SENSOR BASED SHOPPING ASSISTANCE SYSTEM FOR PWDs

A FINAL YEAR PROJECT REPORT

Submitted by

PANDEESWARI S	**[711720104060]**
POOJA U	**[711720104062]**
PRIYADHARSHINI R	**[711720104063]**
SANTHOSHI M	**[711720104077]**

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE AND ENGINEERING

KGiSL INSTITUTE OF TECHNOLOGY, SARAVANAMPATTI

ANNA UNIVERSITY : CHENNAI 600 025

MAY 2024

ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report **"SENSOR BASED SHOPPING ASSISTANCE FOR PWDs"** is the bonafide work of **PANDEESWARI S, POOJA U, PRIYADHARSHINI R, SANTHOSHI M** who carried out the project work under my supervision.

Dr. THENMOZHI T	**Ms. SUGANTHI A**
HEAD OF THE DEPARTMENT	**SUPERVISOR**
PROFESSOR	**ASSISTANT PROFESSOR**
Computer Science and Engineering	**Computer Science and Engineering**
KGISL Institute of Technology	**KGISL Institute of Technology**
Saravanampatti	**Saravanampatti**
Coimbatore-35	**Coimbatore-35**

Submitted for the Anna University Viva-Voce examination held on _____________

Internal Examiner **External Examiner**

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION OF THE DEPARTMENT

To evolve as a Prominent Department in producing Highly Competent Computer Science andEngineering Graduates contributing to the welfare of the Industry and Society at large.

MISSION OF THE DEPARTMENT

MD-1 To impart Quality Education with an emphasis on Software Development.

MD-2 To equip our Faculty Members with Progressive Technologies.

MD-3 To provide suitable Infrastructure and Resources with Modern Tools for creating a better Learning Environment.

MD-4 To collaborate with Industries and Institutes for Innovative Research and Technological updates.

MD-5 To inculcate the aspects of Communication, Creativity, Social and Ethical Values through various Student Participation Activities.

PROGRAM EDUCATIONAL OBJECTIVES

The Graduates of Computer Science and Engineering Program will:

PEO1 Excel in the Software, Hardware and Networking Professions with immense knowledge in the Latest Technologies of the Computer Science Field.

PEO2 Develop Innovative Products and Solutions through High Precision of Analysis, Computing and Problem-solving skills.

PEO3 Exhibit as Lifelong Socially Responsible Engineers possessing High Ethical and Moral Values needed by the Society.

PROGRAM OUTCOMES

The Graduates of Computer Science and Engineering Program will:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‘s own work, asa member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES

PSO1: Apply the technical skills of Data Science, Artificial Intelligence, Cloud Computing and Networking to provide solutions for industrial and societal requirements

PSO2: Use appropriate modern tools and IDEs for real-time software development

PSO3: Apply and adopt contemporary software development methodologies andstandards which suits the dynamism of Societal and Industrial nature

ACKNOWLEDGEMENT

We express our deepest gratitude to our **Chairman and Managing Director Dr. ASHOK BAKTHAVACHALAM** for providing us with an environment to complete our project successfully.

We are grateful to our CEO, Academic Initiatives **Mr. ARAVIND KUMAR RAJENDRAN**, our beloved Director-Academics **Dr. P. SHANKAR** and our honorable Secretary **Dr. N. RAJKUMAR, M.E.,MBA.,Ph.D**. We are thankful to our beloved Principal **Dr. S. SURESH KUMAR, M.E., Ph.D.** for his support, valuable guidance and blessings.

We would like to thank **Dr. T. THENMOZHI, M.E., M.B.A., Ph.D,** Head of the Department, Department of Computer Science and Engineering for her unwavering support during the entire course of this project work. We express our sincere thanks to **Ms. ARUNA TN, M.E.,(Ph.D)** our Project Coordinator, Assistant Professor, Department of Computer Science and Engineering who modeled us both technically and morally for achieving greater success in completing this project work.

We express our sincere and heartfelt thanks to our faculty guide **Ms. SUGANTHI A, M.E.,(Ph.D)** Assistant Professor, Department of Computer Science and Engineering for her constant encouragement and support throughout our course, especially for the useful suggestions given during the course of the project period and being instrumental in the completion of our project with her complete guidance.

We also thank all the **Faculty members** of our department and finally, we take this opportunity to extend our deep appreciation to our **Family** and **Friends**, for all they meant to us during the crucial times of the completion of our project.

ABSTRACT

Sensor based shopping assistance proposes a smart shopping trolley system tailored for visually impaired individuals, integrating NodeMCU, LCD display, IoT connectivity, ultrasonic sensor, voice playback speaker, and a specially designed trolley model. The system aims to enhance the shopping experience for visually impaired shoppers by providing real-time navigation assistance, product identification, and interactive shopping features. The NodeMCU serves as the central controller, coordinating data exchange between the ultrasonic sensor for obstacle detection, the LCD display for presenting information, and the voice playback speaker for auditory feedback. Through IoT connectivity, the trolley communicates with a central server to access product databases and store user preferences, enabling personalized shopping recommendations and assistance. This innovative solution not only promotes independence and accessibility for visually impaired individuals but also demonstrates the potential of IoT technology to address diverse societal challenges in inclusive ways. Navigating through a bustling supermarket can be a daunting task for visually impaired individuals, often leading to frustration and dependence on others for assistance. By integrating cutting-edge technologies such as NodeMCU, LCD display, IoT connectivity, ultrasonic sensor, voice playback speaker, and a custom-designed trolley model, this system aims to revolutionize the shopping experience for individuals with visual impairments. Through real-time navigation assistance, product identification, and interactive features, the smart shopping trolley empowers visually impaired shoppers to navigate aisles, locate products, and make informed purchasing decisions independently.

TABLE OF CONTENTS

LIST OF FIGURES

TABLE OF ABBREVATIONS

PWDs	PERSON WITH DISABILITIES
LCD	LIQUID CRYSTAL DISPLAY
NODEMCU	NODE MICRO CONTROLLER UNIT
IOT	INTERNET OF THINGS
RFID	RADIO FREQUENCY IDENTIFICATION
UI	USER INTERFACE
UX	USER EXPERIENCE
ROI	RETURN ON INVESTMENT

CHAPTER 1

INTRODUCTION

The thought about stepping into a world where shopping becomes a seamless and empowering experience for those with visual impairments. This is the vision behind the Shopping Assistance System designed explicitly for Persons with Disabilities (PWDs). By harnessing the power of technology, this innovative system aims to revolutionize the way visually impaired individuals navigate stores, identify the products, and engage in interactive shopping. Enhancing the shopping experience for visually impaired individuals is not merely an act of convenience but a vital step towards inclusivity in our society. One such groundbreaking initiative is the development of a Shopping Assistance System tailored specifically for visually impaired shoppers. Through the integration of ultrasonic sensors, LCD displays, and voice playback speakers, the NodeMCU provides real-time navigation assistance and auditory feedback, making the shopping journey more accessible and enjoyable.

1.1 PROBLEM DEFINITION

The problem is the lack of accessibility and independence in shopping for visually impaired individuals due to challenges such as navigating aisles and identifying products. The objective is to develop a comprehensive shopping assistance system utilizing technology like Node MCU, sensors, displays, and speakers to overcome these barriers and enhance the shopping experience, ultimately empowering visually impaired individuals to shop more efficiently and independently.

1.2 OBJECTIVE OF THE PROJECT

The objective of the described Shopping Assistance System for Person with Disabilities (PWDs) is to significantly improve the shopping experience for visually impaired individuals by offering comprehensive assistance throughout their shopping journey. This assistance includes real-time navigation guidance, accurate product identification, and interactive features to facilitate independent shopping.

This system, centered around the NodeMCU microcontroller, seamlessly integrates various component such as ultrasonic sensors, LCD display, and voice playback speakers to provide essential feedback and information to the user. Leveraging IoT connectivity, the system enables communicates between the shopping trolley and a central server, granting access to product databases. The Shopping Assistance System for PWDs leverages advanced technology to empower visually impaired individuals, offering real-time navigation guidance and product identificationfor an independent and confident shopping experience.

1.3 SIGNIFICANCE OF THE PROJECT

- The project aims to enhance the shopping experience and overall quality of life for visually impaired individuals.
- It achieves this by providing real-time navigation assistance, product identification, and interactive shopping features.
- Traditional barriers to independent shopping for visually impaired individuals are removed through this system.
- Integration of technologies such as NodeMCU, sensors, displays, and speakers enhances accessibility and fosters inclusivity.
- Visually impaired individuals can engage in the shopping process with greater ease and independence.
- IoT connectivity facilitates seamless communication with a central server, granting access to product databases and personalized preferences.

- This customization tailors the shopping experience to meet the unique needs of each individual.

1.4 OUTLINE OF THE PROJECT

This project aims to enhance the shopping experience and overall quality of life for visually impaired individuals by providing real-time navigation assistance, product identification, and interactive shopping features. Through the integration of technology such as NodeMCU, sensors, displays, and speakers, barriers to independent shopping traditionally faced by this demographic are removed, fostering inclusivity and enabling greater ease and independence in the shopping process.

The project's IoT connectivity facilitates seamless communication with a central server, allowing for access to product databases and personalized preferences, thus further customizing the shopping experience to meet the unique needs of each individual. Ultimately, this initiative represents a significant step towards promoting empowerment, autonomy, and inclusivity for visually impaired shoppers. With ongoing advancements in technology and increased awareness of accessibility needs, this project sets a precedent for innovative solutions catering to the diverse needs of individuals with disabilities. In addition to its immediate benefits for visually impairedindividuals, this project also holds the potential to spark broader conversations and actions towards a more inclusive society. By showcasing the effectiveness of technology in breaking down barriers and promoting autonomy, it encourages further exploration and investment in accessible solutions across various domains. Moreover, the project's emphasis on personalized preferences and user-centric design sets astandard for inclusive practices that can be extended to other sectors, fostering a culture of empathy and inclusivity for people of all abilities. As awareness grows and technology continues to evolve, this initiative serves as a beacon of progress, paving the way for a more accessible and equitable future.

CHAPTER 2

LITERATURE REVIEW

The literature survey on sensor-based shopping assistance systems for Persons with Disabilities (PWDs) represents a multifaceted exploration of the evolving landscape of assistive technologies aimed at facilitating an inclusive shopping experience for visually impaired individuals. Several studies have explored sensor-based shopping assistance for people with disabilities. Athithan et al. (2016) proposed a "Smart Shopping Cart for Visually Impaired People using RFID Technology," emphasizing RFID's role in enhancing shopping experiences. Similarly, Surya et al. (2013) introduced an "RFID Based Shopping Trolley for Visually Impaired," highlighting the potential of RFID in aiding navigation and accessibility in shopping environments. Mohamed et al. (2017) developed an innovative solution titled "RFID and Zigbee based Smart Shopping Cart for Visually Impaired People," showcasing the integration of Zigbee alongside RFID for improved communication and functionality. These studies collectively underscore the significance of sensor technologies, particularly RFID and Zigbee, in augmenting the shopping experiences of individuals with visual impairments.

2.1 DESCRIPTION OF THE METHODOLOGY

The methodology for hardware assembly involves several key steps to ensure the successful integration and functionality of the physical components required for the shopping assistance system. Firstly, a detailed inventory of all necessary components, such as the NodeMCU, ultrasonic sensor, LCD display, and voice playback speaker, is compiled. This may involve soldering connections, mounting components onto a chassis or frame, and securing wiring to prevent interference or damage during operation. The methodology for RFID read and product display focuses on integrating RFID technology into the system to enable efficient product identification. Firstly, RFID tags are affixed to each product in the shopping environment, containing unique identifiers linked to product information stored in a database. These details, including product name, price, and any additional information, are displayed on the LCD screen in a clear and accessible format for visually impaired shoppers. The system is thoroughly tested to ensure accurate and reliable RFID tag detection and information display, with any discrepancies or error addressed and resolved as needed. The system is configured to accurately calculate and transmit bill data to a central server or bill counter for processing. To achieve this, the system is programmed to track selected items and their corresponding prices throughout the shopping session. As items are added to the cart, their prices are totaled and stored within the system's memory. Thorough testing is conducted to ensure the accuracy and reliability of bill data transmission, with any discrepancies or errors addressed and resolved as needed. The methodology for IoT app creation involves the development of a mobile application that complements the shopping assistance system and provides additional functionality for both shoppers and administrators. Firstly, the user interface (UI) and user experience (UX) design of the app are carefully crafted to be intuitive and accessible for visually impaired individuals. The app is thoroughly tested to ensure compatibility with various devices and operating systems, as well as usability and accessibility for visually impaired users. Any issues or feedback identified during testing are addressed and incorporated into the app's design before final deployment.

2.2 SPECIFICATION OF MODEL

1. **Central Controller - NodeMCU:**

- The NodeMCU serves as the brain of the shopping assistance system, orchestrating the interaction between different components.
- It manages real-time navigation assistance by processing data from the ultrasonic sensor to detect obstacles and plan optimal navigation routes.
- Additionally, the NodeMCU handles product identification by interfacing with the RFID reader or other sensors to retrieve product information.
- Through its connectivity capabilities, particularly via Wi-Fi or Bluetooth, the NodeMCU facilitates communication with the central server for accessing product databases and storing user preferences.

2. **Sensor for Obstacle Dectection - Ultrasonic Sensor:**

- The ultrasonic sensor plays a crucial role in ensuring the safety of visually impaired shoppers by detecting obstacles in their path.
- It emits ultrasonic waves and measures the time taken for the waves to bounce back, thus determining the distance to nearby objects.
- Real-time feedback from the ultrasonic sensor allows the central controller to adjust navigation routes, avoiding collisions and ensuring smooth navigation through the shopping environment.

3. **Display – LCD Display:**

- The LCD display serves as the primary interface for visually impaired shoppers, presenting essential information in a clear and accessible format.

- It displays product details, navigation instructions, and feedback messages generated by the central controller.
- The display is designed to be easily readable and user-friendly, featuring high contrast and large fonts for improved visibility.

4. Auditory Feedback – Voice Playback Speaker:

- The voice playback speaker provides auditory feedback to visually impaired shoppers, complementing the information displayed on the LCD screen.
- It delivers navigation instructions, product descriptions, and other relevant information in spoken form, enhancing the shopping experience by offering additional sensory cues.
- The speaker's volume and clarity are optimized to ensure that shoppers can easily hear and understand the provided feedback in noisy environments.

5. IoT Connectivity:

- IoT connectivity enables the shopping trolley to communicate with a central server, facilitating seamless data exchange.
- Through Wi-Fi or cellular networks, the system can access product databases stored on the central server, providing up-to-date information about available products.
- Additionally, IoT connectivity allows the system to store user preferences on the central server, ensuring a personalized shopping experience for each shopper.

CHAPTER 3
SYSTEM ANALYSIS

The shopping assistance system for Persons with Disabilities (PWDs) is meticulously designed to enhance accessibility for visually impaired shoppers in traditional retail environments. With real-time navigation assistance, product identification, and interactive features, the system aims to boost independence. At its core, the NodeMCU acts as the central controller, coordinating data exchange among components like the ultrasonic sensor, LCD display, and voice playback speaker. Leveraging sensory inputs and IoT connectivity, the system ensures safe navigation, relays essential information, and grants access to product databases. By tailoring the experience and providing personalized assistance, it empowers visually impaired shoppers to navigate confidently. Overall, the system's integration of hardware, data processing, and IoT connectivity offers a comprehensive solution, promoting inclusivity and accessibility in retail.

3.1 EXISTING SYSTEM

An existing system designed to cater to the needs of visually impaired shoppers is a sophisticated shopping assistance application that harnesses cutting-edge technologies. This comprehensive app seamlessly integrates GPS navigation, image recognition, and voice commands to provide real-time assistance and enhance the overall shopping experience. Through GPS technology, users are guided with precision throughout the store, receiving turn-by-turn directions and alerts about nearby obstacles to navigate safely.

Moreover, the app employs advanced image recognition capabilities, allowing users to capture images of products on shelves using their smartphone camera. Additionally, the application is meticulously designed with accessibility in mind, boasting high contrast visuals, large fonts, and customizable settings tailored to accommodate users with varying degrees of visual impairment. Voice-guided tutorials further enhance the user experience, providing step-by-step assistance for effective navigation. Overall, this comprehensive system offers a holistic solution that promotes independence, privacy, and convenience for visually impaired shoppers.

3.2 DRAWBACKS:

1. **Dependency on Technology:**
   - Visually impaired shoppers may face challenges if the system experiences technical glitches or malfunctions.
   - Relying heavily on technology for navigation and product identification leaves users vulnerable to disruptions in the event of system failures or connectivity issues.
2. **Limited Accessibility:**
   - Despite efforts to create an inclusive shopping experience, the system may not be fully accessible to all visually impaired individuals.
   - Those with limited familiarity or proficiency with technology may struggle to use the system effectively, reducing its overall utility and accessibility.
3. **Privacy Concerns:**
   - The system's reliance on IoT connectivity and centralized data storage raises privacy concerns regarding the collection and use of sensitive

user information.

- ➢ Visually impaired shoppers may be apprehensive about sharing personal data, especially if they perceive a risk of data breaches or unauthorized access to their information.

4. **Cost of Implementation:**

- ➢ Implementing and maintaining the shopping assistance system can be costly, requiring investment in hardware, software development.
- ➢ This expense may pose a barrier to adoption for retailers or organizations operating on limited budgets, limiting the system's availability and scalability.

5. **Environmental Limitations:**

- ➢ The effectiveness of the system may be impacted by environmental factors such as crowded aisles, irregular store layouts, or poor lighting conditions.
- ➢ These challenges can affect the accuracy of obstacle detection and navigation guidance, potentially hindering the user experience for visually impaired shoppers.

6. **Reliance on External Infrastructure:**

- ➢ The effectiveness of the system may be contingent upon the availability and reliability of external infrastructure such as Wi-Fi networks or cellular connectivity.
- ➢ In areas with poor network coverage or infrastructure limitations, the system's functionality may be compromised, leading to disruptions in service for users.

3.3 PROPOSED SYSTEM

The Smart Shopping Trolley System represents a groundbreaking innovation aimed at transforming the shopping experience for individuals with visual impairments. By seamlessly integrating cutting-edge technology, this system addresses the unique challenges faced by visually impaired shoppers, offering a comprehensive solution to enhance their independence, privacy, accessibility, and overall efficiency while navigating retail environments.

COMPONENTS OF PROPOSED SYSTEM:

1. **NodeMCU Microcontroller:**

   The heart of the system, the NodeMCU microcontroller, serves as the central control unit responsible for coordinating the various functionalities of the Smart Shopping Trolley System.

2. **LCD Display:**

   An intuitive LCD display interface provides users with real-time information and guidance, including navigation instructions, obstacle alerts, and product details.

3. **IoT Connectivity:**

   Leveraging Internet of Things (IoT) connectivity, the trolley establishes communication with a central server infrastructure, enabling seamless access to extensive product databases and user preferences.

4. **Ultrasonic Sensors:**

   Integrated ultrasonic sensors enable the system to accurately detect obstacles in the surrounding environment, providing users with timely alerts to navigate safely through the store.

FUNCTIONALITY:

1. **Real-Time Navigation Assistance:**

   The Smart Shopping Trolley System offers users real-time navigation assistance, guiding them through the store and helping them locate desired products effortlessly.

2. **Obstacle Identification:**

   Utilizing ultrasonic sensors, the system detects obstacles in the user's path and provides audible or visual alerts to prevent collisions and ensure safe navigation.

3. **Product Identification:**

   Through IoT connectivity, the trolley accesses extensive product databases, allowing users to obtain detailed information about specific products simply by interacting with the system.

4. **User Preference Storage:**

   The system securely stores user preferences, such as preferred product categories or navigation settings, to personalize the shopping experience for each individual user.

The Smart Shopping Trolley System represents a significant advancement in assistive technology, offering a holistic solution to enhance the shopping experience for visually impaired individuals. By combining innovative components and functionalities, this system not only facilitates independent navigation and product identification but also prioritizes user privacy, safety, and efficiency in the retailenvironment.

3.4 FEASIBILITY STUDY

The feasibility study assesses the viability of the proposed system for providing legal support to marginalized communities. From a technical perspective, the system demonstrates feasibility, leveraging readily available hardware, open-source software, and the expertise required for AI development and integration. Economic feasibility analysis considers development and operational costs, alongside potential returns on investment (ROI) and break-even points, indicating long-term economic viability. Overall, the study concludes the proposed system is technically, economically, and organizationally feasible, with the potential to deliver significant benefits in enhancing access to legal support and empowering marginalized communities.

3.4.1 TESTS OF FEASIBILITY

The feasibility of implementing the shopping assistance system for visually impaired shoppers is assessed through four key tests. The technical feasibility test ensures the compatibility and functionality of hardware and software components, such as the NodeMCU microcontroller, ultrasonic sensors, LCD display, and voice playback speaker, essential for real-time navigation assistance and product identification features. Operational feasibility is evaluated through user acceptance testing with visually impaired shoppers, training sessions for store staff, and integration testing with existing store infrastructure.

3.4.1.1 TECHNICAL FEASIBILITY

The technical feasibility test plays a critical role in evaluating the compatibility and operational capabilities of the hardware and software components essential for the successful implementation of the shopping assistance system. This examination is pivotal in ensuring that each component, including the NodeMCU microcontroller, ultrasonic sensors, LCD display, and voice playback speaker, not only functions independently but also integrates seamlessly with one another to deliver the system's core functionalities effectively. The technical feasibility test may also involve assessing the power consumption and energy efficiency of the system components to ensure optimal performance and longevity, particularly in environments where prolonged usage is expected, such as during extended shopping trips.

3.4.1.2 OPERATIONAL FEASIBILITY

.

The operational feasibility test is a crucial phase in the development and implementation of the shopping assistance system, focusing on its usability and effectiveness in real-world scenarios. Additionally, comprehensive training sessions are conducted for both store staff and users to ensure they acquire the necessary skills and knowledge to proficiently operate and maintain the system .This training is vital for enabling smooth integration of the shopping assistance system into daily store operations. By thoroughly examining these aspects, the operational feasibility test aims to validate the system's practicality and functionality in real-world environments, ensuring it meets the diverse needs and expectations of both users and store personnel alike.

3.4.1.3 ECONOMICAL FEASIBILITY

Another crucial aspect of the operational feasibility test revolves around evaluating the adaptability of the shopping assistance system to accommodate the diverse array of shopping environments and store layouts encountered in real-world settings. It involves analyzing how well the system navigates through aisles, identifies products, and provides assistance in different store setups. By simulating these dynamic scenarios and observing how the system responds, the test ensures that the shopping assistance system can dynamically adjust its navigation and guidance capabilities to accommodate real-time changes in the shopping environment.

CHAPTER 4

SYSTEM SPECIFICATION

4.1 HARDWARE REQUIREMENTS

Node MCU	: 5 Volt
LCD Display	: 16*2 LCD
RFID Reader	: RFID EM-18
UltraSonic Sensor	: 333KHz

4.2 SOFTWARE REQUIREMENTS

Programming Language	: Embedded C
Operating System	: Windows 11
VS Code	: 1.6 GHz

4.3 TOOLS & FRAMEWORKS:

In the shopping assistance system designed for people with disabilities (PWDs), the integration of IoT (Internet of Things) technology plays a pivotal role in enhancing the overall functionality and effectiveness of the solution. By leveraging IoT connectivity, the system enables seamless communication between the shopping trolley and a central server, facilitating access to product databases, storage of user preferences, and real-time assistance for visually impaired shoppers throughout their shopping journey. This interconnected network of devices and servers allows for the efficient exchange of data and information.

Tools and Frameworks Used in the Shopping Assistance System for PWDs:

1. **Ultrasonic Sensor Library:**

   Libraries such as NewPing or HC-SR04 Ultrasonic Sensor Library are utilized to interface the ultrasonic sensor with the NodeMCU microcontroller. These libraries offer pre-written code for obstacle detection and distance measurement, simplifying the development process.

2. **LCD Display Library:**

   Libraries like LiquidCrystal or Adafruit's GFX Library are employed to interact with the LCD display connected to the NodeMCU microcontroller. These libraries facilitate the display of navigation instructions, product information, and other relevant data on the screen.

3. **Text-to-Speech (TTS) Library:**

   TTS libraries such as Google Text-to-Speech API or MaryTTS are integrated into the system to convert text-based information into audible feedback. This allows visually impaired shoppers to receive auditory instructions and feedback through the voice playback speaker connected to the NodeMCU.

4. **IoT Platform:**

   IoT platforms such as AWS IoT, Google Cloud IoT, or Microsoft Azure IoT are used to establish communication between the shopping trolley and a central server. These platforms also provide robust security features such as device authentication, encryption, and access control, ensuring the integrity and confidentiality of data exchanged between the shopping trolley and the central server, thus safeguarding sensitive information of visually impaired shoppers.

CHAPTER 5
SOFTWARE DESCRIPTION

Controlling Arduino Board with Smartphone and Blynk via Internet:

This is my first work concerning the use of Blynk application to control the Arduino board. Blynk allow us to create applications and then use it to control Arduino board connected to a PC with internet access, from any where in the world, (for instance, controlled, servos, receive data, etc), with a smartphone. It is one of the most interesting actions! The connection can also be established by Bluetooth between smartphone and Arduino board, but this will be not presented in this work.

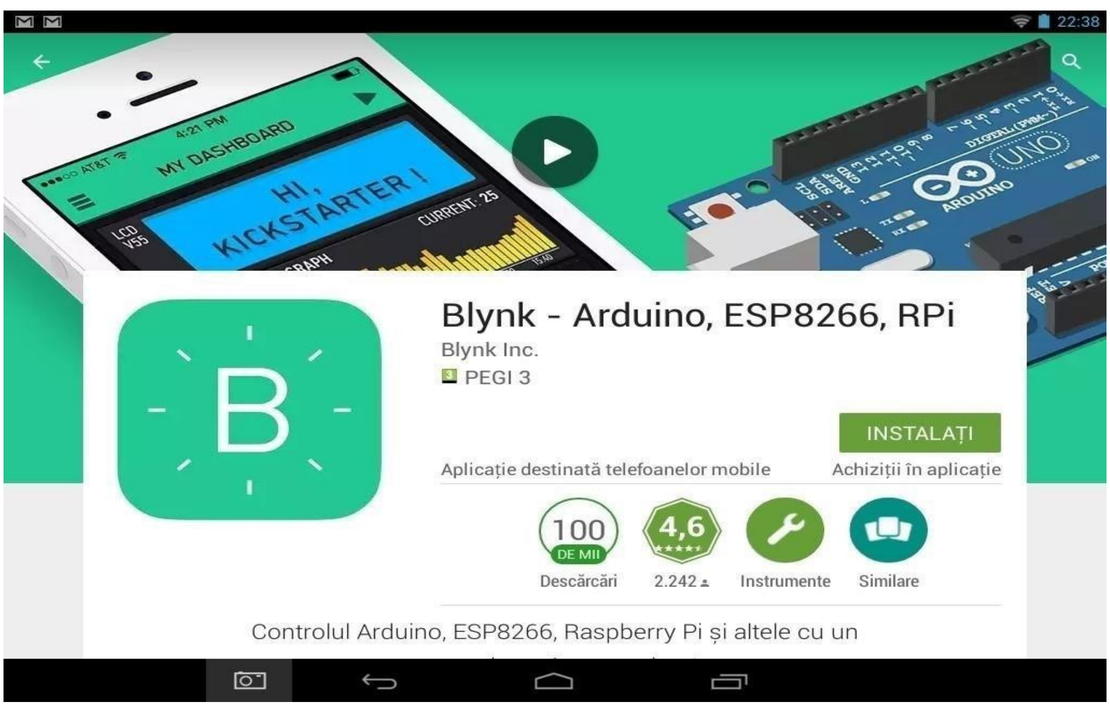
Blynk can be download from Google play store (for Android).& app store (for apple), providing us the dashboard as well as the connectivity to Arduino, (it is a virtual connectivity). Programming Blynk is very simple, push and drag widgets formthe tools bar and allocating them pins on Arduino board. For such project can be usedan ordinary Arduino board, without internet shield, connected to a PC with internet access and a smartphone. The role of PC is to ensure the connectivity of the Arduino board to the internet and to upload the Arduino code. For this purpose, it is necessarily to install Blynk library on the PC and made some settings.

The Arduino codes used for Blynk have the same structure as ordinary codes, but contain specific parts to communicate with Android devices. I will present a simple example, taken from internet, and partially modified by me. You can see that creating new codes is almost similar with the coding of the ordinary Arduino.

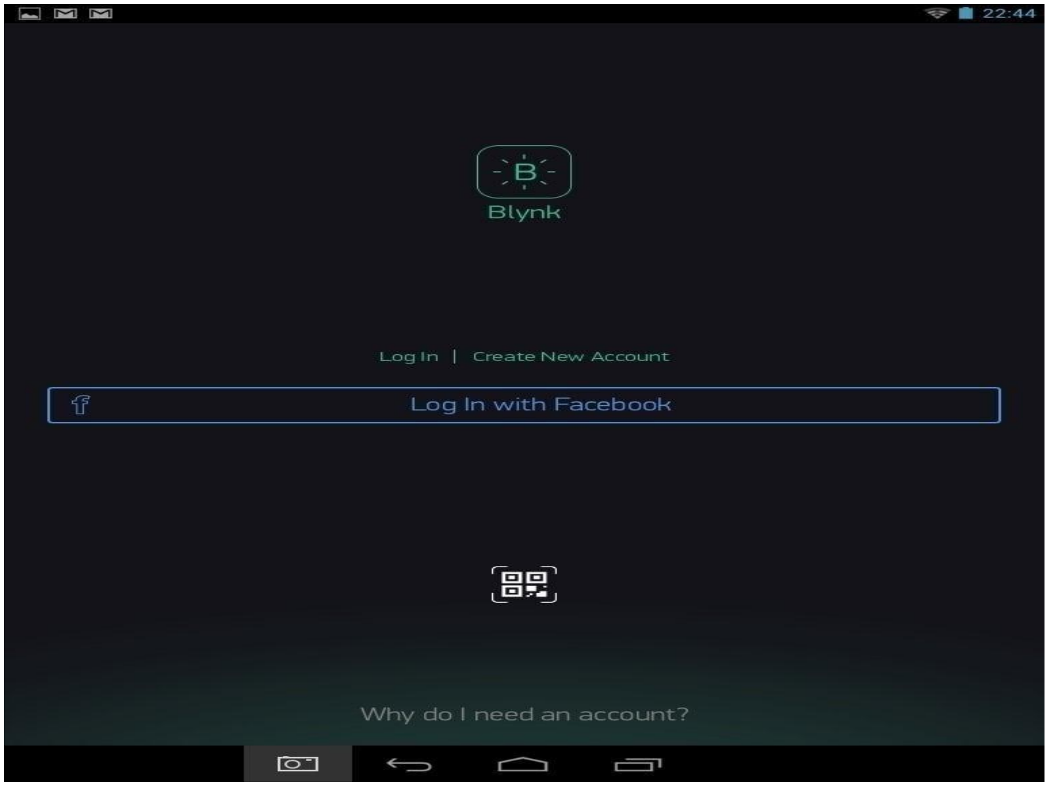
To create our first project we need to follows many steps.

1. Install Blynk app on your smartphone and create your simplest application, for instance control one led.
2. Download blynk v0.3.1 library and install on your PC. Set the right port of the PC to communicate with the Arduino board, (very important), from the script of the Blynk library.
3. Upload the Arduino code, (from the examples presented in this work, or other).
4. Run the Blynk on the smartphone

1. Download Blynk and install on the smartphone.

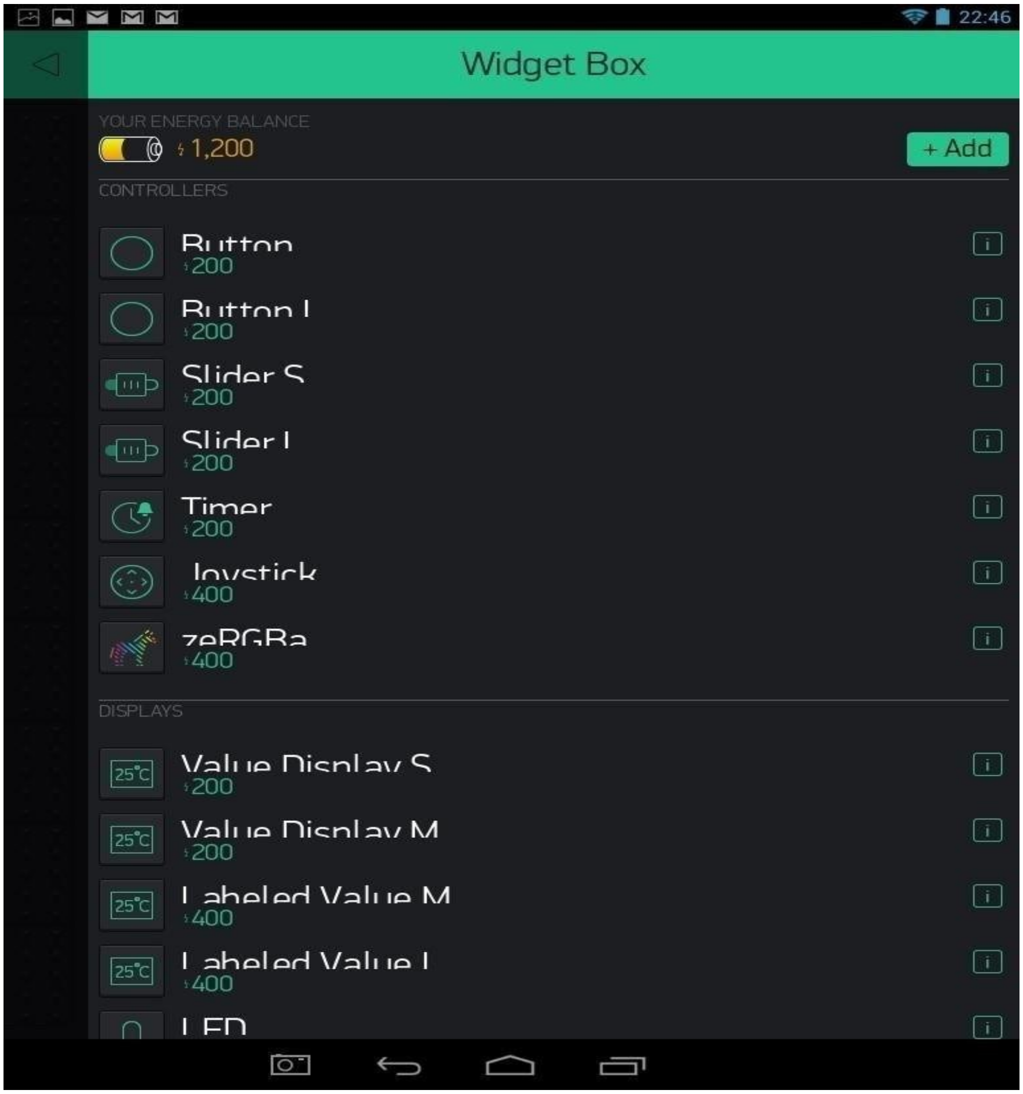


2. Create an account with your email and password. This e-mail will be used by Blynk server to send your "YourAuthToken", which allows only you to command the Arduino board.

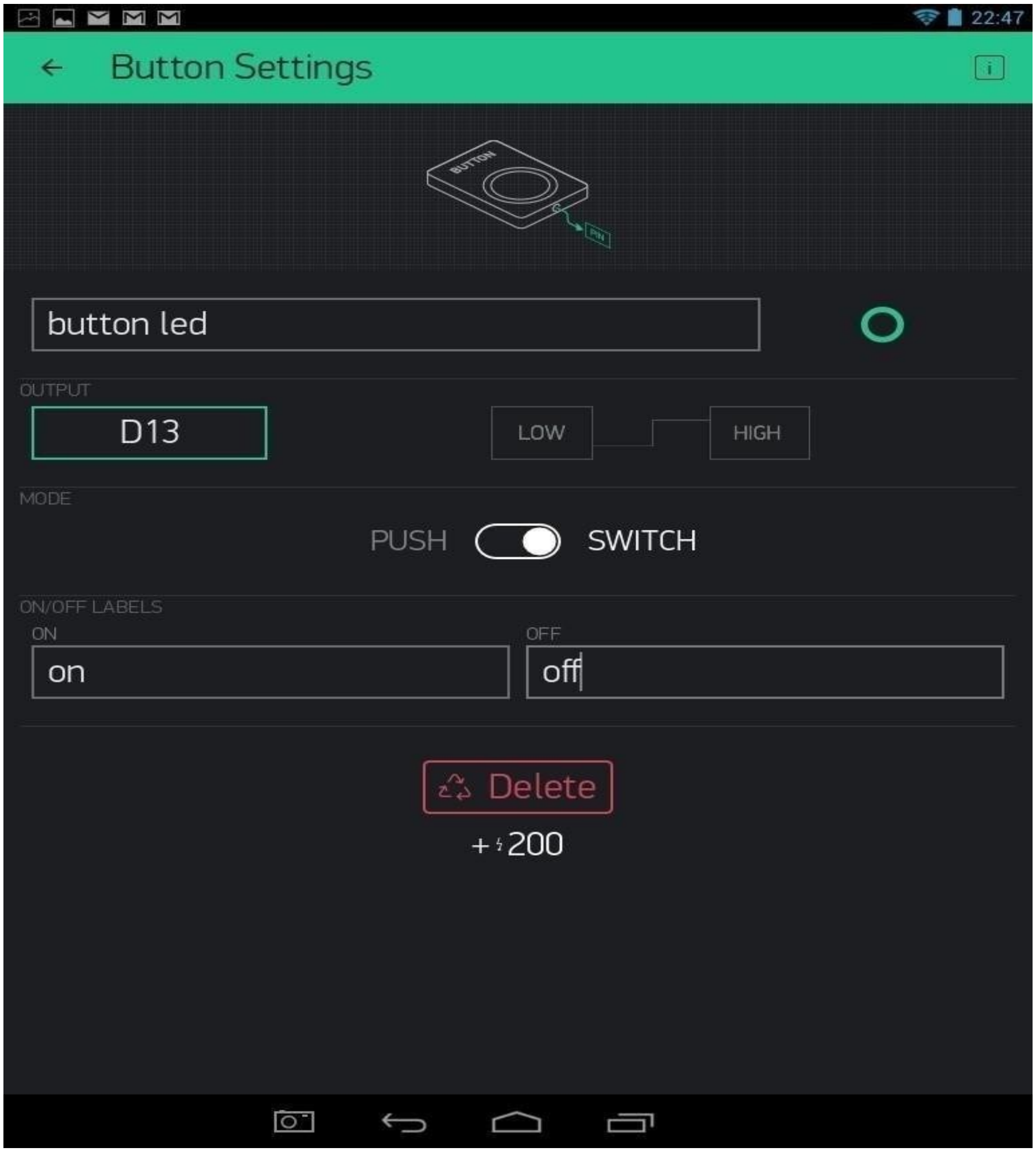


3. Open a new project, give it a name, select your board, and Email the "YourAuthToken", and then create. The "YourAuthToken" is a series of letters and numbers appearing above the E-mail button. This"YourAuthToken"must be introduced into your Arduino code .

4. Go to the Widget Box and select the desired widget, in our case Button.



5. Drag it into the dashboard, give it a name, (button led), and select the Arduino pin to which will be connected, in our case D13. Select the color, (optional), and the mode of activation, switches for our project. After uploading the Arduino code on the board and after setting the right ports of the computer, play the application on your smartphone. Of course, the computer and the smartphone must be connected to the internet. That's all.



In conclusion, setting up Blynk for controlling Arduino boards via smartphone involves downloading the app, creating an account, and obtaining the unique "YourAuthToken" for authentication. After creating a new project and selecting the desired widget, such as a button, users can customize its settings and assign it to a specific Arduino pin. Upon uploading the Arduino code and ensuring internet connectivity, users can remotely control their Arduino board through the Blynk app on their smartphone, facilitating seamless interaction with connected devices.

CHAPTER 6

PROJECT DESCRIPTION

The Shopping Assistance System for Persons with Disabilities (PWDs) is a cutting-edge solution designed to revolutionize the shopping experience for visually impaired shoppers. By leveraging advanced technology, including the NodeMCUmicrocontroller and IoT connectivity, the system provides a comprehensive set of features aimed at enhancing accessibility and convenience for users. The NodeMCU serves as the central controller, facilitating seamless data exchange between the various components of the system, including the ultrasonic sensor for obstacle detection, the LCD display for presenting information, and the voice playback speaker for auditory feedback. Through IoT connectivity, the shopping trolley communicates with a central server, allowing users to access product databases, store personal preferences, and receive real-time assistance throughout their shopping journey.

6.1 OVERVIEW OF THE PROJECT

The Shopping Assistance System for Persons with Disabilities (PWDs) is a comprehensive solution designed to improve the shopping experience for visually impaired individuals. Leveraging innovative technology, such as the NodeMCU microcontroller and IoT connectivity, the system aims to provide real-time navigation assistance, product identification, and interactive shopping features. The NodeMCU acts as the central controller, facilitating communication between components like the ultrasonic sensor, LCD display, and voice playback speaker. Through IoT connectivity, the system communicates with a central server to access product databases and store user preferences to have a effectively and enjoy a more inclusive shopping experience.

6.2 MODULE DESCRIPTION

6.2.1 HARDWARE ASSEMBLY

The hardware assembly for the shopping assistance system is essential for enhancing the shopping experience of visually impaired shoppers, with the NodeMCU microcontroller serving as the central coordinator. Responsible for managing data exchange among peripheral components, the NodeMCU processes sensor data, oversees IoT connectivity, and regulates overall system operation. Key components include the ultrasonic sensor, mounted on the shopping trolley, which detects obstacles by emitting sound waves and measuring their reflection time. Complementing this, the LCD display provides real-time navigation assistance and displays product information in a user-friendly format, while a voice playback speaker offers auditory feedback through text-to-speech technology. Overall, thehardware assembly of the shopping assistance system combines these components into an integrated solution, providing real-time navigation assistance, product identification, and interactive shopping features to empower visually impaired individuals in their shopping endeavors.

6.2.2 RFID READ AND PRODUCT DISPLAY

In the described shopping assistance system, RFID (Radio-Frequency Identification) technology assumes a crucial role in enabling efficient product identification. Additionally, auditory feedback delivered through the voice playback speaker enhances accessibility for visually impaired users by converting RFID data into spoken words, facilitating effortless access to product details. Furthermore, leveraging IoT connectivity, the system accesses product databases, information and empowering users with informed decision-making capabilities. Ultimately, the integration of RFID technology enhances real-time product identification, thereby contributing significantly to a shopping experience tailored to the needs of individuals with visual impairments.

6.2.3 OBSTACLES DETECTION AND AUDIO FEEDBACK

The obstacle detection module, composed of an ultrasonic sensor and the NodeMCU server, ensures safe navigation for visually impaired shoppers by continuously scanning the surroundings and alerting users of obstacles. Detecting obstacles, the ultrasonic sensor works in conjunction with the NodeMCU server, which manages data exchange and integrates with other system components like the LCD display and voice playback speaker. This module delivers real-time obstacle detection and distance measurement, seamlessly enhancing the shopping experience. Similarly, the audio feedback module, comprising a voice playback speaker and the NodeMCU server, offers auditory cues and guidance to users. It facilitates navigation assistance, product identification, and error notifications, thereby improving user interaction and accessibility within the shopping environment. Through its integration with other system components, the audio feedback module ensures clear and informative auditory feedback, ultimately contributing to the development of a comprehensive shopping assistance system for visually impaired shoppers.

6.2.4 IoT APP INSTALLATION

Blynk offers a convenient platform for controlling Arduino boards remotely via smartphone applications. Users can download the Blynk app from the Google Play Store or the App Store to create virtual dashboards for controlling LEDs, servos, and more. Programming with Blynk is user-friendly, involving simple drag-and-drop actions to assign functions to Arduino pins. A standard Arduino board connected to a PC with internet access suffices for this setup. After installing the Blynk library on the PC and uploading Arduino code, users can run the Blynk app on their smartphone to begin controlling their Arduino projects from anywhere in the world.

6.3 ARCHITECTURE DIAGRAM

Here is the block representation called Architecture Diagram was shown below.

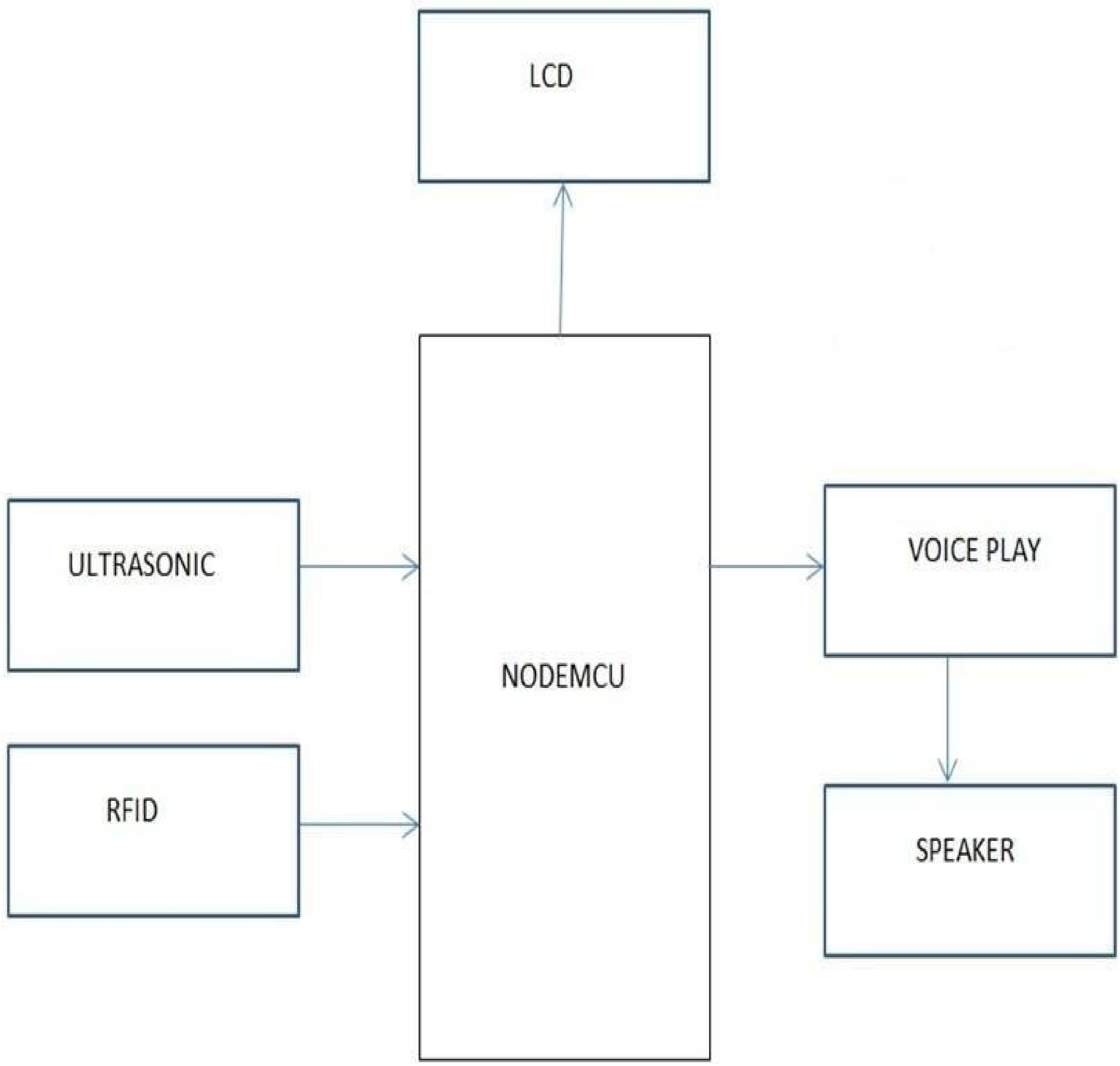


Fig.6.3 Architecture Diagram

COMPONENTS :

1. **LCD Display:**

The LCD display plays a crucial role as the visual interface for the shopping assistance system, catering specifically to visually impaired shoppers. Its primary function is to provide real-time navigation assistance and display essential product information. By presenting text and graphics in a user-friendly format, the display enables users to navigate through the store with ease and identify products efficiently. This information is communicated to the LCD display through the NodeMCU, which serves as a central hub, relaying data about obstacles, product details, and other relevant information. The display then presents this data to the user in a clear and comprehensible manner, facilitating a seamless shopping experience despite visual impairments.

2. **Ultrasonic Sensor:**

The ultrasonic sensor is responsible for detecting obstacles in the shopper's path. Mounted on the shopping trolley, the sensor emits high-frequency sound waves and measures the time it takes for them to bounce back after hitting obstacles.Based on these measurements, the sensor calculates the distance to nearby objects and sends this data to the NodeMCU. The NodeMCU then processes the information to provide real-time navigation assistance and obstacle detection for the visually impaired shopper.

3. **RFID Tag Reader:**

The RFID tag reader is another component that can be integrated into the shopping assistance system. RFID tags are attached to each product in the store, containing unique identification information. The RFID tag reader scans these tags when items are placed in the shopping trolley, allowing the system to identify products and provide detailed information about them. This enables visually impaired shoppers to access product details such as name, price, and ingredients, enhancing their shopping experience.

4. **NodeMCU:**

The NodeMCU serves as the central controller of the shopping assistance system. It coordinates data exchange between various components, including the LCD display, ultrasonic sensor, RFID tag reader, and voice playback speaker. The NodeMCU processes sensor data, manages IoT connectivity, and controls the overall operation of the system. It plays a crucial role in providing real-time navigation assistance, product identification, and interactive shopping features for visually impaired shoppers. In addition to coordinating data exchange, the NodeMCU also manages power distribution and regulates communication protocols to ensure seamless integration and functionality among all system components.

5. **Speaker/ Voice Playback:**

The NodeMCU's role extends beyond data coordination to include power management, ensuring efficient use of resources across the system. It also oversees communication protocols to facilitate smooth interaction between components, enhancing the overall reliability and performance of the shopping assistance system. Additionally, the NodeMCU's ability to process sensor data in real-time enables dynamic adaptation to changing shopping environments, further enhancing the user experience for visually impaired shoppers. The NodeMCU's firmware can be updated remotely, allowing for ongoing improvements and feature enhancements without requiring physical access to the device, ensuring scalability and future- proofing of the shopping assistance system.

CHAPTER 7

SYSTEM TESTING

System testing is a vital phase in software development, evaluating a system's functionality, performance, and reliability. It ensures the integrated system meets specified requirements and operates correctly in real-world scenarios. This phase, following unit and integration testing, verifies seamless component interactions and end-to-end behavior. It includes functionality, usability, performance, security, and compatibility testing to assess compliance with functional and non-functional requirements. Functionality testing confirms proper system function, usability testing evaluates user interface and experience, while performance testing gauges responsiveness and scalability. Overall, system testing validates system quality, ensuring readiness for deployment and instilling stakeholder confidence in meeting project goals.

7.1 TESTING METHODS

Testing methods encompass a range of approaches used to assess software quality and functionality. Unit testing involves testing individual components in isolation, ensuring they function correctly. Integration testing verifies interactions between integrated components, while system testing evaluates the entire system's behavior. Security testing identifies vulnerabilities and ensures data protection. Usability testing evaluates the system's user interface and experience, while compatibility testing confirms operation across different environments. Automated testing streamlines repetitive tasks, and exploratory testing involves spontaneous, unscripted testing to uncover defects. Overall, testing methods ensure software reliability, functionality, and user satisfaction throughout the development lifecycle.

7.2 TYPES OF TESTING

7.2.1 UNIT TESTING

Unit testing in a sensor-based smart trolley for PWDs involves testing individual components like ultrasonic sensors and RFID readers to ensure accurate functionality and integration with the central controller. These tests verify sensor accuracy and responsiveness to different shopping environments, alongside assessing communication interfaces for seamless integration. Thorough unit testing helps identify and address defects early, ensuring overall system reliability and performance.

7.2.2 INTEGRATION TESTING

Integration testing in a sensor-based smart trolley for PWDs verifies the compatibility and interaction between components like sensors, the NodeMCU, and communication interfaces. This testing phase confirms the system's proper functionality and detects any issues related to component interactions or data exchange.

7.2.3 FUNCTIONAL TESTING

Functional testing in a sensor-based smart trolley for PWDs involves evaluating the system's functionalities to ensure they meet specified requirements. This testing assesses features like real-time navigation assistance, obstacle detection, and product identification to ensure they perform as intended.

7.2.4 VALIDATION TESTING

Validation testing in a sensor-based smart trolley for PWDs confirms that the system effectively aids visually impaired shoppers by providing accurate navigation, obstacle detection, and product identification.

7.2.5 ACCEPTANCE TESTING

Acceptance testing for a sensor-based smart trolley for PWDs assesses real-world usability and satisfaction among visually impaired shoppers. Through user testing and training sessions, the system's practicality, functionality, andintegration with existing store infrastructure are validated, ensuring it meets diverse user needs and expectations.

7.2.6 WHITE BOX TESTING

White box testing in the smart trolley system ensures code correctness, design compliance, and full execution path coverage. It identifies errors, boosts performance, and enhances code quality, vital for improving functionality and usability for visually impaired shoppers.

7.2.7 BLACK BOX TESTING

Black box testing assesses the smart trolley's functionality without inspecting internal structures. It validates accurate navigation,obstacle detection, and product identification for visually impaired shoppers, ensuring usability and reliability in real-world scenarios.

7.2.7.1 METHODS OF BLACK BOX TESTING

Black box testing methods for a sensor-based smart trolley for PWDs involve assessing the system's functionality without examining its internal code. Techniques such as equivalence partitioning, boundary value analysis, and state transition testing are used to validate the system's inputs, outputs, and behavior. Testers create test cases based on user requirements and expected system behavior, focusing on scenarios relevant to visually impaired shoppers. By employing these black box testing techniques and tailoring test cases to user requirements, testers can effectively assess the functionality, usability, and accessibility of the sensor-based smart trolley for

Persons with Disabilities. This rigorous testing approach helps identify and address potential issues before deployment, ensuring a seamless and inclusive shopping experience for all users.

7.3 TESTING STRATEGY

The testing strategy for the sensor-based smart trolley for PWDs involves a comprehensive approach to validate the system's functionality, usability, and performance. It includes unit testing to assess individual components, integration testing to evaluate component interactions, functional testing to verify system features, validation testing to ensure user needs are met, and acceptance testing to confirm usability in real-world scenarios. Additionally, white box and black box testing methods are employed to analyze internal code and assess system behavior without knowledge of the internal structure, respectively.

7.4 TEST CASE RESULT

Test case results for the sensor-based smart trolley for PWDs provide insights into the system's performance and adherence to specified requirements. These results indicate whether navigation assistance, obstacle detection, product identification, and user interface functionalities meet expected standards. By analyzing test case results, developers can identify any deviations or issues, prioritize necessary improvements, and ensure that the smart trolley functions reliably and effectively for visually impaired shoppers. The key components of test case results in includes Pass/Fail, Defects, Observation. These are some of the key components of the test cases that are used in test case results. These are the major and important used test cases which are always used in testing the test cases, which produces results. The outcomes are produced in the test case which depends upon the above mentioned test case results.

CHAPTER 8

SYSTEM IMPLEMENTATION

System implementation for the sensor-based smart trolley for PWDs involves the assembly and integration of hardware components, such as sensors, microcontrollers, displays, and speakers, into a functional system. This includes wiring the components, configuring the microcontroller (e.g., NodeMCU), and developing software to control sensor behavior, data processing, and user interfaces. Once implemented, the system undergoes testing and validation to ensure proper functionality, accuracy, and usability in assisting visually impaired shoppers during their shopping experience.

8.1 FRONTEND IMPLEMENTATION

Frontend implementation in a sensor-based shopping assistance system for PWDs involves the development and deployment of the user-facing components of the system. In the context of such a system, frontend implementation typically includes the following elements:

1. Auditory Feedback: Integrating voice playback speakers or audio output devices to provide auditory feedback to users, particularly those with visual impairments. Auditory feedback may include spoken instructions, alerts, confirmation messages, and product descriptions, enhancing accessibility and user engagement. Voice prompts should be clear, concise, and easy to understand, with options for adjusting volume and speech speed if needed.

2. User Interaction: Implementing mechanisms for user interaction, such as touchscreens, buttons, or voice commands, to enable users to navigate the system and input information. User interaction should be designed to accommodate the specific needs and capabilities of visually impaired users, providing alternative input methods and ensuring ease of use and accessibility.

3. Real-time Updates: Incorporating features to provide real-time updates and feedback based on user actions and system inputs. This may include updating navigation instructions as the user moves through the store, dynamically displaying product information based on RFID scans, and providing timely alerts or notifications to users as needed.

8.2 BACKEND IMPLEMENTATION

Backend implementation in a sensor-based shopping assistance system for PWDs involves the development and deployment of the server-side components that manage data, logic, and communication between the frontend user interface and external systems. In the context of such a system, backend implementation typically includes the following elements:

1. IoT Connectivity: Integrating with IoT platforms and protocols to establish communication between the shopping trolley and the backend server. This enables the system to access real-time data from sensors, exchange information with external systems, and perform remote management and monitoring of connected devices.

3 API Development: Developing application programming interfaces (APIs) to enable communication between the frontend user interface and the backend server. APIs define the endpoints and data formats used for exchanging information between different system components, facilitating seamless interaction and integration.

Overall, backend implementation in a sensor-based shopping assistance system for PWDs focuses on ensuring the reliability, scalability, security, and performance of the server-side components that support the frontend user interface and enable seamless operation of the system.

CHAPTER 9

CONCLUSION & FUTURE ENHANCEMENTS

9.1 CONCLUSION

In conclusion, the shopping assistance system for PWDs represents a revolutionary advancement in accessibility technology, specifically designed tocater to the unique needs of visually impaired shoppers. Through the integration of cutting-edge components such as the NodeMCU, ultrasonic sensor, LCD display, and voice playback speaker, the system offers a holistic approach to navigating the shopping environment. By prioritizing accessibility, convenience, and inclusivity, the shopping assistance system for PWDs serves as a beacon of innovation, showcasing how technology can empower individuals and promote equitable experiences in everyday life.

9.1 FUTURE ENHANCEMENTS

One potential future enhancement for the shopping assistance system for Persons with Disabilities (PWDs) involves integrating advanced AI capabilities. With AI algorithms, the system could provide real-time navigation assistance by dynamically optimizing routes based on store layouts and crowdsourced data, ensuring visually impaired shoppers navigate efficiently and safely. Additionally, AI-powered image recognition technology could be integrated to enhance product identification, allowing the system to accurately describe items on shelves using cameras integrated into the trolley. Overall, integrating AI holds promise for a transformative evolution of the shopping assistance system, significantly improving the shopping experience for visually impaired individuals while promoting independence and accessibility in everyday activities.

CHAPTER 10

APPENDIX

10.1. SOURCE CODE

```
#define voice1 D0
#define voice2 D3
#define voice3 D7
#define voice4 D8



#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>

int trigPin = D6;    // Trigger
int echoPin = D5;    // Echo
long duration, cm, inches;


#define BLYNK_TEMPLATE_ID "TMPL39As4II1V"
#define BLYNK_TEMPLATE_NAME "SMART TROLLEY"
#define BLYNK_AUTH_TOKEN "r1M1RuNqDLpXilrwnuKH0EwYZZjeYiGe"

#include <LCD_I2C.h>

LCD_I2C lcd(0x27);
int count = 0;                                        // count = 0
char input[12];
char readert[]= "540026363175";
char readerb[]="4D00856A63C1";
char readerm[]="4D008B4FED64";
boolean flag = 0;                                     // flag =0

//
const char* ssid     = "IOT";
const char* password = "123456789";// flag =0

char auth[]=BLYNK_AUTH_TOKEN;


void setup()
{
    Serial.begin(9600);
    pinMode(voice1, OUTPUT);
    pinMode(voice2, OUTPUT);
    pinMode(voice3, OUTPUT);
    pinMode(voice4, OUTPUT);
```

```
    pinMode(echoPin, INPUT);
    lcd.begin();
    lcd.backlight();

        digitalWrite(voice1,HIGH);
digitalWrite(voice2,HIGH);
            digitalWrite(voice3,HIGH);
digitalWrite(voice4,HIGH);

     lcd.setCursor(0, 0);
     lcd.print("Automatic"); // You can make spaces using well... spaces
    lcd.setCursor(0, 1); // Or setting the cursor in the desired position
    lcd.print("Shopping cart");
    Blynk.begin(auth, ssid, password, "blynk.cloud", 80);
   lcd.clear();
}
void loop()
{

      Blynk.run();
  digitalWrite(trigPin, LOW);
  delayMicroseconds(5);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  pinMode(echoPin, INPUT);
  duration = pulseIn(echoPin, HIGH);

  // Convert the time into a distance
  cm = (duration/2) / 29.1;     // Divide by 29.1 or multiply by 0.0343
  inches = (duration/2) / 74;

  delay(500);
   lcd.setCursor(0,0);
   lcd.print("CM:"); // You can make spaces using well... spaces
   if(cm<=9){lcd.print("00");lcd.print(cm);}
   else if(cm<=99){lcd.print("0");lcd.print(cm);}
   else if(cm<=999){lcd.print("");lcd.print(cm);}
     Blynk.virtualWrite(V2,cm);
```

```
if(cm>1&&cm<6)
{

digitalWrite(voice1,LOW);
    Serial.print("person detected: ");
Blynk.virtualWrite(V3,"PERSON DETECTED ");
  Blynk.logEvent("msg","PERSON DETECTED ");
  lcd.setCursor(0, 0);
  lcd.print("PERSON  ");
  lcd.setCursor(0, 1); // Or setting the cursor in the desired position.
  lcd.print("DETECTED  ");
  delay(2000);
  lcd.clear();
  }
   else
   {
     digitalWrite(voice1,HIGH);
       Blynk.virtualWrite(V3,"                    ");
   }
Serial.print("cm1 : ");
Serial.println(cm);
  if(Serial.available())
  {
    count = 0;
    while(Serial.available() && count < 12)          // Read 12 characters and store them in input
array
    {
      input[count] = Serial.read();
      count++;
      delay(5);
    }
    Serial.print(input);                             // Print RFID tag number

  }
    if(strncmp(input,readert,12) == 0)
    {
       digitalWrite(voice2,LOW);
    lcd.setCursor(0, 0); // Or setting the cursor in the desired position.
    lcd.print("OIL     ");
    lcd.setCursor(0, 1); // Or setting the cursor in the desired position.
    lcd.print("1 LITRE  140Rs");// You can make spaces using well... spaces
```

```
 Blynk.virtualWrite(V0,"SALT");
       Blynk.virtualWrite(V1,"1kg 40Rs");
         Blynk.logEvent("msg","SALT 1kg  40Rs");
    delay(2000);
         input[0]='5';
         lcd.clear();
      digitalWrite(voice3,HIGH);
          Blynk.virtualWrite(V0,"            ");
        Blynk.virtualWrite(V1,"            ");

        }



//RFID 3 .....................................
 else if(strncmp(input,readerm,12) == 0)
      {

    Serial.println("Card 3 Detected");
          digitalWrite(voice4,LOW);
    lcd.setCursor(0, 0); // Or setting the cursor in the desired position.
    lcd.print("SUGAR     "); // You can make spaces using well ... spaces
       lcd.setCursor(0, 1); // Or setting the cursor in the desired position.
     lcd.print("1kg 30Rs");
    Blynk.virtualWrite(V0,"SUGAR");
        Blynk.virtualWrite(V1,"1kg 30Rs");
        Blynk.logEvent("msg","SUGAR 1kg  30Rs");

           delay(2000);
               lcd.clear();
                input[0]='5';
      digitalWrite(voice4,HIGH);
          Blynk.virtualWrite(V0,"            ");
        Blynk.virtualWrite(V1,"            ");
        }

}
```

10.2 SCREENSHOTS:

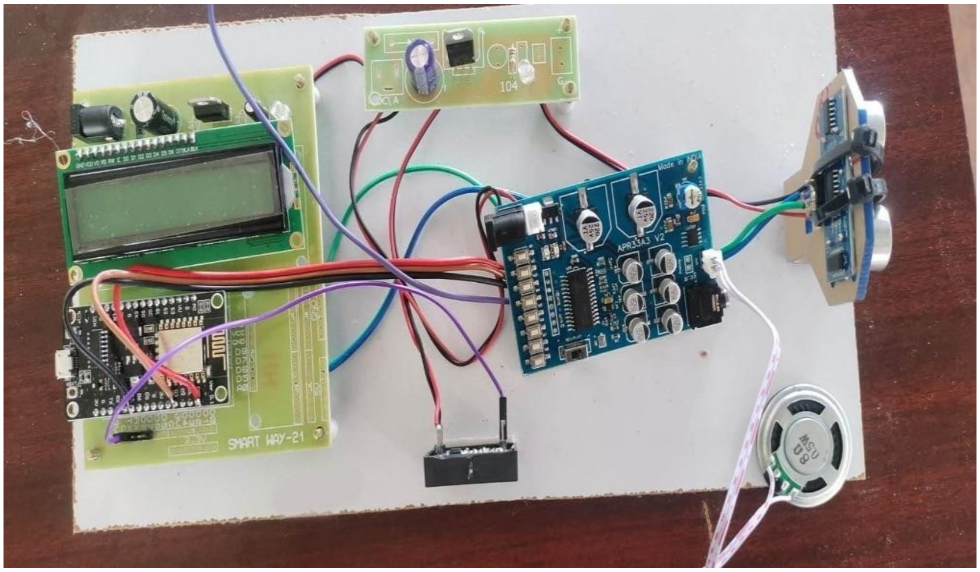


Fig.10.2.1 Hardware Assembly

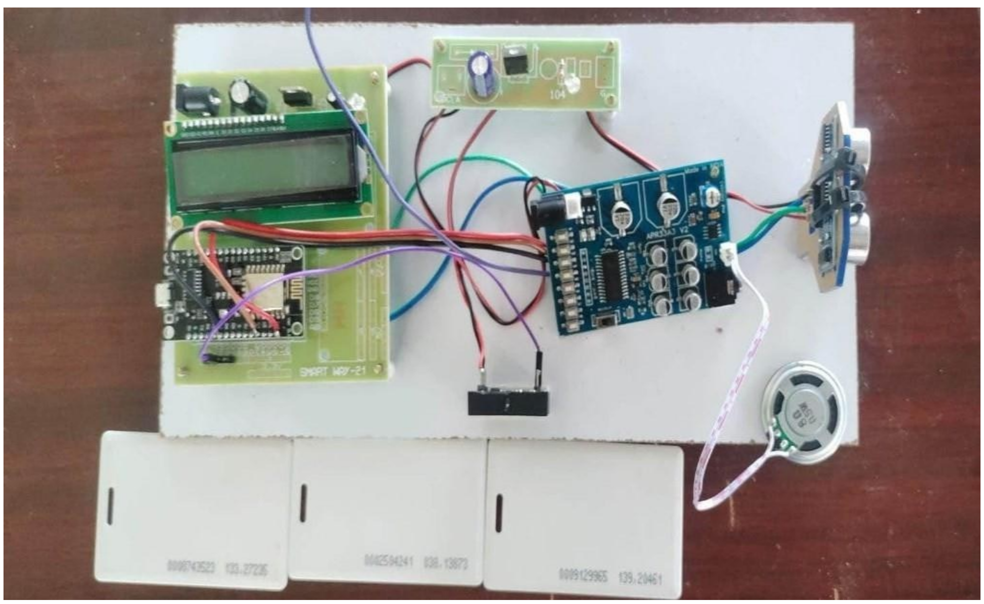


Fig.10.2.2 Hardware Assembly with RFID tags

Fig.10.2.3 Product Display in LCD Product 1

Fig.10.2.4 Product Display in LCD Product 2

Fig.10.2.5 Product Display in LCD – Product 3

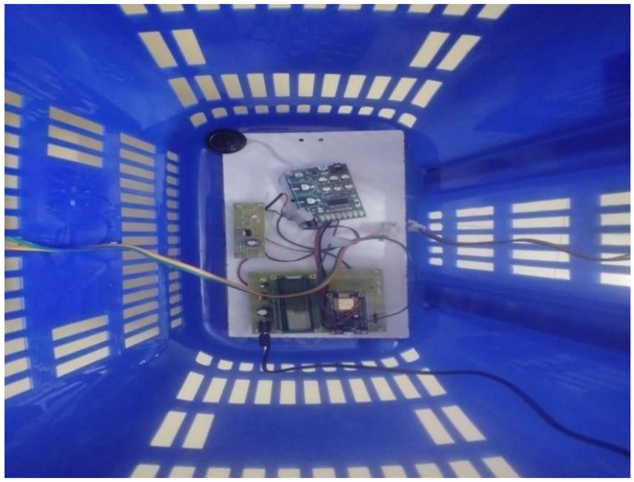


Fig.10.2.6 Hardware Attachment in Trolley

Fig.10.2.7 RFID Reader Fitted in Trolley

Fig.10.2.8 UltraSonic Sensor Fitted in Trolley

CHAPTER 11
REFERENCES

[1] Zeeshan Ali,Reena Sonkusare,"RFID based Smart Shopping: An Overview" in International Conference on Advances in “Communication and Computing ” Technologies ,Issue in 2014.

[2] Prasiddhi K.Khairnar, Dhanashri H. Gawali , "Innovative Shopping Cart For Smart Cities" in IEEE International Conference On Recent Trends in Electronics Information & Communication Technology (RTEICT), May 19-20, 2017, India.

[3] Mr.P.Chandrasekar, Ms.T. Sangeetha,"Smart Shopping Cart with Automatic Billing System through RFID and ZigBee" in IEEE S.A.Engineering College, Chennai, Tamil Nadu, 2014,India.

[4] Akshay Kumar, Abhinav Gupta, S. Balamurugan, S. Balaji and Marimuthu R., "Smart Shopping Cart" in School of Electrical Engineering, VIT University,Vellore IEEE,2017.

[5] Ruinian Li, Tianyi Song, Nicholas Capurso, "IoT Applications on Secure Smart Shopping" in International

Conference on Identification, Information and Knowledge in the Internet of Things, 2017.

[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 Intelligent Shopping Cart" in 3rd International Conference for Convergence in Technology (I2CT),Apr 06-08, 2018 India

[8] Ismahene Hadj Khalifa, Abdelkader Ei Kamel, Bernard Barfety, “real timeindoor intelligent navigation system inside hyper markets”, Science Direct journal, (2010).

[9] S. Kamble, S. Meshram, R. Thokal and R. Gakre, “Developing a Multitasking Shopping Trolley Based on RFID Technology”, International Journal of Soft Computing and Engineering, Vol.3, No.6, pp.179-183.2014

[10] Manan Rao, RFID Based Smart Trolley Using IoT, International Journal of Science and Research (IJSR), 2018.