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VCOMM - Voice Controlled E-commerce

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Abstract - VCOMM aims to develop a voice-controlled e-commerce platform that enables users to shop for products using voice commands. The project utilizes modern natural language processing and voice recognition technologies to enable seamless interaction between users and the platform. The platform is designed to enhance the shopping experience by making it more convenient and accessible. The report outlines the development process, including the technology stack used, the system architecture, and the user interface design. Additionally, the report evaluates the system's performance and user experience, identifying key challenges and future directions for platform improvement. The project highlights the potential of voice-controlled e-commerce platforms in revolutionizing the way people shop online and demonstrates the importance of incorporating cutting-edge technologies in creating an efficient and user-friendly shopping experience. The main objective of this project is to develop a web application where a voice assistant is integrated using Alan AI to present a voice-controlled commodity purchase as per the user's request.

Key Words: Voice Assistant, Natural Language Processing, Voice Recognition, Speech-To-Text, Text-To-Speech, Alan AI

1. INTRODUCTION

E-commerce has drastically changed the scenario of buying and selling things online, which has immensely converted the business world into the digital era. Before voice assistants, all websites, including e-commerce sites, had manual navigation. Searching for a product of an individual's interest and then finding the appropriate product at an affordable price was a tedious task sometimes. In such situations, users ended up getting confused or couldn't find relevant products, which led to wastage of time and degraded the user experience. The main objective of this project is to overcome all the limitations mentioned and be more accessible to the users with a faster response time. Voice-controlled e-commerce will take voice as an input, process it, and perform some task to provide user-related results.

Voice assistants are available on very few e-commerce websites, and their limited features discourage some customers from using them. However, the system proposed will not only enhance user experience but will also aid people with some physical disabilities, i.e., people who are unable to interact with the system due to some reasons will also have the privilege of enjoying the online shopping experience. Voice-controlled e-commerce will be controlled by voice commands and also manual navigation, which will not only provide a user-friendly interface but also an interactive response from the system.

2. PURPOSE

The purpose of a voice-controlled ecommerce application is to provide users with a more convenient and accessible way to shop online by enabling them to browse and purchase products using voice commands. This technology leverages natural language processing and voice recognition to offer a seamless and intuitive shopping experience, eliminating the need for users to navigate complex user interfaces or use a keyboard to input text. The voice-controlled e-commerce application also provides a competitive advantage to online retailers by differentiating them from their competitors, attracting new customers, and retaining existing ones. Additionally, the voice-controlled e-commerce application can offer valuable insights into customer behavior and preferences, helping retailers optimize their product offerings and marketing strategies. From a customer's point of view, the purpose of a voice-controlled ecommerce application is to make the online shopping experience more personalized and intuitive, saving them time and effort, and increasing their overall satisfaction with the shopping experience. It can save customers time and effort by eliminating the need to type in search queries or navigate complex menus.

3. PROJECT SCOPE

The scope of this project is to develop a voice-controlled e-commerce application that provides an innovative and convenient way for users to shop online. The objective of the project is to enable users to interact with the application using voice commands instead of traditional text input, making the shopping experience more personalized and intuitive.

The project will involve the following deliverable: A fully functional voice-controlled e-commerce platform that allows users to search for products, add them to their cart, and complete the checkout process using voice commands.

4. PROJECT GOALS AND OBJECTIVES

Goals of VCOMM are:

- **Improve user experience:** The primary goal of a voice-controlled e-commerce application is to provide users with a more intuitive and convenient way to shop online. By enabling users to interact with the application using voice commands, the shopping experience can be made more personalized and engaging.

- **Increased accessibility:** A voice-controlled e-commerce application can provide an accessible shopping experience for individuals with disabilities, such as visual impairments or motor impairments, who may have difficulty using traditional text-based interfaces.
- **Streamline the shopping process:** By reducing the need for manual input, a voice-controlled e-commerce application can speed up the shopping process and improve efficiency, which leads to higher customer satisfaction and increased sales.
- **Enable personalized recommendations:** A voice-controlled e-commerce application can leverage natural language processing and machine learning algorithms to provide personalized product recommendations to users based on their preferences and past purchase history.
- **Provide a competitive advantage:** Developing a voice-controlled e-commerce application can provide a competitive advantage by differentiating the company's offerings from competitors and attracting new customers.

Objectives of VCOMM are:

- Identify and study the problem statement and limitations of the current system and propose the system with additional features along with existing features.
- Develop a user-friendly and intuitive interface that enables users to interact with the application using voice commands.
- Implement natural language processing and voice recognition technology to accurately interpret and understand user voice commands.
- Integrate with existing e-commerce platforms to manage and process orders and product inventory.
- Deliver the project on time and within budget.
- Provide adequate documentation and training to enable users to utilize the application effectively.

5. PROJECT MANAGEMENT APPROACH

Our project team followed a structured project management approach to ensure that the voice-controlled e-commerce platform is delivered on time, within budget, and to the required quality standards. The subsequent actions were taken:

- Project Planning: A detailed project plan was developed that outlines the project objectives, deliverables, milestones, timelines, and resource requirements. The plan was regularly reviewed and updated throughout the project lifecycle.
- Project Execution: The project team carried out the project activities as per the project plan. The team used agile development methodologies to ensure that the project is flexible, responsive, and able to adapt to changing requirements.
- Project Monitoring and Control: The project progress was regularly monitored against the project plan and the project scope. Any deviations from the plan were identified and corrective actions were taken to bring the project back on track.
- Risk Management: Risks associated with the project were identified, assessed, and mitigated using appropriate risk management strategies.
- Stakeholder Management: The project team maintained regular communication with all stakeholders, including the project guide, project team members, and end-users, to ensure that everyone is informed about the project's progress, issues, and risks.
- Quality Management: The project team ensured that the voice-controlled e-commerce platform is delivered to the required quality standards by carrying out appropriate testing and quality assurance activities.

Overall, our project management approach focused on delivering the voice-controlled e-commerce platform to the required quality standards, within the project timeline and budget, and with a high degree of stakeholder satisfaction.

6. PRODUCT FEATURES

Product features of VCOMM voice-controlled ecommerce system are:

- **Voice recognition:** The system has a high level of accuracy in recognizing and interpreting spoken commands and queries.
- **Natural language processing:** The system is able to understand complex and colloquial language and respond to users in a natural and conversational manner.
- **Conversational user interface:** The system can guide users through the shopping process using a conversational user interface rather than requiring them to navigate menus or web pages.
- **Integration with e-commerce platforms:** The system integrates seamlessly with existing e-commerce platforms, such as inventory management and payment processing systems.
- **Product search:** The system allows users to search for products using natural language queries, such as "show me some electronics products."
- **Order placement:** The system allows users to place orders using their voice, including selecting items, specifying quantities, and providing payment information.
- **Order tracking:** The system allows users to track the status of their orders using their voice, including updates on shipping and delivery.
- **Accessibility:** The system is designed to be accessible for users with disabilities, such as by providing audio descriptions of products for visually impaired users.

7. USER CLASSES AND CHARACTERISTICS

User classes and characteristics for a voice-controlled ecommerce project are:

- **Early adopters** may be more willing to provide feedback and suggest new features for the voice-controlled ecommerce system.

- **Busy professionals** may prioritize convenience and speed in their shopping experience.
- **Elderly or visually impaired** users may require a more intuitive and accessible interface, with clear audio descriptions.
- **Mobile users** may require a system that is optimized for mobile devices with minimal data usage and battery consumption.
- **Customers with RSI** may require a system that minimizes typing and clicking with voice commands that reduce strain on their hands and wrists.

8. SYSTEM FEATURES

- **Voice recognition:** The system is able to recognize and interpret voice commands from users accurately and efficiently.
- **Voice-enabled Sign In/Sign Up/Logout:** Users are able to register or login themselves to the e-commerce platform by using voice commands instead of typing in their username and password. With this feature, users can say something like "Log me into my account" and the system will recognize their voice and authenticate them without requiring them to type in their username and password. And to log out users can simply say "Logout".
- **Voice-enabled Product Search:** Users are able to search for products using voice commands, such as "Find me a red dress" or "Search for running shoes." The system is able to return relevant results quickly and accurately.
- **Voice-enabled Payment Processing:** The system is able to process payments securely and efficiently using voice commands, such as "Pay with my credit card" or "Authorize payment for my order." It is able to handle various payment methods and provide secure authentication and authorization.
- **Voice-enabled Order Placement:** Users are able to place orders using voice commands, such as "Add an Apple watch to my cart" or "Place an order for a blue t-shirt." The system is able to process orders quickly and accurately, and provide confirmation to the user.
- **Voice-enabled Order Modification:** Users are able to modify their orders using voice commands, such as "Change the delivery address" or "Add an item to my order." The system is able to update the order and provide confirmation to the user.
- **Voice-enabled Feedback:** Users are able to provide feedback using voice commands, such as "I liked the product" or "I had a problem with my order." The system is able to collect and analyze user feedback to improve the overall user experience.
- **Voice-enabled Wishlists:** Users are able to create and manage wishlists using voice commands, such as "Add this product to my wishlist." The system is able to save and display wishlists for users.
- **Voice-enabled Order History:** Users are able to access their order history using voice commands, such as "Show me my previous orders." The system is able to display order history for users and provide options for reordering previous purchases.
- **Voice-enabled Product Information:** The system provides users with detailed product information, including specifications, images, and reviews.

9. SYSTEM ARCHITECTURE DESIGN

Voice commerce is the process of consumers using voice commands to make purchases through devices such as Amazon Alexa or Echo or other devices. However, the process is more complex than it appears. It involves several stages that happen behind the scenes.

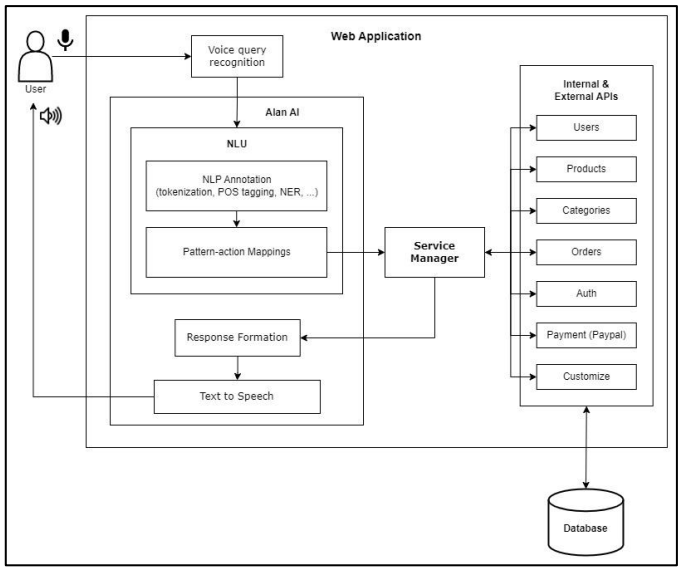


Fig - 1: System Architecture

Initially, the consumer says a voice command, like "Alan, find me a vacuum cleaner with a targeted spray nozzle. What are my options?" The system then translates the voice into text and understands the meaning behind the command.

The voice commerce system then chooses what to do with the interpreted command. It determines which response would be the most relevant and converts it into text. The system then translates the text into audio and provides a voice response to the user. For example, it may suggest a product and ask if the user wants to order it.

10. SUB-SYSTEM DEVELOPMENT

As part of the sub-system development process, we identified and defined the various components and modules that make up the voice-controlled e-commerce system. These components were developed using the MERN stack and other open-source libraries and tools, and were designed to work together seamlessly to provide a smooth and intuitive user experience.

The subsystems developed for the project include the following:

- **Voice Recognition & Interpretation:** The voice recognition & interpretation subsystem is responsible for converting user voice commands into machine-readable text, interpreting the meaning of the text, and generating appropriate responses. We utilized the Alan AI service to implement the voice recognition & interpretation subsystem. Alan AI service allows users to interact with

the e-commerce platform using natural language, making the shopping experience more intuitive.

- **Product Search:** The product search subsystem enables users to search for products on the e-commerce platform using their voice commands. We implemented search filters that allow users to search for products by product name, brand, category, and other relevant attributes.
- **Product Information:** This product information subsystem provides detailed product information to the user upon request, such as product descriptions, prices, images, availability, and reviews. It also communicates with the order processing subsystem to ensure that accurate and up-to-date product information is provided during the order placement process.
- **User Authentication:** The User Authentication subsystem handles all the necessary tasks related to user authentication, such as user registration, login, and logout. The module also includes additional features like password reset, multi-factor authentication, and session management to enhance the security of the system. Having this module ensures that user data is secure and protected from unauthorized access.
- **Cart Management:** The cart management subsystem enables users to add products to their cart, view their cart, and checkout using voice commands. We utilized the MERN stack to implement the cart management subsystem. The subsystem stores the user's cart information in a MongoDB database and provides real-time updates to the user as they add or remove products from their cart.
- **Order Processing:** The order processing subsystem enables users to place orders using voice commands. We integrated the Paypal payment gateway to allow users to make payments using credit cards or other payment methods supported by Paypal. The order processing subsystem also provides order confirmation and updates the user's order history in the database.

11. CLASS DIAGRAM

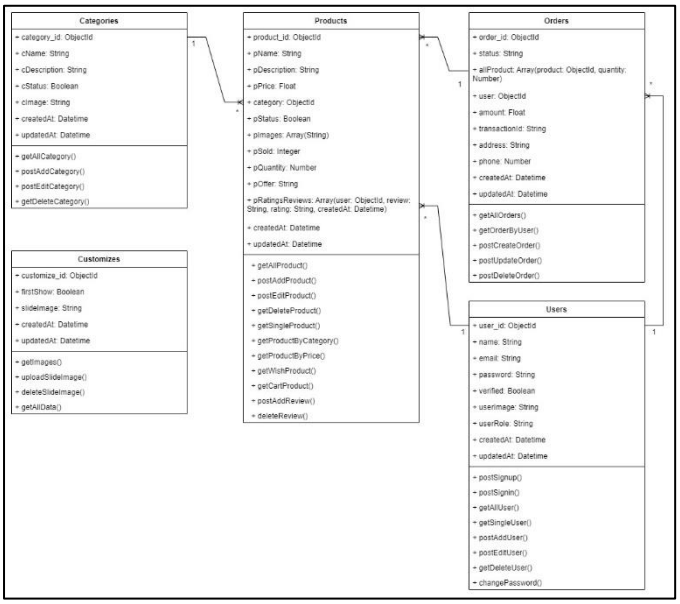


Fig - 2: Class Diagram

12. IMPLEMENTATION

Alan AI Scripts

```
alan-script.js

intent("(Go to login|open login page|login| open login)", (p) => {
  p.play({ command: "Login" }, p.play("Opening Login page"));
});
intent("(close login page|close login)", (p) => {
  p.play({ command: "closeLogin" }, p.play("Sure , Closing Login Page"));
});
intent("(open|show|Go to) (cart| shopping cart) (page|)", (p) => {
  p.play({ command: "showCart" }, p.play("Manage your orders"));
});
intent("close cart", (p) => {
  p.play({ command: "closeCart" }, p.play("Closing cart"));
});
intent("(Open | Show) $(Product* .+)", (p) => {
  p.play({ command: "showProduct", title: p.Product.value });
});
intent("username is $(Word* .+)", (p) => {
  p.play({ command: "TypeUsername", title: p.Word.value });
});
intent("password is $(Word* .+)", (p) => {
  p.play({ command: "TypePassword", title: p.Word.value });
});
intent("Remove $(Word* .+) from cart", (p) => {
  p.play({ command: "removeCart", title: p.Word.value });
});
intent(
  "(Add to cart| add this product to cart| add this in cart| add in cart|add product to
cart)",
  (p) => { p.play({ command: "addToCart" }); }
);
intent(
  "(Tell|About|Describe|Give)(me|)(about|description)(this|it|of)(product|)",
  (p) => { p.play({ command: "describeProduct" }); }
);
intent("(what|How|price|) (is|much) (the|for) (price|cost|it|this) (of|product)", (p) => {
  p.play({ command: "readPrice" });
});
intent(
  "(Add|) (this|to) (product|item|) (to|) (wishlist|in wishlist|to wishlist)",
  (p) => { p.play({ command: "addToWishList" }); }
);
intent("(checkout | check out)", (p) => {
  p.play({ command: "checkout" });
});
intent("delivery address is $(Word* .+)", (p) => {
  p.play({ command: "address", title: p.Word.value });
});
intent("credit card number is $(Word* .+)", (p) => {
  p.play({ command: "ccNumber", title: p.Word.value });
});
intent("expiration date is $(Word* .+)", (p) => {
  p.play({ command: "expiryDate", title: p.Word.value });
});
intent("pay now", (p) => {
  p.play({ command: "payNow" });
});
```

Fig - 3: Code for Voice Recognition & Interpretation

Authentication Middleware

```
auth.js

const jwt = require("jsonwebtoken");
const { JWT_SECRET } = require("../config/keys");
const userModel = require("../models/users");
exports.loginCheck = (req, res, next) => {
  try {
    let token = req.headers.token;
    token = token.replace("Bearer ", "");
    decode = jwt.verify(token, JWT_SECRET);
    req.userDetails = decode;
    next();
  } catch (err) {
    res.json({
      error: "You must be logged in"
    });
  }
};
exports.isAuth = (req, res, next) => {
  let { loggedInUserId } = req.body;
  if (!loggedInUserId || !req.userDetails._id || loggedInUserId != req.userDetails._id)
{
    res.status(403).json({ error: "You are not authenticate" });
  }
  next();
};
exports.isAdmin = async (req, res, next) => {
  try {
    let reqUser = await userModel.findById(req.body.loggedInUserId);
    // If user role 0 that's mean not admin it's customer
    if (reqUser.userRole == 0) {
      res.status(403).json({ error: "Access denied" });
    }
    next();
  } catch {
    res.status(404);
  }
};
```

Fig - 4: Code for User Authentication

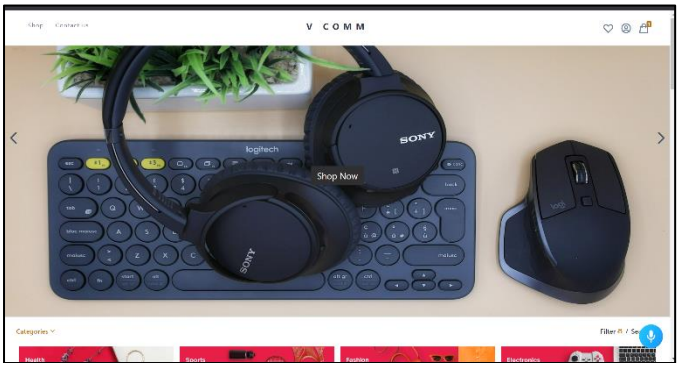
Payment Processing Controller

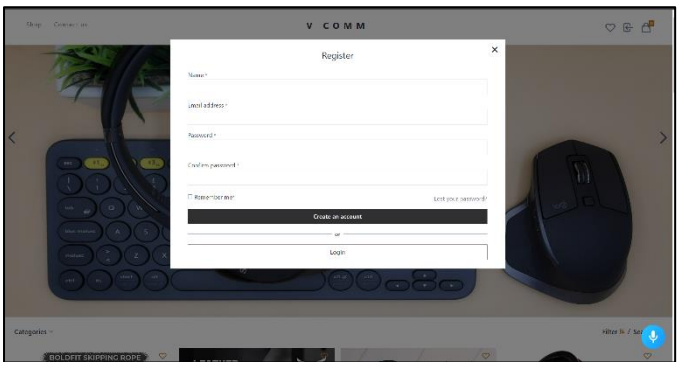
braintree.js

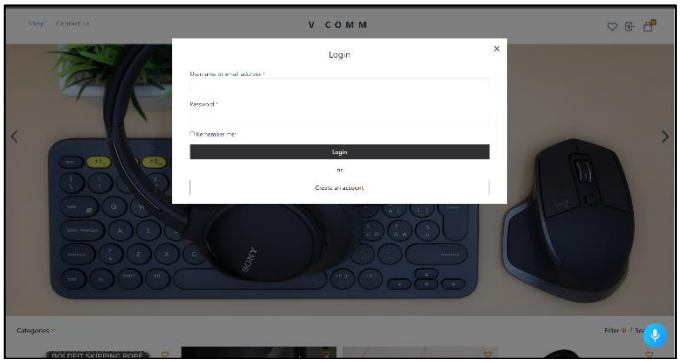
```
var braintree = require("braintree");
require("dotenv").config();
var gateway = new braintree.BraintreeGateway({
  environment: braintree.Environment.Sandbox,
  merchantId: process.env.BRAINTREE_MERCHANT_ID,
  publicKey: process.env.BRAINTREE_PUBLIC_KEY,
  privateKey: process.env.BRAINTREE_PRIVATE_KEY
});
class brainTree {
  ganerateToken(req, res) {
    gateway.clientToken.generate({}, (err, response) => {
      if (err) {
        return res.json(err);
      }
      return res.json(response);
    });
  }
  paymentProcess(req, res) {
    let { amountTotal, paymentMethod } = req.body;
    gateway.transaction.sale(
      {
        amount: amountTotal,
        paymentMethodNonce: paymentMethod,
        options: {
          submitForSettlement: true
        }
      },
      (err, result) => {
        if (err) {
          console.error(err);
          return res.json(err);
        }
        if (result.success) {
          console.log("Transaction ID: " + result.transaction.id);
          return res.json(result);
        } else {
          console.error(result.message);
        }
      }
    );
  }
}
const brainTreeController = new brainTree();
module.exports = brainTreeController;
```

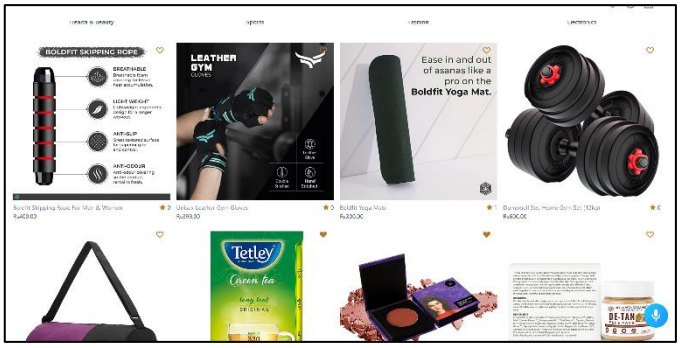
Fig - 5: Code for Payment processing

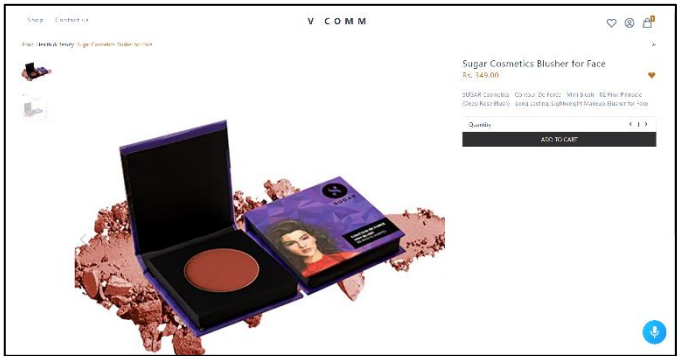
12. SCREENSHOTS

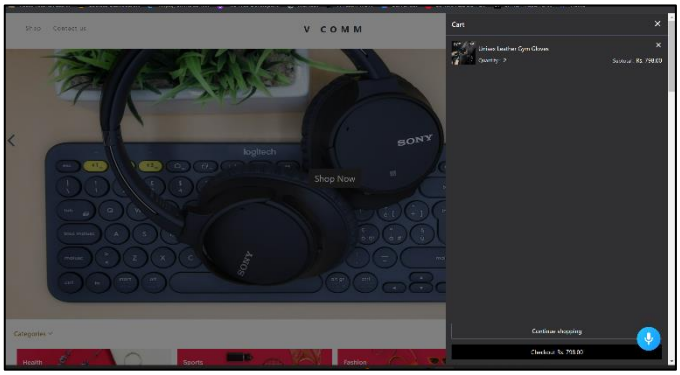


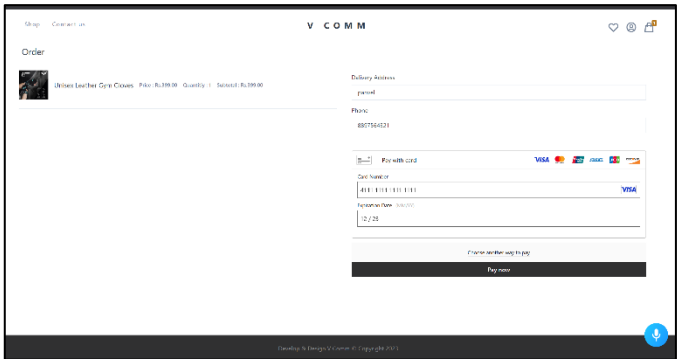


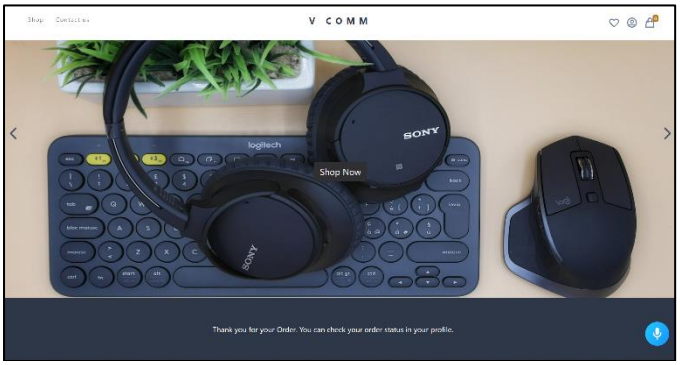


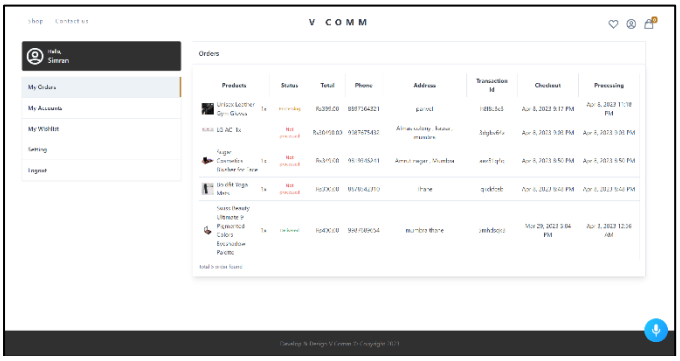


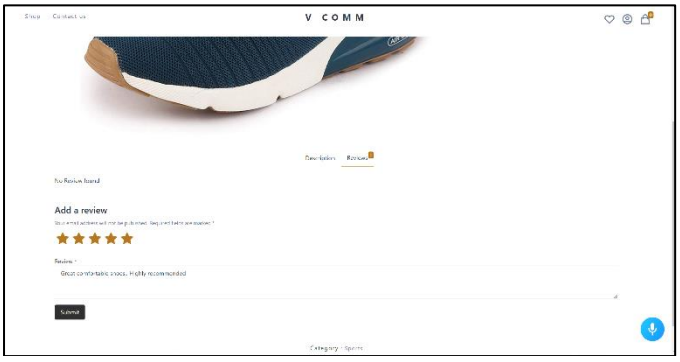


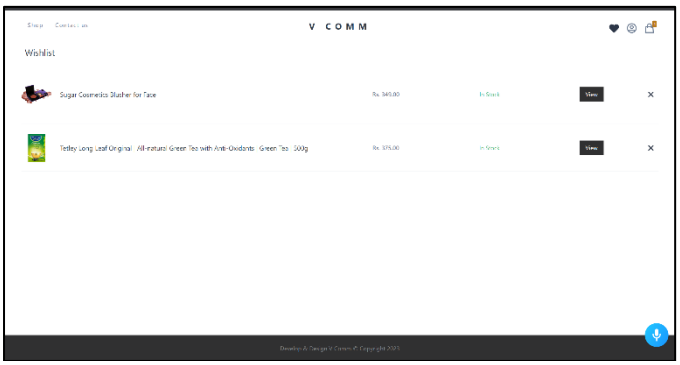












13. CONCLUSIONS

In conclusion, we have successfully created a fully functional voice-controlled e-commerce platform using the MERN stack, Alan AI service, and various other open-source libraries and tools. The platform offers voice assistance for various functionalities such as login, product search, and cart management, making it a cutting-edge and convenient way for customers to make online purchases. We believe that voice-based e-commerce systems provide a new and exciting opportunity for businesses to enhance their customer experience and gain a competitive advantage. However, careful consideration must be given to factors such as user experience, security, and scalability for the platform's success.

Altogether, our project has been a valuable learning experience for us and has given us the opportunity to explore and implement emerging technologies in the field of e-commerce.

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