E-commerce Website for the Visually Impaired

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Abstract: In recent years, the popularity of e-commerce has soared. However, many e-commerce sites are not easily accessible for visually impaired individuals due to their complex layouts and numerous elements, which makes navigation difficult using screen readers. Our project aims to develop an inclusive e-commerce website specifically designed for visually impaired individuals. To address the accessibility issues they face online, we have integrated a voice assistant that enables users to navigate the website using voice commands. Additionally, our website features a user-friendly interface that is simple, interactive, and easy to navigate. We prioritize user feedback in our iterative design process to ensure effectiveness and usability. Our ultimate goal is to empower visually impaired individuals to shop independently and confidently in the digital world.

Keywords: E-commerce, visually impaired, online shopping, voice assistant

I. INTRODUCTION

In today's digital era, e-commerce has revolutionized the way we shop, offering convenience and accessibility to millions worldwide. However, amid this technological advancement, there remains a significant portion of the population often overlooked: the visually impaired. Despite the large number of increase in e-commerce platforms, accessibility barriers persist for this community, obstructing their ability to independently navigate and engage with online shopping experiences.   Traditional interfaces rely heavily on visual cues, making navigation and product selection arduous for users with visual impairments. While screen readers offer a solution by converting text to speech, they often fall short in interpreting complex web layouts and dynamic content, resulting in a frustrating user experience. Recognizing this gap, recent studies have explored alternative approaches to improve accessibility, including the integration of speech recognition technology. E-commerce businesses like Amazon, Flipkart, Alibaba among others are also actively trying to make technology inclusive for everybody regardless of their disability[3].

In this paper, we aim for the development of an E-commerce website specifically tailored to the needs of the visually impaired, using the capabilities of JavaScript speech APIs. By utilizing the power of speech recognition, we aim to create an intuitive and seamless browsing experience that empowers users with visual impairments to independently explore products, make purchases, and engage with online content.

II. LITERATURE REVIEW

The paper " User Trust in eCommerce Services: Perception via Screen Reader" by Maria Claudia Buzz, Barbara Leporini, Fahim Akhter [1] delves into the intricate realm of user trust in E-Commerce services, with a specific focus on screen reader users—a demographic that is often overlooked in online trust research. By examining how trust is perceived within this group, the authors shed light on the decision-making processes of individuals with visual impairments when engaging in online transactions. Their findings underscore the crucial role of accessibility considerations in fostering trust among diverse user populations and emphasize the significance of user experience in shaping perceptions of reliability and security in eCommerce platforms. This study significantly contributes to the broader discussion on trust in online environments, highlighting the importance of inclusive design practices to ensure equitable access and user satisfaction in electronic commerce.

In the paper "E-Commerce Website for Visually Impaired" by Anagha S Kulkarni, K Shravani, Kanishkvardhan A N, Srinivas B Patil, and Vinaya Jahagirdar[2] delves into the critical issue of digital inclusivity for the visually impaired population in the realm of e-commerce. Recognizing the unique challenges faced by this demographic, the authors propose a novel approach to designing an accessible e-commerce platform tailored to their specific needs. The study focuses on incorporating features such as screen reader compatibility, intuitive navigation, and user-friendly interfaces, with the aim of improving the overall accessibility and usability of online shopping for visually impaired users. However, we found that using screen readers can be challenging as they simply read out the whole web page, which may cause visually impaired users difficulty in using the websites since they may not have much clarity. To

overcome this issue, we came up with the idea of including a voice assistant.

The paper titled "Visually Impaired Friendly E-commerce website" authored by Mallika Chand, Shreya Mulchandani, and Sulalah Mirkar in 2019 [4] presents an innovative approach to developing an e-commerce platform tailored for individuals with visual impairments. The design of the application is characterized by its use of voice commands for instruction, allowing users to interact with the interface using either a mouse or keys. The authors aim to create a more inclusive and accessible online shopping experience for visually impaired individuals. According to the results shared by the authors, the application's usability was subjected to a thorough test, revealing an efficiency rate of 75%. This outcome suggests a commendable level of effectiveness in facilitating user interactions and navigating the e-commerce website for individuals with visual impairments. A noteworthy inference drawn from the presented results is the comparative advantage of using keys as an interface for visually impaired users over the use of a mouse. The authors' findings indicate that interacting with the application through key-based commands yielded a higher efficiency rate, emphasizing the importance of considering alternative input methods for users with visual impairments.

In the paper "Voice Enabled Virtual Assistant For E-Commerce Web Application" by Prof. Jayshree Patil, Swaranjali Sanjay Balikai, Jyoti Dhanaji Ramane, Vishal Rajabhau Nannvare, Sarjerao Bajirao Pujari[5], the authors investigate the potential benefits and challenges of incorporating voice-enabled virtual assistants (VAs) into e-commerce web applications. As the use of smart devices and voice interaction becomes increasingly prevalent, the authors explore the benefits and drawbacks of integrating VAs into online shopping experiences. By examining the functionality and user experience of voice-enabled VAs in e-commerce, the authors provide insights into how this technology can improve accessibility, convenience, and efficiency for consumers. They also address concerns such as privacy, security, and the effectiveness of natural language processing in facilitating seamless interactions between users and virtual assistants. The authors' research contributes to the development of e-commerce technology by shedding light on the implications of voice-enabled VAs for both businesses and consumers, paving the way for further exploration and implementation of this innovative approach to online shopping.

In the paper ""Web Accessibility to E-Commerce for Blind Users" by Er. Shrinidhi Gindi, Azizul Patni, Abubaker Sayyed, Sadiya Phudinawala, Aafiya Shaikh delves into the crucial nexus of technology and inclusivity. The authors explore the difficulties faced by blind individuals when accessing online shopping platforms, and investigate the effectiveness of various accessibility features and assistive technologies in improving their browsing and purchasing experience. Through their analysis, the authors shed light on the obstacles encountered by blind users, such as navigating complex interfaces, understanding visual content, and completing transactions independently. Additionally, they explore potential solutions and best practices aimed at enhancing the accessibility of e-commerce websites, including the utilization of screen readers, alternative text descriptions, and intuitive interface designs. By addressing these issues, the authors emphasize the significance of inclusive design principles in ensuring equal access to digital resources and services for all individuals, regardless of their abilities, thus fostering a more inclusive and equitable online shopping experience.

In the paper "WebAccessibility Testing for Visually Impaired People in Indonesia" by Maria Cahyahadi and Nina Setiyawati delves into the critical issue of web accessibility testing for visually impaired individuals in Indonesia, a topic that has gained increasing importance in the digital age. By examining the specific challenges faced by this demographic when accessing online content, the authors highlight the necessity of tailored accessibility testing methodologies to ensure equitable access to information and services. Through their research, they identify key barriers that impede web accessibility for the visually impaired in Indonesia, ranging from inadequate assistive technologies to insufficient awareness among website developers. Their findings not only underscore the urgency of addressing accessibility gaps but also provide valuable insights into the development of more inclusive digital environments. By shedding light on the unique context of web accessibility in Indonesia, this study contributes to the broader discourse on inclusive technology design and implementation, paving the way for more effective strategies to enhance digital accessibility for all users.

III. PROPOSED DESIGN

1. Requirement gathering:

Extensive research was done to gain insights into the requirements and preferences of visually impaired individuals, with a focus on their utilization of screen readers. This included conducting a literature review to identify the obstacles they face when accessing digital content. Furthermore, interviews were conducted with visually impaired individuals who are part of organizations that provide them support. The purpose of these interviews was to obtain direct feedback of their experiences in navigating through the online world.

By combining insights from both the literature review and the interviews, a thorough understanding of the challenges faced by visually impaired users was attained. This knowledge was then utilized to guide the development of the project.

By incorporating the identified needs and preferences, the final product was designed to deliver a more inclusive and user-friendly digital experience for visually impaired individuals.

1. Frontend development:

The website was designed with great care to provide a responsive user interface that integrates leading voice assistant APIs for intuitive and hands-free navigation and interaction. The framework for the user interface is built using a combination of HTML, CSS, and JavaScript speech APIs. The website's design philosophy is centered on accessibility, guaranteeing seamless operation with screen readers and delivering an optimal experience for users with varying levels of visual impairment. Voice commands serve as a crucial tool, facilitating user navigation throughout the website, product searches, and transaction completions. The website's navigational structure is especially critical for individuals with special needs, including those who are visually impaired. These users require a clear understanding of their current location within the webpage and how to navigate to desired destinations, whether it be returning to the homepage or reaching specific sections within the site [1]. The website places a strong emphasis on reducing dependence on traditional keyboard and mouse inputs. Additionally, strict adherence to web accessibility standards, particularly the Web Content Accessibility Guidelines (WCAG), has been a top priority throughout the development process.

For this project, two key technologies were employed to enable voice-based interaction: **SpeechSynthesisUtterance** and **webkitSpeechRecognition**.

SpeechSynthesisUtterance: is an interface of the Web Speech API that allows developers to generate synthetic speech from text. It provides control over the pitch, rate, and volume of the speech output.

webkitSpeechRecognition: is another component of the Web Speech API, which enables the website to recognize speech input from users. This capability allows users to interact with the website through spoken commands, enhancing accessibility and ease of use.

These technologies highlight the project's commitment to inclusive design, ensuring that all users, including those with disabilities, can navigate and engage with the website effectively

2. Backend development:

The backend of the website, which is based on PHP, plays a critical role in enabling the dynamic functionality and interactivity of the platform. PHP, being a widely-used and mature scripting language, offers robust features for web development. Its server-side execution capabilities enable the generation of dynamic web pages, handling of form submissions, and integration with databases. In this project, PHP acts as the backbone for processing user requests and managing the flow of data. One of the primary functions of the backend is to validate and process user input. This involves ensuring that the information submitted by users through forms or interactions with the website meets specified criteria. PHP's form-handling capabilities, along with custom validation scripts, enable the website to prompt users for accurate and complete data entry. This validation process not only enhances user experience by providing immediate feedback but also helps maintain data integrity within the system. Moreover, PHP facilitates communication between the frontend interface and the database. When a user interacts with the website, such as searching for products or placing orders, PHP scripts handle these requests by querying the database for relevant information. For instance, when a user searches for a specific product, PHP processes the search query and retrieves corresponding product details from the database. This seamless communication between the frontend and backend guarantees that users receive up-to-date and accurate information in real-time.

The database management system employed is MySQL, which is a powerful and reliable relational database management system (RDBMS) celebrated for its performance and scalability. Tables within the database are logically structured to store different types of information. For instance, there are tables dedicated to product particulars, user profiles, and order histories. Each table is designed with specific fields to store pertinent data, such as product names, prices, user addresses, and order timestamps. To establish a favourable environment for development and testing, XAMPP is utilized as the local hosting solution. XAMPP streamlines the setup of a local server environment by bundling Apache, MySQL, and PHP into one package. Apache functions as the web server, accountable for handling HTTP requests and presenting web pages. MySQL operates as the database server, managing the storage and retrieval of data. PHP, as the server-side scripting language, supplies the logic and functionality for dynamic web applications. PHP directs the dynamic functionality and data processing, MySQL manages and organizes critical information, and XAMPP provides a comprehensive local hosting environment. This architecture guarantees a robust, secure, and efficient backend system,

facilitating smooth user interactions, precise data management, and effortless integration between frontend and backend components.
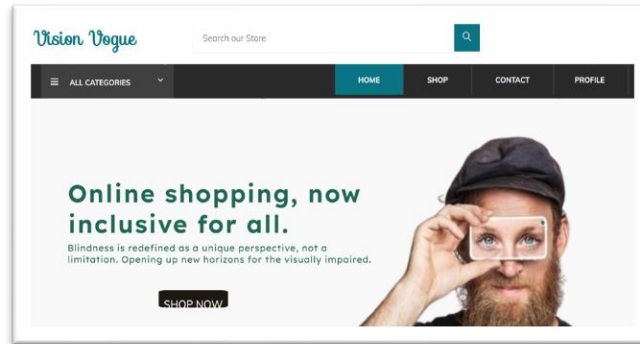
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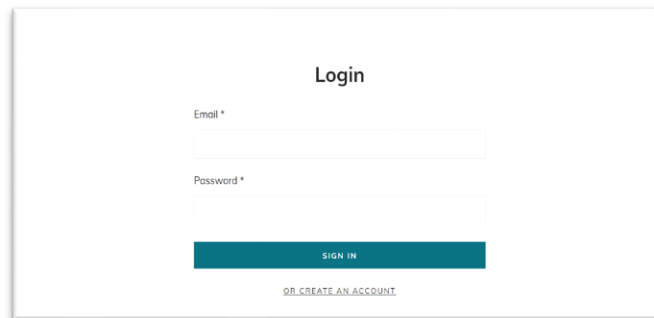

Figure 1: Home Page

Figure 2: Login Page

Figure 1 and Figure 2 show the home and login pages of the website, respectively. The home page functions as the starting point for users, presenting various navigation options for exploring the website's content. Users can navigate the site by browsing products by category, allowing them to explore the offerings in a structured manner. Additionally, the home page has a search bar, which enables users to search for specific products based on their preferences or they can search using voice commands. Once the home page is loaded, users are immediately greeted with voice commands that guide them through the website's features and functionalities. This voice-guided assistance enhances accessibility and user experience, providing an alternative method of navigation. The home page also offers easy access to essential user features, such as the user's profile and contact information. Users can quickly access their personal profile and contact details as needed.

The login page requires users to log into the site using their email address and password. These credentials ensure that only authorized users can access the shopping website's full range of features and functionalities. The login process serves as a security measure, protecting sensitive information and transactions.
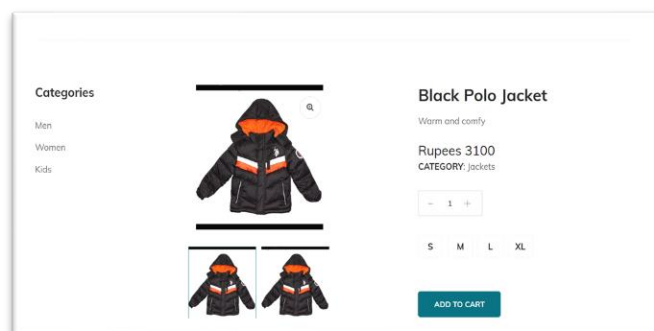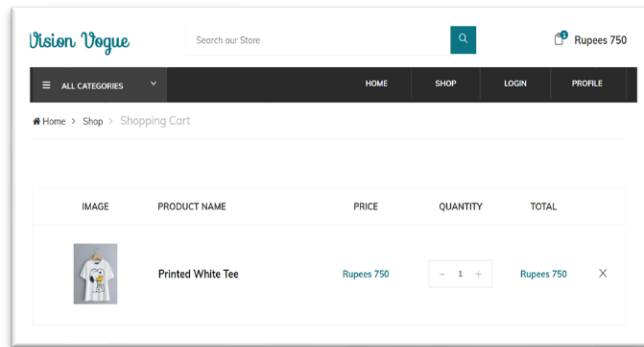

Figure 3: Product Page

Figure 4: Cart Page

Figure 3 shows the products page and the cart page is shown in Figure 4. The product page functions as a comprehensive information source for individual products, providing users with essential details that facilitate informed purchasing decisions. On the product page, users have access to product information, such as pricing, available sizes, various product images, and a detailed product overview. This layout allows users to thoroughly evaluate the product's attributes, including its specifications, features, and visual representation through product images. The product description offers valuable insights into its unique qualities and details of the product. Upon transitioning to the cart page, users are presented with a view of their selected items and their corresponding quantities. This page functions as a virtual shopping cart, displaying a summary of the user's chosen products before proceeding to checkout. Users can review and adjust the quantities of items in their cart through voice commands, ensuring accuracy before finalizing their purchase.
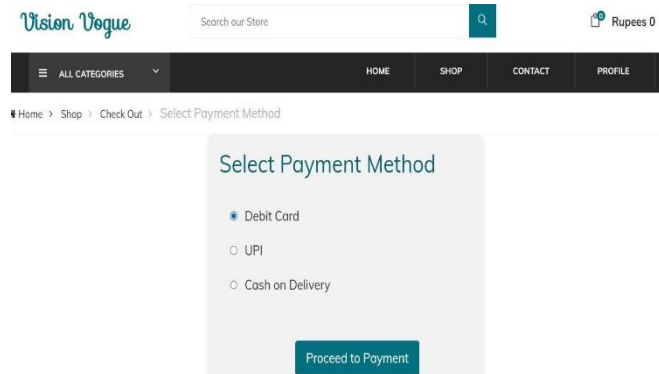

Figure 5:Payment Page

Figure 5 shows the payment page of the website, which users are redirected to upon finalizing their chosen items in the shopping cart. This page represents the purchasing process, it prompts users to choose their preferred payment method. Available payment options include card payment, UPI (Unified Payments Interface) payment, and cash on delivery. By selecting their desired payment method, users are navigated to the corresponding payment page to finish their transaction.
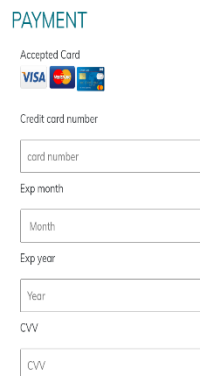

Figure 6:Card Payment Page

Figure 6 shows the card payment page, users are provided with fields to input their card details, including the card number, CVV (Card Verification Value), and other card related information. This page is designed to securely capture sensitive payment details, ensuring the confidentiality and integrity of user data. Throughout the payment process, voice commands guide users through each step. The voice-guided assistance offers instructions and prompts, assisting users in accurately entering their card details. Additionally, the voice assistant reads out the information entered by the user in each field, allowing for verification before proceeding. Upon successfully entering all necessary details, users proceed to make the payment and finalize their order. The incorporation of voice commands in this process streamlines the payment experience, providing a user-friendly and secure method for completing transactions.

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