical and Electronics Engineering,AVS Engineering College Salem,TamilNadu

***Abstract*—An automated smart shopping system is formed by introducing the concept of IoT to connect all items in the grocery shop. In this system, an inexpensive RFID tag is embedded within each product. Our project aims at developing an automated self-billing system that would save the customers' time and would also be economic enough to be smoothly implemented. We propose the use of RFID technology and an Arduino board for the same. Every product will have an RFID tag (instead of barcodes being used conventionally). When a customer has collected all the items he needs to buy in his shopping bag, he simply places the bag on a self-checkout counter which is equipped with an RFID reader. Hence, billing is made from the shopping cart itself preventing customers from waiting in a long queue at checkout. Also, expiry date of the product is displayed and the damaged products can be identified with respect to its weight. Thus, expired and damaged products will not be considered for bill calculation. In addition to that, smart shelving is added to this system by introducing RFID readers that can monitor stock, perhaps updating a central server. The reader reads the tags while the Arduino sums up the amount and transmits it to a touch screen display placed adjoining the reader**

Keywords—self billing system, RFID tag, RFID reader, Arduino, IoT

I. INTRODUCTION

Physical objects have become a reality, Day to day items would now be able to be outfitted with computing power and communication functionalities, permitting objects everywhere to be associated with one another. This has brought a new revolution in industrial, financial and environmental systems and triggered great challenges in data management, wireless communications and real-time decision making. Also, numerous security and protection issues have risen and lightweight cryptographic techniques are in high demand to fit in with IoT applications. There has been a lot of IoT experimentation on various applications such as smart homes, e-health frameworks, wearable gadgets, and so on. This method centers around a smart shopping framework based on Radio Frequency Identification (RFID) technology. All things available to be purchased are joined with a RFID tag, so they can be tracked by any gadget outfitted with a RFID reader in the store. The utilization of ultra-high frequency (UHF) RFID technology is proposed in the smart shopping framework, as UHF passive tags have a more drawn out range from 1 to 12 meters. Past research on the design of smart shopping frameworks principally centered on utilizing low/high frequency RFID, which have insufficient ranges and leave clients to physically check items with a RFID scanner. In this proposed framework, each smart cart is furnished with an UHF RFID reader, an Arduino, a LCD touch screen, a GSM/GPRS module, and a load cell

II. EXISTING SYSTEM- BILLING PROCESS

A. *Conventional System*

Global positioning system (GPS) and Global system mobile communication (GSM) with the help of Wi-Fi module GPS is a space-based navigation system used to track the vehicle and it gives the location of the robbed device in all weather conditions. It gives the latitude and longitude of the device using GPS antenna. GSM is a specialized type of modem. Arduino is the main component which is used to interface dc motor and GPS, GSM. RFID (Radio Frequency Identification) reader will read the purchasing product information on the shopping cart and the information about the product is displayed on LCD which is interfaced to the microcontroller. At the billing counter, the total bill will be transferred to PC at the counter side by using GSM module. It's a system that enables you to automate the routine, but quite often complex, billing functions. This can include invoicing, payment collection, provisioning, dunning, approvals, and customer-event triggers.

DISADVANTAGES

- Can read only single item in this Prototype
- RFID reader can read RFID tag in the
- Order few distance only in prototype

B. Proposed System

In the current system, bar codes are used for scanning the product details where the customers tend to wait in long queue for generating the bill followed by payment. At times, the bar codes would have been damaged and that particular product cannot be scanned by a barcode scanner leading to confusion. Also, each and every product has to be scanned manually. In order to solve the problems previously identified and save consumers time, money and help the retailers to win loyal clients, in this proposed system, each product will have a passive Radio Frequency ID tag which is bearing a unique Electronic Product Code. This Electronic Product Code provides the information about the product i.e. its name and price. When the customer puts the product in the Smart Trolley, the Radio Frequency ID reader scans the tag and the Electronic Product Code number is generated. Radio Frequency ID reader passes the Electronic Product Code to the Arduino. The name and price of the product obtained by the controller gets displayed on the LCD of the Smart Trolley, where client can see the item data. To store the item price and total billing data, Arduino memory is used. LCD is interfaced with Arduino, It is used to indicate the purchaser, the action taken by the purchaser that is inserting of an item, removal of an item, item's price and total billing cost of items in the trolley. At the billing Counter, the total bill data will be transferred to PC through GSM/GPRS module. As per the test, when putting an item into the smart cart or expelling an item from the cart, the smart cart is able to precisely read it. One astonishing outcome is that the metal outside the cart obstructs the signal to a high degree that when the reader is inside the cart, no item outside the cart can be read. This clearly indicates that an item put into a smart cart will not be perused by a nearby cart accidently. A RFID reader is installed at the checkout point so that the items in the cart can be meticulously read. In the embedded section, Arduino is used to coordinate with the RFID reader, weight scanner, and LCD touch screen, GSM/GPRS module to perform computing functions. Via serial communication, the information is passed to GPRS module and then under the Java section, the data is retrieved and viewed in the website using the cloud access.

III. SYSTEM ARCHITECTURE

The smart cart is able to automatically read the items put into a cart via the RFID reader. An Arduino is installed on the cart for data processing and a LCD touch screen is equipped as user interface. In order for the smart cart to communicate with the server, we have chosen GSM/GPRS technology. We also have a load cell (weight scanner) installed on the smart cart for weighing items. The weight scanner also helps do a security check. For example, if a malicious user peels off one item's RFID tag and puts it into the cart, an extra unaccounted weight will be added. When shopping has been done by a customer, the payment can be made at the checkout point using the billing data generated on the smart cart. An RFID reader is kept before the exit door in order to check if all the items in the cart have been paid for. Security and privacy issues related to smart shopping system are considered. Wireless communications among the server, smart carts and items are vulnerable to various attacks. If there is no proper security method, an adversary can easily intrude with the communication process. Privacy issues also exist, the competitor of a store might get easy access to the circulation of commodities for financial strategy and customer preferences can be inferred by easily collecting the product information in shoppers' shopping carts.

Block Diagram

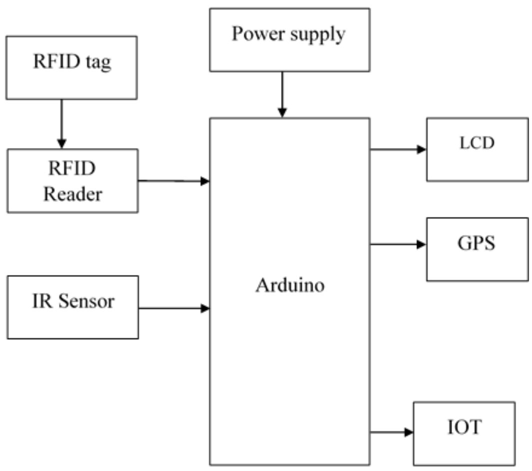

Figure 1: Architecture Diagram

LCD Display

A liquid crystal display or LCD draws its definition from its name itself. It is combination of two states of matter, the solid and the liquid. LCD uses a liquid crystal to produce a visible image. Liquid crystal displays are super-thin technology display screen that are generally used in laptop computer screen, TVs, cell phones and portable video games. LCD's technologies allow displays to be much thinner when compared to cathode ray tube (CRT) technology. Liquid crystal display is composed of several layers which include two polarized panel filters and electrodes. LCD technology is used for displaying the image in notebook or some other electronic devices like mini computers. Light is projected from a lens on a layer of liquid crystal. This combination of colored light with the grayscale image of the crystal (formed as electric current flows through the crystal) forms the colored image. This image is then displayed on the screen.

An LCD is either made up of an active matrix display grid or a passive display grid. Most of the Smartphone's with LCD display technology uses active matrix display, but some of the older displays still make use of the passive display grid designs. Most of the electronic devices mainly depend on liquid crystal display technology for their display. The liquid has a unique advantage of having low power consumption than the LED or cathode ray tube. Liquid crystal display screen works on the principle of blocking light rather than emitting light. LCD's requires backlight as they do not emits light by them. We always use devices which are made up of LCD's displays which are replacing the use of cathode ray tube. Cathode ray tube draws more power compared to LCD's and are also heavier and bigger.

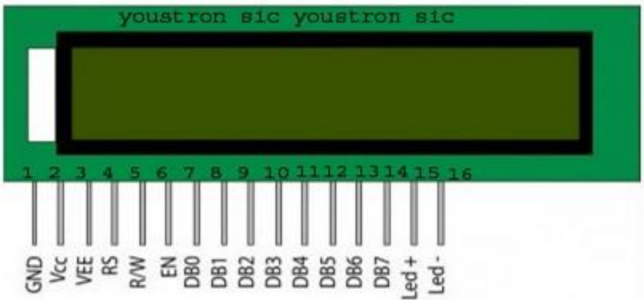

Figure 2: LCD Display

Power Supply

The electrical power is almost exclusively generated, transmitted and distributed in the form of ac because of economical consideration but for operation of most of the electronic devices and circuits, dc supply is required. Dry cells and batteries can be used for this purpose. No doubt, they have the advantages of being portable and ripple free but their voltages are low, they need frequent replacement and are expensive in comparison to conventional dc power supplies. Now day, almost all electronic equipment include a circuit that converts ac supply into dc supply. The part of equipment that converts ac into dc is called DC power supply. In general at the input of the power supply there is a power transformer. It is followed by a rectifier (a diode circuit) smoothing filter and then by a voltage regulator circuit. From the block diagram, the basic power supply is constituted by four elements vise a transformer, a rectifier, a filter, and regulator put together.

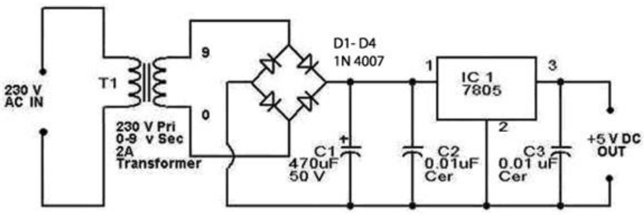

Figure 3: Power Supply

Arduino

In this chapter, we will learn about the different components of the Arduino board. We will study the Arduino UNO board because it is the most popular board in the Arduino board family. Also, it is the best board to get started with electronics and coding. Some boards look slightly different from those given below, but most Arduinos have most of these components in common.

Figure 4: Arduino

Internet of Things (IoT)

The Internet of things (IoT) describes the network of physical objects “things” 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. Things have evolved due to the convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems. Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), and others all contribute to enabling the Internet of things. In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home", including devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smartphones and smart speakers. IoT can also be used in healthcare systems. There are a number of serious concerns about dangers in the growth of IoT, especially in the areas of privacy and security, and consequently industry and governmental moves to address these concerns have begun including the development of international standards. The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The internet of things helps people live and work smarter, as well as gain complete control over their lives. In addition to offering smart devices to automate homes, IoT is essential to business. IoT provides businesses with a real-time look into how their systems really work, delivering insights into everything from the performance of machines to supply chain and logistics operations. IoT enables companies to automate processes and reduce labor costs. It also cuts down on waste and improves service delivery, making it less expensive to manufacture and deliver goods, as well as offering transparency into customer transactions.

IV. SOFTWARE REQUIREMENT

Proteus Software Description

The proposed system that is going to be described in this phase is done using the Proteus model. In order to get the desired output, the simulation circuit has been designed in Proteus software by using the respective components that is present in the Proteus.

This chapter describes the design and current implementation of the Proteus dependability manager and object factory. The application requirements and the type of Aqua applications that are currently supported by Proteus are also described. The gateway, also a component of Proteus**.**

WORKING OF THE PROTUES

a) Application Model

This section describes the type of applications that are supported by the current implementation of Proteus.

b) Distributed Application Features

Aqua applications using the current implementation of Proteus may exhibit the following properties:

- Any CORBA object in the application may act as a client and as a server.
- Any CORBA object in the application may communicate with multiple applications.
- Any CORBA object in the application may have state.

The application may use synchronous or deferred synchronous communication. Synchronous communication means that an object making a request to another object blocks until a reply has been received from the other object. When an object does not block after making a request to another object but maintains a request-reply structure, this type of communication is referred to as deferred synchronous communication in this thesis. The application may make hierarchical method invocations. For example, suppose object A makes a request to object B. Before responding to object a, object B may make a request to object. An application may be developed independent of the Aqua architecture. There is a minimal amount of integration into Aqua because the application is written so that it is unaware that it may be replicated. Integrating an application to use Proteus requires only the definition of two extra CORBA methods for each object. These methods are used to transfer an object's state. If an object does not need to be replicated, there are no changes that need to be made to that object.

➢ Application Requirements this section lists the requirements imposed on an Aqua application. Each requirement is listed as being either a design restriction or an implementation restriction.

➢ The application cannot use the CORBA Life Cycle or Naming services. The Life Cycle service may not be used because Proteus must manage object creation. Object binding may not be done with the Naming service, but rather through the direct use of Internet Object References (IORs). This is usually implemented by having the application read in a file that contains the IOR it needs to use. These requirements are imposed by the design.

➢ The application cannot use general asynchronous communication. Only synchronous and deferred synchronous communications are supported. This requirement is imposed by the current implementation of Proteus.

➢ If an object needs to be replicated, it must be deterministic. Determinism means that if two replicas are delivered an ordered sequence of messages, both replicas will have the same state after all the messages have been processed. This generally requires that an object be prohibited from using non-deterministic features such as threads, random number generators, and time stamps. It also requires that all communication done by the object be done through the Aqua architecture. This requirement is imposed because the current implementation of Proteus only supports the active replication scheme for Aqua applications.

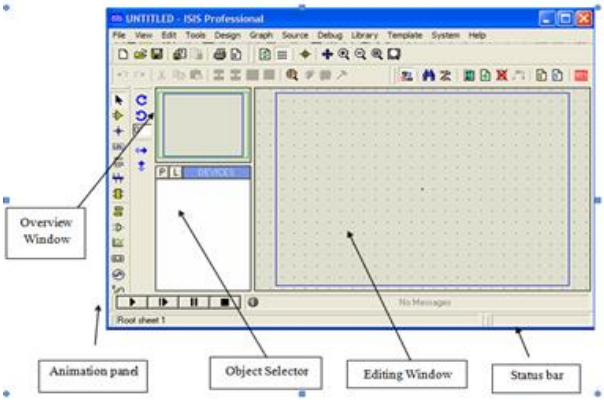

Figure 5: Proteus Window

➢ An object that is developed using a threaded ORB with non-deterministic scheduling, deferred synchronous communication, and communication with multiple objects cannot be replicated. Been achieved or when the desired QOS can no longer be maintained. The dependability manager also provides fault treatment for Aqua applications. Based on errors detected by other components, the dependability manager evaluates the system configuration and either treats the fault or makes a callback to Quo. The dependability manager is composed of a gateway process and a CORBA object process. This section describes the functional interface to the dependability manager and the implementation of the CORBA object process. The dependability manager's gateway is described. The current implementation of the dependability manager does not allow the dependability manager to be replicated. Therefore, the dependability manager is a single point of failure in the current implementation of the Aqua architecture.

➢ The dependability manager only manages the system configuration. No application-level messages are transmitted through the dependability manager. Therefore, if the dependability manager crashes, any Aqua applications will continue to communicate despite the lack of a dependability manager. Because of that, if a fault in the application occurs, the fault will not be treated and no call-back will be given to QUO. In the current implementation, the dependability manager cannot be restarted in the case of failure, since it will not be aware of the state of the dependability manager prior to the crash. Errors are detected by object factories and Aqua application gateways. If an application cannot be started or killed, the error is reported by the object factory. If an Aqua application crashes, the error is detected by the Aqua application gateways. The dependability manager uses these error detection mechanisms to treat faults.

The dependability manager can be used without a QUO runtime by directly specifying the QOS requirements from an application itself, or from an input window on dependability manager. The input window allows a user to create, edit, and delete QUO regions as if QUO were making the calls itself. This is useful for testing the dependability manager independently of QUO. The internal structure of the dependability manager's CORBA application process is divided into a protocol coordinator and an advisor, as seen in. The protocol coordinator is a CORBA object that is used to interface with the other system components. The advisor makes decisions about how to configure the system

CONCLUSION

In this project, we propose a secure smart shopping system utilizing RFID technology. This is the first time that RFID is employed in enhancing shopping experiences and security issues are discussed in the context of a smart shopping system. We detail the design of a complete system and build a prototype to test its functions. We also design a secure communication protocol and present security analysis and performance evaluations. We believe that future stores will be covered with RFID technology and our idea is a pioneering one in the development of a smart shopping system. Our future work will focus on improving the current system, for example, by reducing the computational overhead at the smart cart side for higher efficiency, and how to improve the communication efficiency while preserving security properties.

REFERENCES

[1] D. Ryumin, D. Ivanko, A. Axyonov, I. Kagirov, A. Karpov and M. Zelezny, "Human-Robot Interaction with Smart Shopping Trolley Using Sign Language: Data Collection," 2019 IEEE International Conference on Pervasive Computing and Communications Workshops (PerCom Workshops), Kyoto, Japan, 2019, pp. 949-954, doi: 10.1109/PERCOMW.2019.8730886.

[2] T. Hanooja, C. G. Raji, M. Sreelekha, J. Koniyath, V. Muhammed Ameen and M. Mohammed Noufal, "Human Friendly Smart Trolley with Automatic Billing System," 2020 4th International Conference on Electronics, Communication and Aerospace Technology (ICECA), Coimbatore, India, 2020, pp. 1614-1619, doi: 10.1109/ICECA49313.2020.9297439.

[3] D. Thote, S. Parsewar, A. Welekar, N. Sheikh, R. Dhakate and R. Sheikh, "Automatic Shopping Basket Technobask," 2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS), Coimbatore, India, 2019, pp. 661-665, doi: 10.1109/ICACCS.2019.8728309.

[4] E. Kaoud, M. A. El-Sharief and M. G. El-Sebaie, "Scheduling problems of automated guided vehicles in job shop, flow shop, and container terminals," 2017 4th International Conference on Industrial Engineering and Applications (ICIEA), Nagoya, Japan, 2017, pp. 60-65, doi: 10.1109/IEA.2017.7939179.

[5] S. R. Subudhi and R. N. Ponnalagu, "An Intelligent Shopping Cart with Automatic Product Detection and Secure Payment System," 2019 IEEE 16th India Council International Conference (INDICON), Rajkot, India, 2019, pp. 1-4, doi: 10.1109/INDICON47234.2019.9030331.

[6] Ł. Knypiński and J. Krupiński, "The Energy Conversion Efficiency in the Trolley Travelling Drive System in Tower Cranes," 2019 15th Selected Issues of Electrical Engineering and Electronics (WZEE), Zakopane, Poland, 2019, pp. 1-4, doi: 10.1109/WZEE48932.2019.8979940.

[7] T. Naveenprabu, B. Mahalakshmi, T. Nagaraj, N. Kumar S.P. and M. Jagadesh, "IoT Based Smart Billing and Direction Controlled Trolley," 2020 6th International Conference on Advanced Computing and Communication Systems (ICACCS), Coimbatore, India, 2020, pp. 426-429, doi: 10.1109/ICACCS48705.2020.9074173.

[8] T. Hanooja, C. G. Raji, M. Sreelekha, J. Koniyath, V. Muhammed Ameen and M. Mohammed Noufal, "Human Friendly Smart Trolley with Automatic Billing System," 2020 4th International Conference on Electronics, Communication and Aerospace Technology (ICECA), Coimbatore, India, 2020, pp. 1614-1619, doi: 10.1109/ICECA49313.2020.9297439.

[9] J. Xu and Q. Chen, "Modeling and optimal control of automated trolleys," 2009 IEEE International Conference on Systems, Man and Cybernetics, San Antonio, TX, USA, 2009, pp. 710-713, doi: 10.1109/ICSMC.2009.5346722.

[10] T. K. Das, A. K. Tripathy and K. Srinivasan, "A Smart Trolley for Smart Shopping," 2020 International Conference on System, Computation, Automation and Networking (ICSCAN), Pondicherry, India, 2020, pp. 1-5, doi: 10.1109/ICSCAN49426.2020.9262350.