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Smart Shopping Facilitator for Visually Impaiared using Speech to Text AI Model

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Abstract: *Visual impairment is one of the disabilities of a human being. To date, numerous methods have been proposed to enhance the lifestyle of visually impaired and blind people. Still, purchasing products in the e-shopping application without others' support is tricky for them. The project describes a system that guides to help them in identifying and purchasing products in a supermarket application. The audio instructions will assist them inside the supermarket application based on real-time situations. To make the supermarket smarter, the billing system is automated, eliminating the existing queuing system. The ultimate aim of this system is to eliminate the need for others' support during shopping and provide visually impaired people with a convenient and sophisticated environment. Implementing this system will facilitate shopping for blind people, save customers' time, and promote business sales*

Keywords: Smart Shopping, Visually Impaired Speech-to-Text, Assistive AI, Voice Interface

I. INTRODUCTION

In this smart digital world, people are becoming more dependent on technology in their daily lives. One of the most visible changes in this era is the way humans interact with intelligent systems like Voice Assistants (VAs) and E-Commerce platforms. These technologies are designed to make human life more comfortable, efficient, and accessible. However, the growing use of Artificial Intelligence (AI)-based systems like VAs also introduces new challenges, especially in terms of user privacy, emotional connection, and interface personalization.

digital voice-controlled systems such as Amazon Alexa and Google Assistant have become common in households, offering users the ability to interact with smart devices easily. But in shared environments, these systems may risk revealing private data due to weak access control mechanisms. Hence, better privacy safeguards are needed to make these systems more secure.

On the other hand, E-Commerce platforms are also using AI and Machine Learning (ML) to provide smarter, more personalized user experiences. Traditional interfaces that serve all users in the same way are no longer sufficient. By applying multivariate user interfaces, online businesses can adapt layouts and features based on customer behaviors, increasing satisfaction and business growth.

Moreover, the emotional connection between humans and AI systems is another important topic. Unlike traditional technologies, modern AI-based systems can display human-like behaviors, which may create emotional attachments similar to interpersonal relationships. For example, using psychological theories like Sternberg's Triangular Theory of Love, researchers have found that users may experience feelings of passion, intimacy, and commitment toward AI, forming what can be called "Love for AI."

Thus, with the help of intelligent technologies and emotional AI systems, a better and more inclusive experience can be created for all users, including those with disabilities or specific needs. Continuous research and development in this area is essential to improve not only the technical aspects but also the human experience and trust in AI systems.

II. LITERATURE SURVEY

A. Magnusson et al. (2012) conducted a study on navigation and recognition in complex haptic virtual environments through the lens of blind users. The research emphasized the importance of haptic feedback systems and user-centered design to improve accessibility in virtual spaces

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B. Earlier, C. Sjostrom (1999) explored Touch Access for People with Disabilities at CERTEC Lund University. His work laid foundational insights into the development of tactile interfaces that empower users with disabilities to interact more effectively with digital content [2].

C. Zeeshan Ali and Reena Sonkusare (2014) provided an overview of RFID-based smart shopping and billing systems, focusing on automation and time-saving during checkout processes. Their research highlighted the importance of integrating RFID for smarter retail infrastructure [4].

D. Chandra Sekar P and Sangeetha T (2015) further developed this idea with the RFID-Based Smart Shopping Cart, reinforcing the relevance of IoT and automation in modern shopping solutions [5].

E. Adam Wasilewski and Grzegorz Kolaczek (2024), who proposed a Multivariant User Interface approach. Their study utilized AI techniques to tailor interface designs according to customer behavior, enhancing user satisfaction and business outcomes [6].

F. Debajyoti Pal et al. (2023) examined the intelligent attributes of voice assistants and introduced the concept of 'Love for AI' based on Sternberg's Triangular Theory of Love. Their SEM-based study identified how AI's anthropomorphic features influence user trust and engagement [7].

G. Hassan A. Shafei and Chiu C. Tan (2024) addressed critical issues in multi-user voice systems, specifically the access control vulnerabilities in shared environments like households. They proposed a framework to evaluate these risks and recommended improvements to ensure user privacy and data protection [8].

III. RESULTS AND DISCUSSION

A. Motivation

1. Empowering Blind and Visually Impaired Individuals

One of the core motivations is to support independent living for visually impaired and blind individuals, especially when it comes to performing everyday tasks like shopping. Currently, such individuals often rely heavily on others to help them navigate store aisles, locate products, and complete billing procedures. By introducing a smart shopping system based on voice commands and intelligent technologies, the project enables greater autonomy and confidence among users. This promotes inclusivity and contributes to a more equitable society where assistive technology bridges the gap caused by visual impairment.

2. Reduced Store Traffic and Billing Counter Congestion

In conventional shopping environments, long queues at billing counters are a common issue, especially during peak hours. This often leads to crowding and longer waiting times, which can be particularly stressful for people with disabilities. The proposed smart shopping system aims to automate various shopping and billing processes using technologies like RFID and AI-based voice assistants. This reduces manual intervention and checkout time, streamlining the entire customer journey and minimizing congestion in stores.

3. Enhanced Public Safety and Hygiene

In today's world, particularly in the context of post-pandemic public behavior, minimizing unnecessary physical interaction and surface contact has become essential. Traditional shopping requires users to handle physical menus, carts, or billing devices, which may increase the risk of spreading infections. The implementation of a voice-controlled, contactless system not only enhances hygiene but also ensures safer shopping experiences for all users especially those with health vulnerabilities. This aligns with broader public health goals of creating safer, touch-free public environments.

4. Real-Time Data Collection and Intelligent Insights

Another strong motivation is the ability of the system to gather and analyze real-time data related to user behavior, shopping preferences, frequently purchased products, and store navigation patterns

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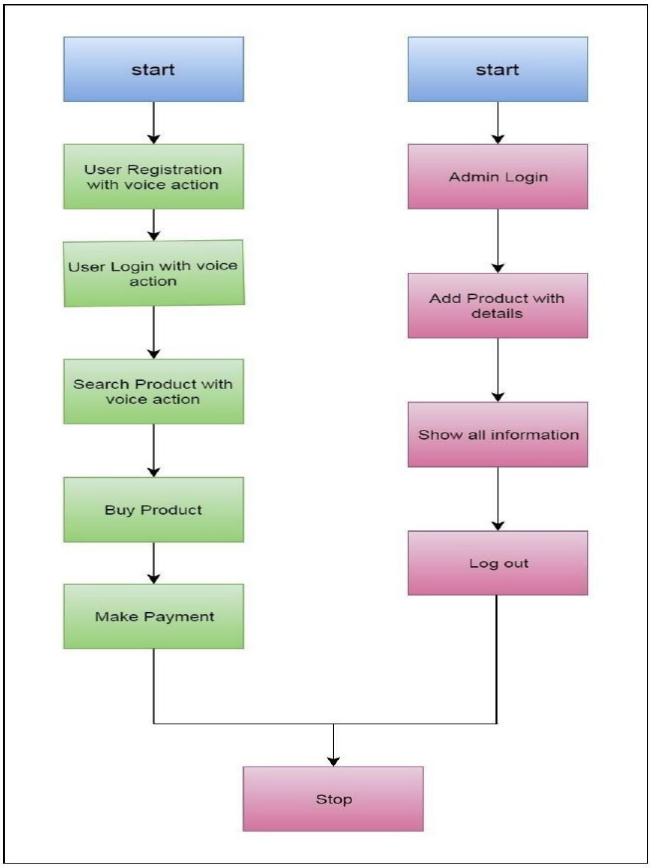

Fig1 Activity Diagram

This system ensures a fully voice-assisted shopping experience, combining convenience and accessibility. It enables blind users to search, select, and purchase products independently, while admins manage the backend efficiently.

Proposed System

Proposed System introduces a smart shopping facilitator for blind. The system mainly meant for blind can also be used for normal people. Automatic Product details & Billing is introduced in the smart announcement techniques. And payment using cash on delivery or online can be done within the system. So that waiting long for billing & Visually impaired people can be avoided. The audio instructions will assist them inside the supermarket application based on the real-time situations. And these Audio instructions help blind people purchase products inside the supermarket application. The guidelines are given to select products. While reading product id and all the details about product are given through the microphone (Auxout).

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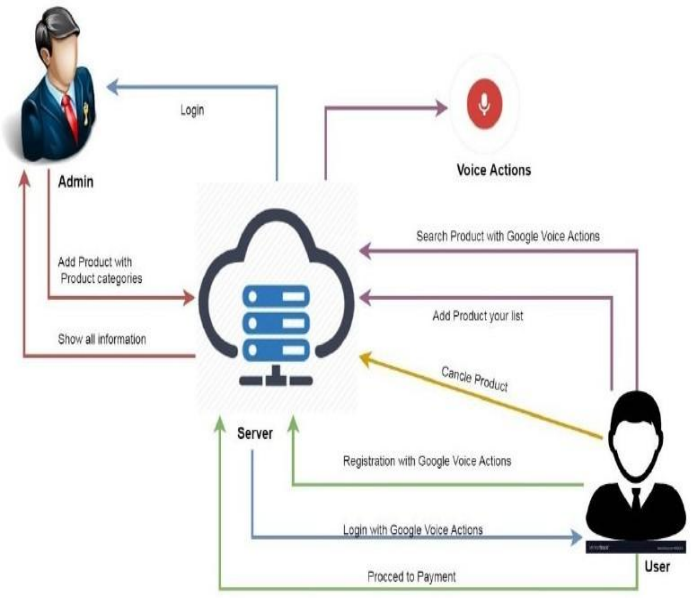

Fig 2 : System Architecture

Core Features: Automatic product detection and audio description. Voice-based navigation within the supermarket application. Smart billing system to reduce waiting time. Flexible payment methods (Online or Cash on Delivery).

User Interface: Users interact through Google Voice Actions or similar voice interfaces. Product details are read out via AUX output earphones for user clarity.

Admin Functions: Admin can manage the product database (add/update/delete products).System monitoring and control of inventory data.

System Architecture Components:

- User Module – Registration, product selection, and payment via voice.
- Admin Module – Manages backend operations and product inventory.
- Server Module – Connects all components and handles real-time data flow.
- Voice Interface – Converts voice commands into system actions and plays audio instructions.

IV. CONCLUSION

The proposed smart shopping system with Automated Central Billing (ACBS) streamlines the shopping process by enabling voice-based product search and automated billing, reducing wait times and manual labor. It enhances efficiency, minimizes theft, and offers a reliable, user-friendly solution for visually impaired users. Overall, it promotes a more accessible and time-effective retail experience.

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