IOT-Based Intelligent Shopping Trolley

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ABSTRACT

CERTIFICATE

Dated: _____

Final Approval

It is certified that project report titled '_____'
submitted by _____ for the partial fulfillment of the requirement

of **"Bachelor's Degree in Computer Science"** is approved.

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DECLARATION

We hereby declare that our dissertation is entirely our work and genuine / original. We understand that in case of discovery of any PLAGIARISM at any stage, our group will be assigned an F (FAIL) grade and it may result in withdrawal of our Bachelor's degree.

Group Members   **Signature**

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3. Student Name   _____

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1. Introduction

This section gives an overview of the proposal, introducing the main ideas and context. It explains what the document will cover and why it's important.

1.2. Purpose

The purpose of this project is to make shopping easier and more comfortable for customers. This Smart Shopping Trolley system is designed to remove the need to push heavy trolleys, reduce long waiting lines at the billing counter, and allow the customer to complete their payment directly through the trolley. By using sensors, QR scanning, and a cloud system, the trolley will help shoppers move freely, check their total bill anytime, and save time at checkout.

1.3. Problem Description

Shopping centers, like big supermarkets, are overcrowded during shopping hours, especially in the holiday season. These shopping trolleys become unbearable to move around when l oaded or after pushing them around for some time, that is the inconvenience of pushing or pulling the trolley and the discomfort it comes with. Furthermore, shoppers get faced with long queues when accessing the cashier, whether to request expenses to budget their shopping needs or to make final goods payment.

1.4. Proposed System

1.5. The proposed system is an IoT-based Smart Shopping Trolley designed to make shopping smarter, faster, and more convenient. It uses an Arduino microcontroller as the main control unit, integrated with sensors and an AP32 QR/Barcode Scanner for product identification. A web-based interface will be connected through Wi-Fi, allowing customers to view scanned product details, prices, and the total bill in real time on their smartphone or a mounted tablet. Each scanned item's information will be stored securely in a cloud database, ensuring accurate tracking and easy management of shopping data. The system will also support digital billing, helping reduce waiting time at the checkout counter. By combining automation, IoT connectivity, and a user-friendly interface, this proposed solution provides an easier, faster, and more efficient shopping experience for customers.

1.5.1. Features

Here, we list the main features of the proposed system, describing what it will be capable of and how it will help users. Each feature should relate back to solving the problems mentioned earlier.

1.5.1.1. System diagram [6]

This subsection includes a visual representation of the system's components and their interactions. A system diagram helps to visualize how different parts of the proposed system work together achieve the solution.

Figure 1.2 System Flow Diagram

1.6. Methodology

In this section, we outline the approach for conducting the project, detailing the data collection and analysis methods, as well as the tools and techniques used to meet the project's objectives.

1.7. Existing Systems

Here, we examine current solutions, discussing their strengths and weaknesses, and highlighting how the proposed system will address existing gaps and improve user experience.

1.6.1 Comparison Between Proposed System and Existing System

Table 1.1 Comparison Between Proposed system and Existing System

System	Feature	Feature	Feature	Feature	Feature	Feature	Feature
Proposed System	Yes	Yes	Yes	Yes	Yes	Yes	Yes
App 1	Yes	Yes	Yes	No	Yes	No	No
App 2	No	Yes	Yes	Yes	No	No	No
App 3	Yes	Yes	Yes	No	Yes	No	No
App 4	No	Yes	Yes	No	Yes	Yes	No

1.8. Project Scope

This project aims to develop an IoT-based Smart Shopping Trolley that can automatically follow the user, avoid obstacles, and scan products using QR codes. A web or mobile interface will display product details, total cost, and generate a digital pre-bill to save time at the checkout counter. The system will store all data in a cloud database and include both hardware and software components.In addition, the system will offer an online billing option where customers can view their total bill in real-time and make digital payments directly from the trolley to avoid long queues at the cashier.This project will be tested only in indoor supermarket environments and will work as a prototype to demonstrate automatic movement, product scanning, smart billing, and online payment features.

1.9. Goals and Objective

The main goal of this project is to make shopping easier and smarter by creating an IoT-based Smart Shopping Trolley. This trolley will move automatically and follow the shopper using sensors, removing the need to push or pull it. It will also detect and avoid people or objects to ensure safety.

Each product will have a QR code that can be scanned to display the item's name, price, and details on a web or mobile interface connected to the trolley. All scanned items will be stored in a cloud database, which will update the total bill instantly.The system will generate a digital pre-bill before reaching the cashier to reduce waiting time. Additionally, an online billing and payment option will be included so customers can pay directly through the trolley system and avoid standing in long queues.Shoppers can also check their total expenses anytime to stay within their budget.
Overall, this project aims to provide a hands-free, fast, smart, and convenient shopping experience for users.

1.10. Feasibility Study

The Smart Shopping Trolley project is practical and achievable with the available tools and resources. It is technically feasible because it uses components like Arduino, sensors, and a QR scanner that are easy to program and integrate. The economic feasibility is also strong, as the system is low-cost to build and reduces the need for manual billing staff, saving time and money in the long run. The operational feasibility shows that customers will easily accept this system since it makes shopping faster, smarter, and hands-free. Finally, the time feasibility ensures that the project can be completed within the given duration using simple hardware and web tools. Overall, the system is efficient, affordable, and ready for real-world implementation in supermarkets.

1.10.1.   Social Feasibility:

Examines the social acceptance of the project, assessing its impact and benefits to users and the community.

1.10.2.   Technical Feasibility:

Examines the social acceptance of the project, assessing its impact and benefits to users and the community.

1.11. Expected Outcomes

The **Smart Shopping Trolley** project is designed to make shopping faster, smarter, and more efficient. One of the main outcomes is the **elimination of long checkout queues, allowing customers to complete their purchases without waiting. The system provides real-time budget tracking** through its web interface, displaying the total bill instantly as items are scanned. It also supports *secure and hands-free digital payments, making the checkout process simple and convenient. For retailers, the system will **improve store efficiency** by reducing the need for manual cashiers and minimizing billing errors through a**ccurate AP32 scanning** and

cloud-based data storage. The successful integration of **Arduino, AP32 Scanner, Wi-Fi, and a cloud-connected web interface** demonstrates a functional and reliable IoT-based system. Overall, the project will deliver a modern, automated shopping solution that enhances customer experience and improves operational productivity.

1.12. Tools and Technologies

This section provides an overview of the software, programming languages, frameworks, and hardware required for the project, explaining how each tool and technology supports the development and implementation of the proposed system.

Table 1.3 Tools and Technologies

Technology	Description
Flutter	
Firebase	

1.13. Expertise of Team Members

This section highlights the qualifications, skills, and experience of each team member, showcasing how their expertise contributes to the successful execution of the project.

Table 1.4 Expertise od Team Members

Team Member	Expertise
Malieka Naveed	●
Mahnoor	
Syeda Anabia Liaquat	

1.14. Milestones

This section outlines the key stages of the project, detailing the significant achievements or deliverables at each phase, along with the expected timeline for their completion.

Table 1.5 Milestones

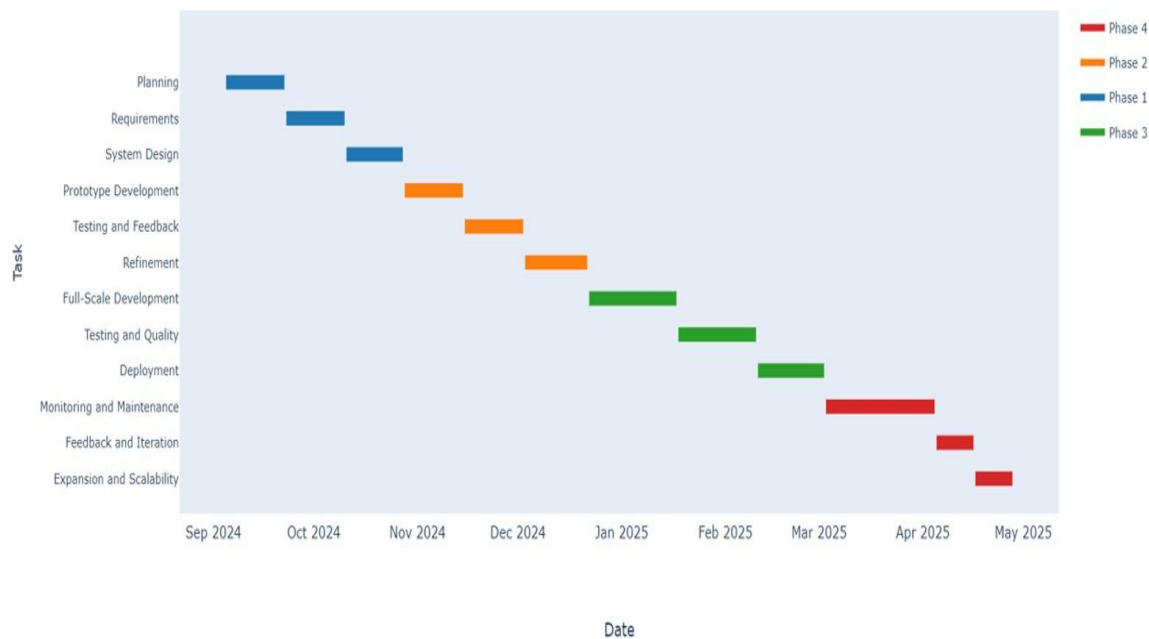| Increment	Tasks	Start Date	End Date	Duration
First Increment	Project Planning & Requirement Analysis	1-july-25	1-Nov-25	120
Second Increment	Prototype Development	11-Nov-24	30-Nov-24	20
Third Increment	Full-Scale Development	11-Jan-25	31-Jan-25	21
Fourth Increment	Monitoring and Maintenance	11-Mar-25	30-Mar-25	20

1.15. Gantt Chart [7]

Figure 1.7 Gantt Chart

1.16. Summary

This section provides a concise recap of the project, highlighting the main points discussed, including the methodology, goals, expected outcomes, and the significance of the proposed system in addressing the identified problems.

REFERENCES

This section lists all the sources related to the existing system, formatted according to APA 6th edition guidelines.

[1]   "Keeping London moving - Transport for London," TRANSPORT FOR LONDON, [Online]. Available: https://tfl.gov.uk/. [Accessed 05 05 2024].