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AI Based Feed Forward Neural Network Training Based Interactive Shopping for Blind

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Abstract: *In order to help visually impaired persons with their everyday computer interactions, the project focuses on creating an AI-based smart accessibility system that leverages a Feed-Forward Neural Network (FFNN) for natural language processing. The system recognizes texts and translates them into vocal feedback to help with typing. This makes it possible for visually impaired people to type and communicate more effectively without the need for outside assistance. Additionally, the solution makes digital platforms more accessible by offering voice-based buying assistance and voice commands for human-computer interaction. The goal of this project is to develop an intelligent, dependable, and user-friendly accessibility tool that enhances the freedom and quality of life of visually impaired people by fusing neural networks with interactive voice technologies. The suggested solution combines voice interaction, natural language processing, and artificial intelligence to function as a comprehensive accessibility assistant for visually impaired users. While the voice aid module will offer real-time audio feedback for simpler comprehension, the feed-forward neural network will assist in identifying typed inputs and translating them into intelligible outputs. By ensuring that customers can browse, choose, and buy products online with just voice commands, the shopping assistance tool helps users become less reliant on other people. This project intends to give its users independence, inclusion, and an enhanced quality of life by developing a human-computer interaction environment specifically designed for the visually handicapped.*

Keywords: AI, Natural Language Processing, Accessibility Assistance, Visually Impaired, Voice Commands, Text Recognition, Shopping Assistance, Human-Computer Interaction, etc

I. INTRODUCTION

Millions of people throughout the world struggle with visual impairment, which limits their capacity to use computers, access digital information, and carry out daily tasks on their own. Numerous vital services, including communication, purchasing, and information access, have moved to online platforms due to the quick development of digital technologies. Nevertheless, the majority of web apps are made primarily for sighted users, which makes it challenging for those with visual impairments to use them. Recent studies in the domains of natural language processing (NLP), artificial intelligence (AI), neural networks, and human-computer interaction (HCI) have demonstrated that voice-based systems that make use of text-to-speech and speech-to-text technologies can greatly increase accessibility for users who are blind or visually impaired. Intelligent interfaces and AI-based voice assistants have been researched as useful resources to support blind users' more autonomous and natural computer interaction.

Previous research emphasizes the use of AI-driven speech technologies and feed-forward neural networks to produce spoken responses, translate speech into text, and recognize voice instructions. These innovations lessen reliance on conventional input methods like mouse and keyboards. Additionally, research demonstrates that interactive voice-based systems can enhance user confidence and accessibility, particularly in applications like online shopping where visually impaired users struggle to browse products, read descriptions, and complete transactions. Nevertheless, a lot of current

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solutions are either not linked into a comprehensive web-based system designed especially for blind users, have limited capability, or lack an appropriate interaction flow.

This project's primary goal is to create an AI-Based Feed-Forward Neural Network-driven Smart Accessibility Assistance System that allows visually impaired persons to use voice commands to interact with computers and web apps. The project intends to provide an intelligent, interactive, and user-friendly voice-assisted system in order to solve the issue of limited accessibility in online contexts. The main goal is to develop a smart shopping experience that allows blind users to independently browse the system, search products, and get spoken information through human-like interaction.

The suggested method combines NLP techniques like text-to-speech conversion and speech-to-text with AI-based voice help to address this issue. To increase response accuracy and command recognition, a feed-forward neural network is employed. Because it is a Java-based online application, blind users can use voice commands to interact with the system for information retrieval, shopping assistance, and navigation. The suggested approach attempts to give visually impaired individuals an inclusive, accessible, and intelligent digital experience by fusing AI, NLP, and HCI principles.

II. PROBLEM STATEMENT

Visually impaired people face difficulties in interacting with computers and accessing online information. Typing, reading text, and shopping online are challenging due to limited accessibility options. Existing systems are either expensive, non-interactive, or lack features like real-time voice feedback and assistance. There is a need for an affordable and interactive system that enables human-computer interaction for visually impaired people. This project addresses this by creating an AI-based platform with speech-to-text, text-to-speech, and smart assistance modules for smart shopping experience for blind.

III. MATERIALS AND METHODS

The goal of this project is to leverage voice-based human–computer interaction to create an AI-based smart accessible aid system for those with visual impairments. The system is developed as a Java web application that enables speech commands to be used by blind people to communicate with the computer. The materials utilized and the techniques employed to create and implement the system comprise the development process.

• Materials Used

Java for backend development, Java web technologies (such JSP/Servlets) for creating the web application, and Natural Language Processing (NLP) libraries for text-to-speech and speech-to-text conversion are among the software resources. Voice commands are processed using a Feed-Forward Neural Network model, which increases the accuracy of recognition. The system is trained and tested using a dataset of predefined voice commands, shopping-related questions, and answers. The hardware inputs for voice interaction include microphones and standard web browsers.

• Methods Followed

First, a microphone is used to record the visually challenged user's vocal input. Using NLP approaches, the speech-to-text module turns spoken words into text. The feed-forward neural network then processes and analyzes this text to classify the command and ascertain the user's intent. The system carries out the necessary activity, such as searching for products, reviewing product descriptions, or navigating the purchasing platform, based on the identified purpose.

The system then uses the text-to-speech module to translate the relevant text responses into speech. This enables seamless interaction without the need for visual aid by giving the user clear audio feedback. Voice commands are used by the smart shopping module to assist consumers with product browsing, description listening, and selection. The accuracy, reactivity, and usability of the system are enhanced by ongoing testing and improvement. This approach guarantees visually impaired people an engaging, accessible, and easy-to-use experience.

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IV. PROPOSED SYSTEM ARCHITRECTURE

The findings verify that voice interaction powered by AI greatly enhances accessibility for people with visual impairments. Compared to straightforward keyword-based systems, the application of a feed-forward neural network improves command understanding and decreases misinterpretation. This immediately tackles the primary issue of blind individuals' restricted access to digital networks.

Voice-based systems can offer a natural and user-friendly experience, as demonstrated by the effective integration of NLP and human-computer interaction approaches. The system's practical utility in real-world applications is demonstrated by the smart shopping help. Overall, the findings support the work's goal by demonstrating how intelligent voice-assisted web apps can enable visually impaired individuals to confidently and independently access online services.

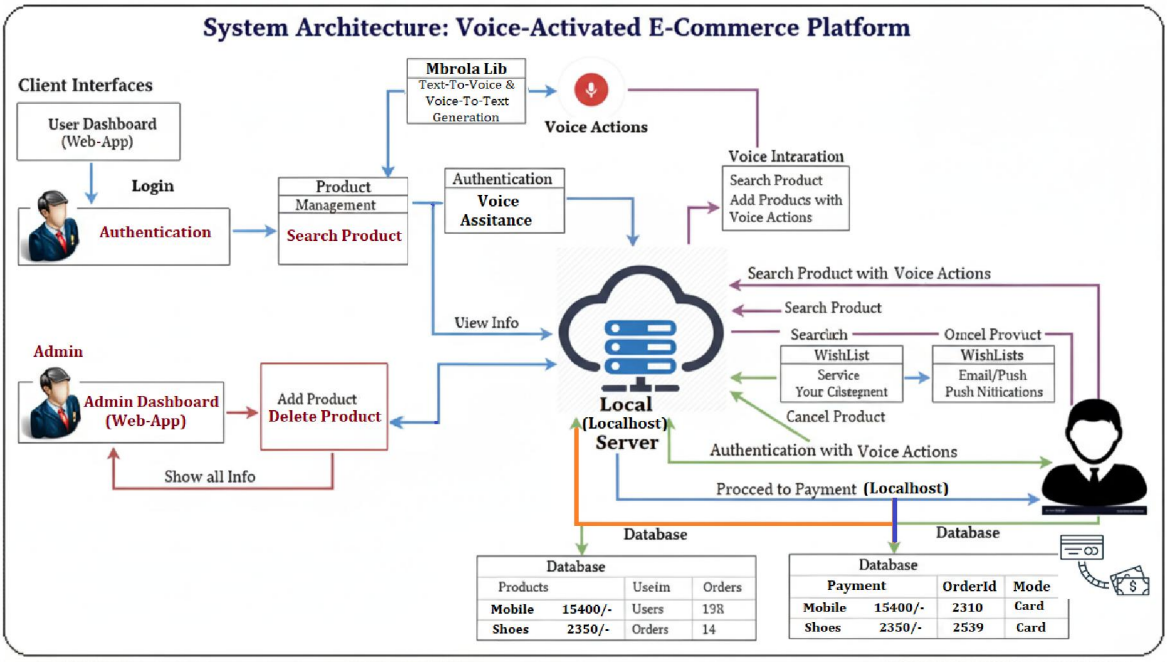

Fig.1: System Architecture Design

The overall architecture, data flow, and interactions between the system's numerous components are defined at the crucial system design stage of software development. It clearly illustrates the internal workings of the system and how each module interacts with the others to deliver the desired functionality. Additionally, the architecture guarantees that the system is affordable, controllable, and simple to grow in the future.

System Architecture Diagram Module Wise Explanation:-

1. User Interaction Module

The visually impaired user gives commands using voice instead of typing, making the system easy to use.

2. Speech-to-Text Module

This module converts voice into text so the system can understand what the user is saying.

3. NLP + AI (FFNN) Module

This is the main processing unit. It understands the user's command using NLP and AI model (Feed-Forward Neural Network).

4. Command Processing Module

It decides what action to take based on the user's request like searching products, adding to cart, or navigation help.

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5. Web Application Module (Java)
Handles all system operations and connects user requests with backend services.
6. Database Module
Stores data like users, products, and orders and provides required information to the system.
7. Text-to-Speech Module
Converts system responses into voice output, so users can hear the results.
8. Voice Assistance Module
Provides guidance and feedback to the user, acting like a smart assistant.

V. RESULT ANALYSIS

Voice commands can be used by visually impaired users to engage with a web-based application thanks to the established method. While the feed-forward neural network efficiently categorizes user instructions like navigation, product search, and information requests, the speech-to-text module precisely translates user speech into text. Through text-to-speech, the system offers real-time audio responses, enabling users to get comprehensible feedback without the need for visual aids.

By assisting consumers in conducting product searches, listening to product details, and navigating between possibilities via voice interaction, the smart shopping module exhibits dependable performance. Test results demonstrate that training the neural network with numerous speech inputs improves command recognition accuracy and decreases reaction time. Because of the system's seamless interaction flow, visually impaired users can easily finish activities on their own.

Key Results

- Accurate conversion of speech to text and text to speech.
- High command recognition accuracy using feed-forward neural network.
- Smooth voice-based navigation and shopping assistance.
- Improved user independence and accessibility.

VI. CONCLUSON

The project's findings demonstrate how a voice-assisted AI system can significantly increase digital accessibility for those with visual impairments. The effective usage of feed-forward neural networks, text-to-speech, and speech-to-text demonstrates that visually impaired users may use natural voice commands to engage with web applications on their own. This makes technology more accessible and user-friendly by lowering their reliance on keyboards, visual interfaces, and outside help.

The results also suggest that effective solutions for real-world accessibility issues can be developed by combining artificial intelligence with human-computer interaction. These systems can support everyday activities like online buying in a safe and effective way, as shown by the smart shopping and information access functionalities. Overall, the study demonstrates the great potential of intelligent voice-based online apps to empower visually impaired people, boost their self-esteem, and advance equitable access to digital services.

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