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Smart Shopping Assistance for the Blind:A Feed –Forward Neural Network Approach

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Abstract: — Disability is the state of a person in which one has to depend on others for their own needs. Visual impairment is one of the disabilities of a human being. To date numerous methods had been proposed to enhance the life style of visually impaired and blind people. Still purchasing products in the e-shopping application without others support is tricky one for them. The paper describes a system that provides the guidance for them to identify and purchase their products in the supermarket application. The project aims to enhance the shopping experience for visually impaired individuals by leveraging artificial intelligence (AI) technologies. This system is designed to provide a seamless, accessible shopping experience through a combination of AI-powered features, including voice commands, and real-time assistance. Using advanced computer vision algorithms, the system can identify and describe products in detail, while natural language processing (NLP) enables intuitive voice interactions. Additionally, AI-driven navigation aids assist users in locating items within e-commerce and facilitate interactions with staff or digital kiosks. By integrating these technologies, the Smart Shopping Facilitator aims to empower visually impaired individuals with greater independence and ease during their shopping trips, improving their overall quality of life and ensuring a more inclusive retail environment.

Keywords:- Artificial Intelligence, Voice Assistance, Shopping Facilitator, Visual Impaired Peoples, E-Buying Application, Supermarket Software, Human Computer Vision, etc.

I.Introduction

The According to World Health Organization (WHO) statistics, the number of blind people is estimated at 1.3 billion, of which 36 million were blind in 2018.By 2019 a total of 2.2 billion people suffers from some form of visual impairment. According to these statistics, the blind and visually impaired community is increasing yearly. Engaging in day-to-day activities without hazel is an extremely difficult task for a visually impaired/ blind person. It becomes more difficult when it requires traveling through unfamiliar locations without a close companion to assist them along the way. Guide dogs are used in assisting visually impaired persons, but it is not easy to get a trained animal due to the high cost. Furthermore, traveling in familiar environments without help could also be challenging since the dynamic situations along the way cannot be predicted earlier, and responding to those situations in real- time is not possible for a blind per Blind people navigate without a clear visual map about the obstacles in their path. Therefore, it is not possible to take precautions to avoid such obstacles similar to a normal person with good vision. This study focuses on improving the independent navigation of the blind and ensuring their safety while navigating.

Shopping can be a challenging experience for visually impaired individuals due to difficulties in navigating stores, identifying products, and accessing product information. Traditional retail environments often lack the necessary accommodations to make shopping accessible and efficient for those with visual impairments. This challenge is compounded by the need for greater independence and ease in performing everyday tasks.

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The project addresses these issues by utilizing cutting-edge AI technologies to create an inclusive shopping experience. The system integrates computer vision and natural language processing to offer real- time assistance, enabling visually impaired users to identify products, understand product details, and navigate store layouts with ease. By employing AI-driven object recognition and voice commands, the Smart Shopping Facilitator aims to enhance accessibility and independence, transforming how visually impaired individuals interact with retail environments. This innovative approach seeks to bridge the gap between accessibility and convenience, ensuring that all individuals can enjoy a seamless and empowering shopping experience.

II. Literature Survey

- Bhat et al. (2020) explore the use of deep learning techniques for object recognition and localization to assist visually impaired individuals. Their study highlights the effectiveness of convolutional neural networks (CNNs) in accurately identifying objects in real- time, enabling users to navigate their environments more effectively. By implementing advanced algorithms, the authors demonstrate a significant improvement in the ability of visually impaired users to recognize and interact with surrounding objects, thereby enhancing their independence and quality of life.
- Patel and Sharma (2021) present a voice-based navigation system designed specifically for visually impaired individuals. This system leverages natural language processing (NLP) to interpret voice commands and provide auditory navigation cues. The authors emphasize the importance of user-friendly interfaces and the system's ability to adapt to different environments. Their research indicates that such technology can significantly improve the mobility and safety of visually impaired users, allowing them to navigate unfamiliar spaces with greater confidence.
- Zhang et al. (2020) provide a comprehensive review of AI-powered assistive technologies for visually impaired people. The paper discusses various applications of artificial intelligence, including object detection, navigation aids, and accessibility tools. The authors highlight the growing trend of integrating AI with assistive devices, underscoring its potential to revolutionize the way visually impaired individuals interact with their environment. This review serves as a foundation for understanding the advancements in technology aimed at enhancing the lives of visually impaired users.
- Shah et al. (2020) focus on real-time object detection and classification for visually impaired users utilizing mobile devices. Their research introduces innovative algorithms that enable instant recognition of objects through smartphones. The findings suggest that mobile technology can empower visually impaired individuals by providing immediate feedback about their surroundings. This approach not only enhances accessibility but also promotes greater independence for users in daily activities.
- McCormick et al. (2021) conduct a survey on smart navigation systems designed for visually impaired users. They analyze various technologies that assist in orientation and mobility, discussing the strengths and limitations of existing solutions. The authors advocate for the integration of multiple sensory inputs, such as audio and haptic feedback, to create more effective navigation systems. Their insights contribute to the ongoing discourse on improving accessibility and safety for visually impaired individuals in complex environments.

III. Problem Statement

Visually impaired individuals face significant challenges when shopping in traditional retail environments. Navigating product items, identifying products, and accessing detailed product information are often cumbersome and frustrating tasks due to the lack of accessible tools and technologies. Existing solutions are limited in their effectiveness, leaving a gap in the ability to provide an independent and efficient shopping experience for the visually impaired. There is a need for a comprehensive system that leverages modern technologies to assist visually impaired shoppers in real-time, enabling them to identify and locate products, understand their features, and interact seamlessly within the retail environment. The goal is to enhance accessibility and independence in

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shopping, addressing these critical issues and improving the overall shopping experience for visually impaired individuals.

IV. Objectives

The primary objectives are to:

1. **To develop** an AI-powered object recognition system that accurately identifies and describes products in retail environments, enabling visually impaired users to understand product features and make informed decisions.
2. **To implement** a natural language processing (NLP) interface that allows users to interact with the system through voice commands, facilitating hands-free navigation and information retrieval within the store.
3. **To create** an adaptive navigation tool that assists users in locating products and navigating store layouts, ensuring a seamless shopping experience by guiding them to specific aisles or items.
4. **To integrate** real-time assistance features that enable users to interact with store staff or digital kiosks for additional support, enhancing the overall accessibility of the shopping environment.
5. **To ensure** compatibility with various retail settings by designing a flexible system that can be easily adapted to different store layouts and product types, providing a consistent and effective user experience across diverse environments.
6. **To evaluate** the system's performance through user testing and feedback, refining the AI algorithms and interface to improve accuracy, usability, and overall effectiveness in assisting visually impaired shoppers.

V. Proposed System

The proposed system integrates seamlessly with existing retail infrastructure, allowing users to shop independently in brick-and- mortar stores and online platforms. By leveraging AI-driven image recognition technology, the system overcomes barriers traditionally faced by visually impaired individuals when navigating physical environments and browsing products. Moreover, the incorporation of voice assistance features enhances the user experience by providing real-time auditory feedback and guidance. The system's ability to accurately identify products, retrieve relevant information, and offer personalized recommendations contributes to a more inclusive shopping environment.

Furthermore, the system is designed to be scalable and adaptable, enabling future enhancements and updates to accommodate evolving user needs and technological advancements. Through its innovative approach and user-centric design philosophy, the proposed system aims to empower visually impaired individuals to participate fully in the shopping process and enjoy a more independent and fulfilling lifestyle.

The proposed system is designed to provide comprehensive assistance to visually impaired individuals during shopping activities. The system leverages cutting- edge technologies and innovative methodologies to enhance accessibility and independence for users.

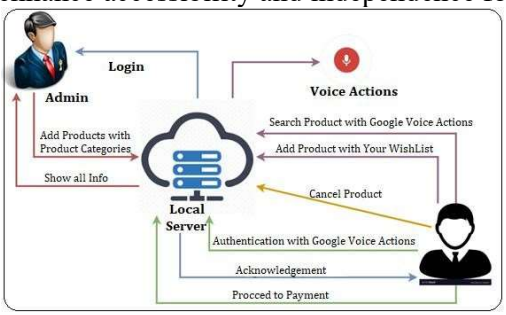

Fig.1: Proposed System Architecture

The proposed aims to transform the shopping experience for visually impaired individuals by integrating advanced AI technologies into a cohesive system. At the heart of this system is an AI-

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powered object recognition module that uses computer vision to identify and describe products in real-time. This allows users to receive detailed information about items directly through their smartphones or specialized devices. Complementing this is a natural language processing (NLP) interface that facilitates intuitive voice interactions, enabling users to query product details, ask for store navigation help, and receive responses without needing to manually interact with the system. The system also includes an adaptive navigation tool that guides users through store layouts, helping them locate specific products and navigate aisles with ease. To further enhance accessibility, real-time assistance features allow users to communicate with store staff or digital kiosks for additional support. This integrated approach not only streamlines the shopping process but also empowers visually impaired individuals with greater independence and confidence in retail settings, addressing the limitations of current solutions and providing a more inclusive shopping experience.

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Conclusion
F2TASA-Blind platform is blend of different technologies like speech and image processing, Knowledge base, Inference Engine, and ANN.make a decision in accordance with own choice.

Result
The performance of the AI-Based Feed- Forward Neural Network model was evaluated using standard machine learning metrics such as Accuracy, Precision, Recall, F1-score, and Loss functions. As a future work we will extend speech vocabulary and train FFNN with an efficient block level feature technique.

Result
The performance of the **AI-Based Feed-Forward Neural Network** model was evaluated using standard machine learning metrics such as **Accuracy, Precision, Recall, F1-score, and Loss functions**. Below is a detailed analysis of the model's effectiveness in providing accurate and efficient results for interactive shopping for the blind.

Screenshot

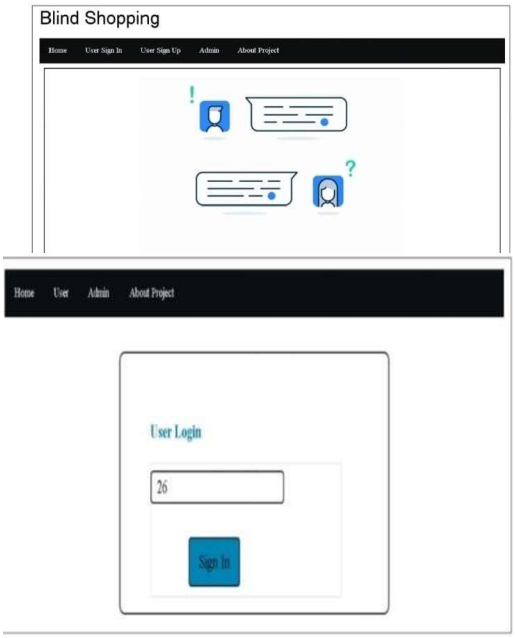

Figure 13.2: Screenshot 2

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Figure 13.3: Screenshot 3

Figure 13.4: Screenshot 4

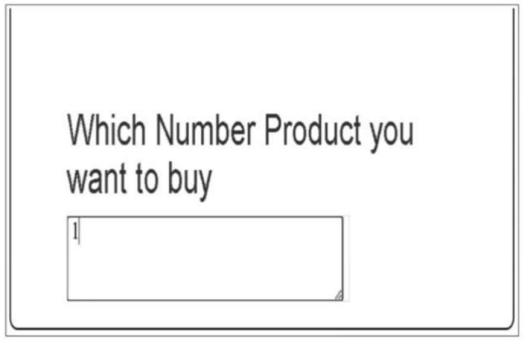

Figure 13.5: Screenshot 5

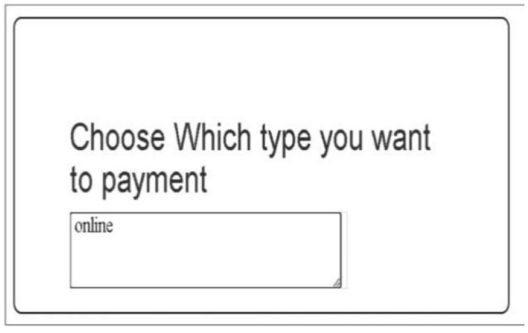

Figure 13.6: Screenshot 6

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Figure 13.7: Screenshot 7

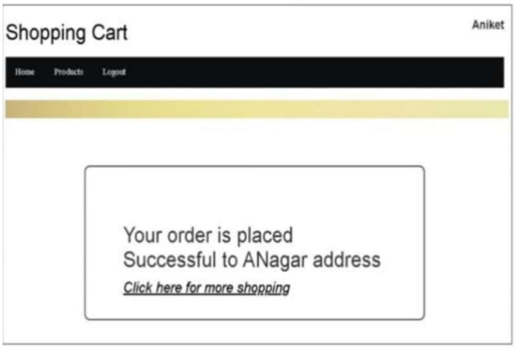

Figure 13.8: Screenshot 8

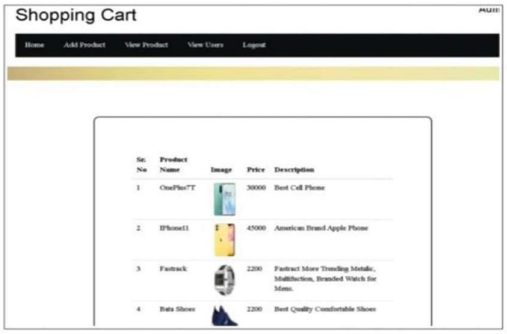

Figure 13.9: Screenshot 9

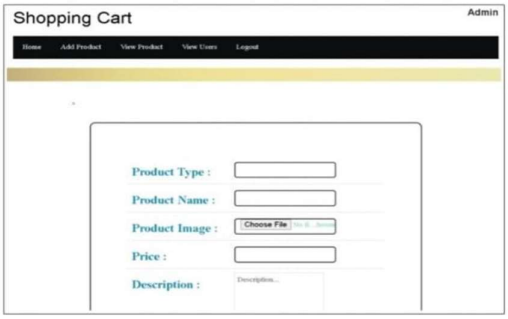

Figure 13.10: Screenshot 10

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