iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** II **Month of publication:** February 2022

DOI: https://doi.org/10.22214/ijraset.2022.40449

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue II Feb 2022- Available at www.ijraset.com

Design of Automatic e-Cart for Shopping-Malls in Smart Cities

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Abstract: ***In this fast-moving world, time is no less than a luxury. People prefer technology and services which reduce their workload and are time efficient. Busy shopping malls with loads of customers and long queues during billing make it loads of inconvenient for people, to enjoy their shopping experience. So here comes our proposed idea into the highlight as "Smart Shopping E-cart using IoT". Providing convenient, faster, and less stressful way, to enjoy our shopping. The project consists of an RFID reader module (ES18), RFID tags, a Liquid crystal display, LED lights, a buzzer, a motion detector, NodeMCU, and push-buttons. This paper is focused on the implementation of the Smart Shopping E-cart which not only provides the basic functionality of a cart but also provides a convenient way of shopping. Reducing the task of cashier and long billing calculations.***

Keywords: Smart E-cart, RFID, IoT, Shopping Malls, Anti-theft.

I. INTRODUCTION

Technology brings great relief to humans. Over the last decade's development of e-commerce sites has exponentially grown, changing our way of living and shopping [1]. Online shopping platforms like Amazon, Flipkart, Nykaa, and many more have made a great influence on people. But even after the huge effect of these e-commerce sites, still many people prefer traditional shopping spree [2]. The market is the real-time experience and giving customers products they want with their own quality check experience. Shopping carts provided in malls do not prevent long queue problems and are also not time efficient. Our smart shopping E-cart is way too different from traditional carts [3]. Even if its manufacturing cost is higher than that of a traditional one. Still, the comfort and convenience make it worth it all. The smart E-cart has benefits like a smart accounting system, anti-theft, reducing staff requirements, and providing less time consumption [4]. Just pick what you want, get your bill, and pay online and you're good to go. It is not only good for normal people, but it also helps people with disabilities [5]. To start with the procedure, one must scan their product's RFID tags in front of an RFID reader that will lead to the addition of items in our bucket list leading to buzzer making a sound [6]. At last scanning, the admin RFID cart will display the final bill on the LCD screen. And anti-theft is provided by a motion detector sensor. A conceptual framework for a smart shopping e-cart is shown in fig.1.



Fig.1 Smart Shopping e-Cart for Shopping Malls

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ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue II Feb 2022- Available at www.ijraset.com

The customer can scan their RFID tags in front of the RFID reader which will then read and display the details on LCD [7]. The billing is done with help of NodeMCU and after that, it is sent to the cloud from where we can retrieve and get it on our mobile screen from where we can pay the final bill [8]. If by mistake a customer keeps a product without scanning it first buzzer will make a sound and final billing will be stopped immediately [9]. The advantages/ facilities provided by our smart shopping e-cart system are as follows:

1) To reduce long queues.
2) To provide a better shopping experience.
3) Less human resource involvement.
4) Less time-consuming.
5) Easy payment.
6) Anti-theft.

II. BASIC BLOCK DIAGRAM OF SMART SHOPPING E-CART

The basic block diagram of the Smart Shopping e-Cart is shown in fig. 2. Here, it consists of a power source (battery), RF transceiver, RFID reader module, IR Add and Removes product sensors, ATMEL Atmega 16-bit microcontroller, LCD, Keypad, and buzzer [10].

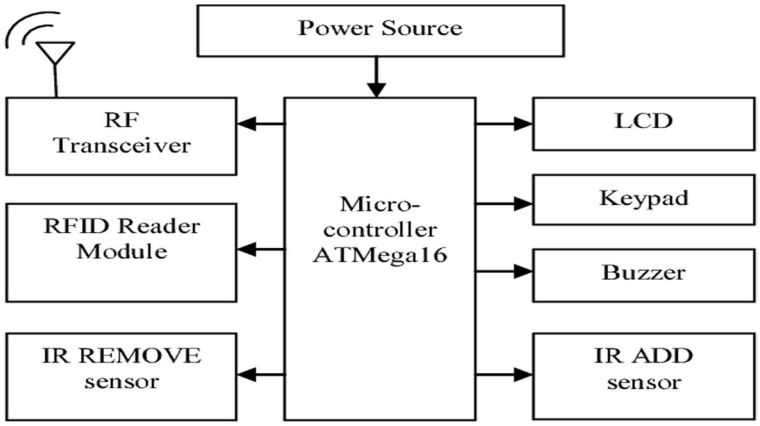


Fig. 2 Block Diagram of Smart e-Cart for Shopping Malls

III. HARDWARE COMPONENTS

The electronics components required to implement the e-Cart product are as follows [11]:

1) RFID Reader (ES18)
2) Liquid Crystal Display (LCD)
3) Push button
4) Reset Button
5) NodeMCU
6) LED Lights (red, green)
7) Motion Sensor
8) Buzzer

IV. OPERATION & WORKING

To start the process, one has to scan their RFID tags in front of an RFID reader. Product's scanned are then visible on LCD, their name and price [12]. With help of nodeMCU our products name, quantity, and price are all being monitored and calculated. When a product is passed into the cart after scanning then green light glows. If an object is placed without being scanned from our RFID reader, a red LED glows and a buzzer makes a sound, depicting an error made by the customer or the possibility of theft [13]. This mechanism makes it an anti-theft model as well. When shopping is done or finished customer can scan their admin card and can get their final bill on their smartphone. If the customer wants to remove any product they need to push the remove button, then scan those product's RFID tags. The final bill will consist of a list of products after unwanted products have been removed. We will use a centralized database that will help customers to pick from the given options. Below is the data table that we are going to use.

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Table 1. Data will be stored in the main database.

Item	Cost	Quantity
Milk	10	2
Biscuits	30	4
Spinach	50	6

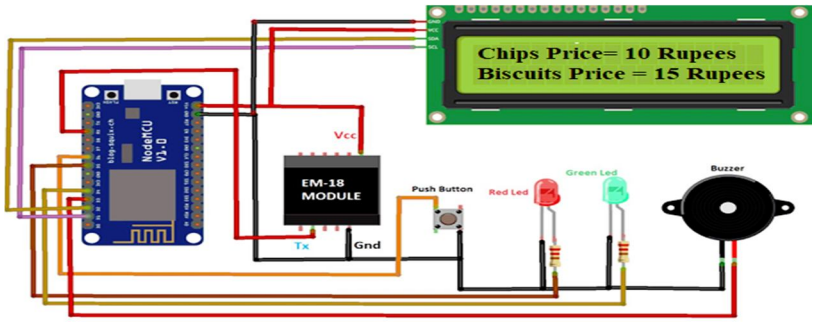


Fig. 3: Circuit Diagram of Smart Shopping e-Cart

The flow chart describes the step-by-step operation & work in more detail.

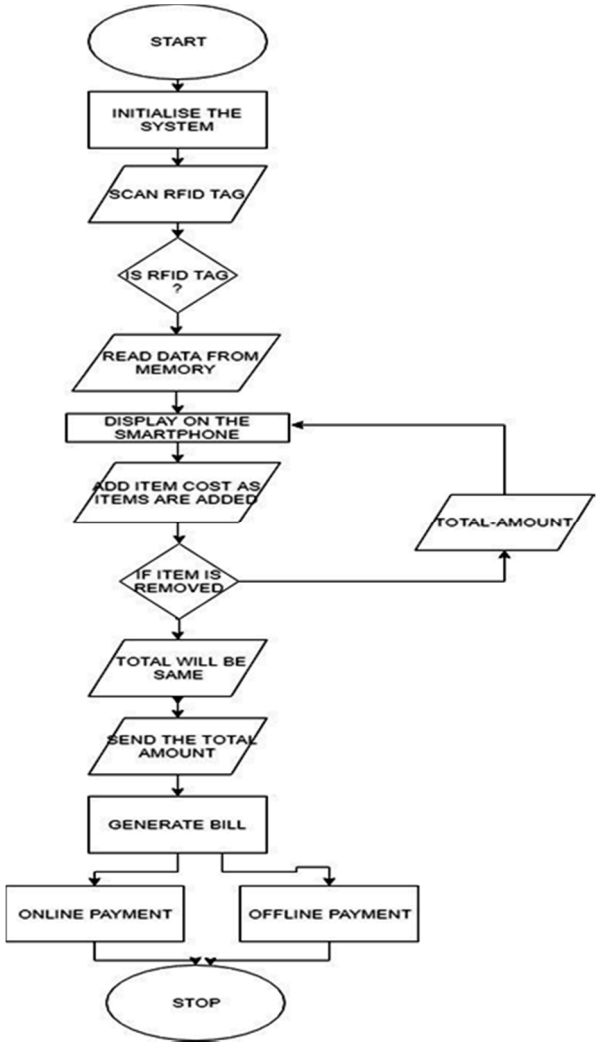


Fig. 4: Flow chart for the operation of Smart e-Cart

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V. PROPOSED SYSTEM

A. Each cart will have an RFID reader, motion detector, and nodeMCU [14].
B. Each product will have an RFID tag.
C. There will be a Centralized Server System where data will be sent with help of nodeMCU.
D. If the delete button is pushed item is removed after the RFID tag reading of the item is removed.
E. Final bill can be issued after scanning the RFID tag of admin.
F. Motion detector helps to prevent theft.
G. Display Product Info like price, name, and quantity in the final bill with total.

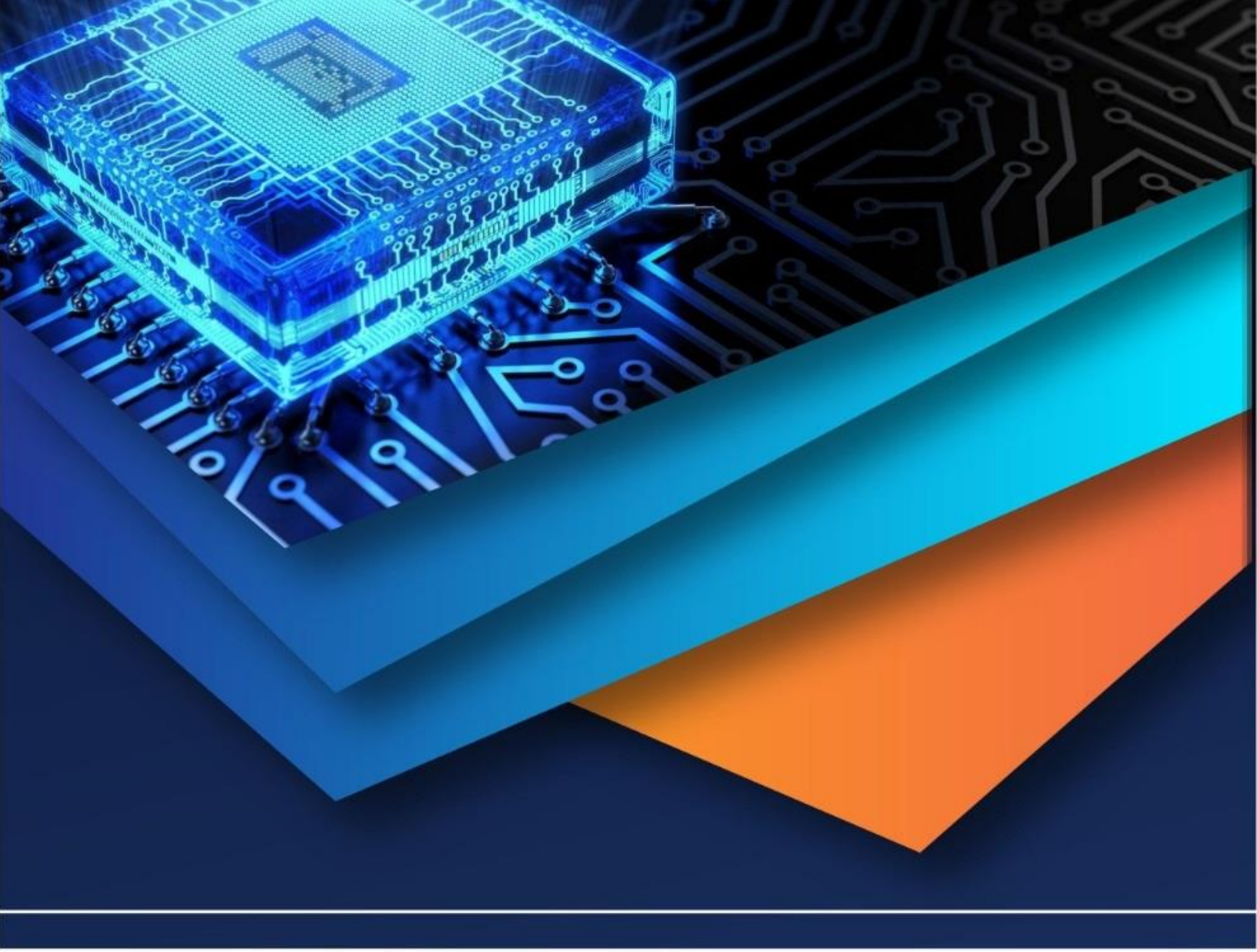
VI. CONCLUSION

A smart approach to solve long queues and time-consuming problems. Smart Shopping E-cart resolves these problems not only by making it convenient for customers but also by reducing human efforts with anti-theft protection. Worked as per requirements. This system can be in small stores, grocery stores, or big shopping malls. Improving the shopping experience and making shopping not a tiring task in smart cities.

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