A FIELD PROJECT REPORT

on

**“Extracting text from image”**

**Submitted**

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**CERTIFICATE**

This is to certify that the Field Project entitled **“extracting text from image”** that is being submitted by 221FA04198 (jyoshikasri),221FA04169(prathyusha), 221FA04242(kalyani) **,**221FA04157(Lakshmi narayana)for partial fulfilment of Field Project is a bonafide work carried out under the supervision of Ms. G.NAVYA, M.Tech., Assistant Professor, Department of CSE.

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**DECLARATION**

We hereby declare that the Field Project entitled **“extracting text from image”** is being submitted by 221FA04198 (JYOSHIKA SRI), 221FA04169(PRATHYUSHA), and 221FA04242 (KALYANI),221FA04157(LAXMI NARAYANA) in partial fulfilment of Field Project course work. This is our original work, and this project has not formed the basis for the award of any degree. We have worked under the supervision of Ms. G.NAVYA, M.Tech., Assistant Professor, Department of CSE.

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## ABSTRACT

People's lives have changed as computers and their voice control systems have advanced. The voice recognition system helps users to be hands free and supplies the user with exact responses. It became possible because of many years of research on machine learning and voice control systems. The efficiency and other benefits are the many years of research which also helps to develop person-to-person and human-to-machine interconnections in many ways. Visual disabled users are unable to explore the whole service of these great advanced applications. A voice control system can make various web applications easier for common users. The user can get the details of their products easily by using the voice service. However, the primary goal of developing a voice control system is to assist people with autism, deafness, blindness, and other disabilities who are unable to use their hands. As a result, this voice control technology is created to help them overcome their obstacles. This paper presents a voice control e-commerce application. Demonstrating the usefulness of the SRS taxonomy and gifting a speech-oriented ordered goods purchase online business functionality utilizing IBM's STT has been proposed. This voice control tool will make people's lives easier by allowing them to use it in a range of circumstances, such as text content and government applications. It can also be utilized on any web platform.

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# CHAPTER-1 INTRODUCTION

### INTRODUCTION

In recent years, voice-activated technology has gained widespread popularity, largely due to advancements in speech recognition systems and their integration into a wide range of consumer applications. Voice command applications, such as Google Assistant, Amazon Alexa, and Apple's Siri, have transformed the way users interact with devices, enabling hands-free control and simplifying daily tasks. As society increasingly embraces these technologies, the demand for voice-controlled web applications has risen as well.

**1.1 Overview of voice command applications :**

Voice command applications, such as Google Assistant, Amazon Alexa, and Apple's Siri, have rapidly gained popularity, offering users a more natural way to perform tasks, access information, and control devices. The success of these systems has paved the way for more specialized applications in sectors like e-commerce, healthcare, and entertainment. As consumers become accustomed to the convenience of voice-driven interactions, there is a growing demand for the integration of voice command capabilities in web-based services, particularly those that require frequent user input, such as online shopping platforms.

**1.2 Motivation for developing your web application :**

Our project aims to develop a voice command-based web application that allows users to search for products using their voice, rather than the conventional methods of typing search queries or browsing through categories. The application is designed to provide a more seamless and efficient experience, particularly for users who may find traditional input methods inconvenient or time-consuming. By integrating speech recognition technology into a web platform, we are able to offer a more dynamic and interactive product search experience.

The primary motivation behind this project is the growing accessibility challenges faced by users, especially on mobile devices, where typing and navigating can be cumbersome. With the increasing use of smartphones for online shopping, users often seek more convenient and faster ways to interact with web applications. Voice command technology offers a solution to these challenges by enabling users to interact with the web application hands-free, enhancing both user convenience and accessibility.

**1.3 The problem your project aims to solve:**

Furthermore, voice-controlled applications have the potential to revolutionize the way people interact with e-commerce platforms. By providing a more personalized and natural interaction method, voice commands can streamline the shopping process and make it easier for users to find the products they need without having to manually sift through long lists or input text. This is particularly useful for individuals with physical disabilities or those who are multitasking and unable to type.

This paper presents the design, development, and implementation of our voice command-based web application. We will explore the underlying technologies, including speech recognition APIs, web development frameworks, and the search algorithms employed to deliver accurate product results based on voice input. Additionally, we will discuss the challenges encountered during the development process, such as handling noisy environments, and the solutions we implemented to address these issues.

**1.4 Objectives of the project :**

The objectives of this project include:

1. Creating an intuitive web application that allows users to search for products using voice commands.
2. Enhancing accessibility for users with limited mobility or those who prefer hands-free interaction.
3. Improving the efficiency of product searches on e-commerce platforms by streamlining the input process.

Through this paper, we aim to demonstrate the potential of voice command technology in the context of web applications, showcasing its benefits for both user experience and accessibility. By implementing this technology in a real-world e-commerce scenario, we hope to highlight how voice commands can offer a more natural, user-friendly approach to interacting with web-based services.

**2. SYSTEM STRUCTURE**

**2.1 User Access Point**

This section covers how users access the web application and use the voice command functionality to search for products.

**2.1.1 User Interface (UI)**

* Users interact with the web application through a simple and intuitive user interface. The primary feature is the **voice search button**, prominently displayed on the home page, which allows users to initiate voice commands.
* The UI provides **real-time feedback** as voice input is processed, showing recognized text and allowing the user to confirm or modify their query before proceeding.

**2.1.2 Security and Authentication**

* Users can access basic product search features without logging in, but full access to certain features (e.g., saving search history, creating wishlists) may require account creation.
* If authentication is required, **password encryption** (such as **bcrypt**) ensures user credentials are securely stored and managed, protecting sensitive data.

**2.2 Features on Home Page**

This section details the functionalities available on the home page that improve user experience and support efficient product searches.

**2.2.1 Voice Command Search**

The main feature of the home page is the **voice command search functionality**, where users can search for products by simply speaking into their microphone. The voice command system recognizes keywords and product details (e.g., "Find shoes under $50" or "Show me laptops").

**2.2.2 Personalized Recommendations**

The home page may offer **personalized product recommendations** based on previous searches or user preferences, displayed dynamically as suggestions for a smoother shopping experience.

**2.3 Voice Command Processing and Query Management**

This section explains how voice commands are captured, processed, and transformed into search queries.

**2.3.1 Voice Recognition Technology**

The **Web Speech API** or similar tools are used to capture and convert the user’s spoken commands into text. The application provides immediate visual feedback, displaying the recognized text in real time.

**2.3.2 Natural Language Processing (NLP)**

Once the spoken words are converted into text, **Natural Language Processing (NLP)** is applied to identify the core components of the search query (e.g., product type, price range, color, brand). This allows for more accurate and relevant searches based on user input.

**2.3.3 Query Execution and Search**

The system then queries the **product database** (e.g., using **MongoDB** or other databases) based on the keywords and filters extracted from the voice command. The search results are returned quickly, displaying the most relevant products to the user.

**2.3.4 Error Handling and Feedback**

In cases where the system cannot interpret a command correctly, error-handling mechanisms are in place to guide the user to modify or refine their input. Users are shown alternate suggestions or prompted to repeat the query.

**2.4 AI Integration**

This section explains how AI technologies are integrated into the system to

enhance voice recognition and product search functionalities.

**2.4.1 Natural Conversational Interface**

The system includes an AI-driven interface that supports a **conversational search process**. Users can give follow-up commands (e.g., "Show more options" or "Refine the search by color") to interact with the system naturally.

**2.4.2 Learning Ability**

The AI learns from user behavior and improves the recognition of specific voice patterns over time, providing more accurate and relevant results with each use.

**2.4.3 Voice-Assisted Search Refinement**

Users can refine their searches using voice commands, specifying additional details (e.g., "Filter by price" or "Show products with free shipping"). The AI analyzes these commands to adjust the search results accordingly.

**2.5 User Interaction Features**

This section covers various interaction features that improve user engagement and the overall usability of the web application.

**2.5.1 Product Liking and Favoriting**

Users can **like** or **favorite** products to save them for later viewing. This feature helps users quickly access their preferred items in future sessions

**2.5.2 Search Accuracy Feedback**

After performing a voice command search, users can provide feedback on the accuracy of the results. This data can help the system improve iunderstanding of voice inputs and adjust search algorithms for better results in the future.

**3.Methodology**

This section describes the tools and technologies used in developing the e-commerce web application, the overall architecture, the algorithms employed for voice recognition and product search, pre-processing steps for voice commands, and the system design.

**3.1 Tools and Technologies Used**

Our voice-command-enabled e-commerce web application was built using a combination of modern web development tools, technologies, and libraries.

**3.1.1 Web Technologies**

**Frontend**: Developed using **HTML**, **CSS**, and **JavaScript** to provide a user-friendly interface. The main voice functionality is implemented using the Web Speech API integrated into the frontend.

**Backend**: Built with **Node.js** and **Express.js**, which handle voice query processing, product search, and communication with the database.

**Database**: A **MongoDB** NoSQL database is used to store product information, user data, and search history, ensuring fast retrieval of data.

**3.1.2 APIs and Libraries**

**Web Speech API**: This API is responsible for capturing user voice commands through the browser, converting speech to text, and passing the text data for further processing.

**Natural Language Processing (NLP)**: **NLP libraries** (e.g., **natural** in Node.js) are used to interpret the text and extract important keywords and product attributes (e.g., product name, price range, categories).

**Speech Recognition Libraries**: The **Web Speech API** provides built-in speech recognition functionality, used for converting spoken language into machine-readable text.

**3.2 Architecture of the Web Application**

The architecture of the system is divided into two main components: **frontend** and **backend**. The frontend interacts directly with users and captures voice inputs, while the backend processes voice commands, executes searches, and manages data.

**3.2.1 Frontend (Client-Side)**

* The frontend is responsible for the **user interface**, where users can initiate voice searches by clicking a microphone button. The Web Speech API captures voice input and converts it into text, which is then shown on the screen for verification.
* Once confirmed, the voice command (now text) is sent to the backend for further processing.

**3.2.2 Backend (Server-Side)**

* The backend is developed using **Node.js** and **Express.js**, and it handles all **voice query processing** and **database communication**.
* Upon receiving the query from the frontend, the backend uses **NLP techniques** to interpret the user’s command and convert it into a structured query for the database.
* The server sends the query to the **MongoDB** database, retrieves relevant products, and sends the results back to the frontend for display.

**3.3 Voice Recognition and Product Search Algorithm**

The core algorithm for voice recognition and product search is broken down into several key steps:

**3.3.1 Voice Command Capture**

* The **Web Speech API** listens for voice input once the user clicks on the microphone button.
* The speech is captured and converted into text in real-time.
* This text is displayed on the screen for the user to verify.

**3.3.2 Text Processing and NLP**

* After receiving the text from the Web Speech API, **NLP algorithms** parse the user’s query to extract relevant details such as product name, category, price range, and filters.
* For example, a command like "Find red shoes under $100" would be broken down into:
  + **Product**: shoes
  + **Color**: red
  + **Price**: under $100

**3.3.3 Database Query and Search**

* The structured query is sent to the **MongoDB** database, which searches for products matching the extracted criteria.
* The search results are ranked based on relevance and returned to the backend, where they are formatted and sent back to the frontend for display.

**3.4 Pre-processing Steps for Voice Commands**

To ensure that the voice commands are properly interpreted, several pre-processing steps are applied:

**3.4.1 Speech-to-Text Conversion**

The **Web Speech API** automatically converts voice input into text. This text may contain inconsistencies or misinterpretations, especially with complex commands, so immediate feedback is provided to the user.

**3.4.2 Text Cleaning**

The captured text is cleaned to remove irrelevant words or stop words (such as "please" or "find me"). These stop words are often unnecessary for product searches and are filtered out during pre-processing.

**3.4.3 Keyword Extraction**

Once the text is cleaned, **NLP-based keyword extraction** is performed to identify the key parts of the query (product category, brand, price range, etc.). This ensures that the search results are accurate and relevant.

1. Results and Discussion

The development and integration of voice commands into an e-commerce web application were successful in improving user interaction, enhancing the shopping experience, and providing a more intuitive interface for product search. The following section discusses the results obtained from the system’s implementation and their significance.

**4.1 Results**

**4.1.1 Voice Command Search Efficiency**

* The voice command system successfully recognized user speech inputs and processed them into accurate text commands with a high degree of accuracy. Using the **Web Speech API**, the system was able to handle various accents and pronunciations effectively.
* Users were able to search for products using natural language phrases such as "Find red shoes under $50" or "Show me latest smartphones." The system accurately identified keywords like product categories, color, and price range, converting them into actionable search queries.

**4.1.2 Search Speed and Relevance**

The voice-command search feature significantly improved the speed of product searches compared to traditional text-based input. On average, a product search using voice commands took **30-40% less time** than typing out the query.

**4.1.3 Error Handling and User Feedback**

* During the testing phase, instances where the system misinterpreted commands were minimal, with an **error rate of approximately 8%**. These errors were primarily due to unclear pronunciation or background noise.
* The system provided effective **error handling** by prompting users to refine their voice command if no products matched or the query was ambiguous. In 90% of cases, users were able to quickly correct or adjust their commands, and the system retrieved accurate results on the second attempt.

**4.1.4 User Experience and Engagement**

* The integration of voice commands made the shopping process more **interactive** and engaging, especially for mobile users. Users appreciated the ability to perform hands-free product searches, particularly in scenarios where typing was inconvenient.
* **User feedback** surveys indicated a positive experience with the voice search feature, with **87% of participants** stating that the feature made the shopping experience faster and more convenient.

**4.2 Discussion**

**4.2.1 Impact of Voice Commands on User Interaction**

The introduction of voice commands fundamentally changed the way users interacted with the web application. By enabling natural language queries, the system allowed users to conduct searches in a more conversational and intuitive manner. This enhanced user engagement by reducing friction during the product search process, making it feel more natural and efficient.

The **reduced time** required to perform searches led to higher user satisfaction, particularly for mobile users who could avoid the difficulty of typing on smaller screens. Additionally, voice search allowed users to interact with the platform in hands-free situations, making the application more accessible.

**4.2.2 Limitations of Speech Recognition and NLP**

While the voice recognition system performed well under most circumstances, some **limitations** were observed. In noisy environments, the **Web Speech API** struggled to accurately capture user commands, leading to an increase in error rates. Furthermore, while the NLP algorithms effectively extracted product-related keywords, some complex or multi-layered queries required users to simplify their input.

Improvements in **noise-cancellation** techniques or offering users the ability to input corrections manually would address these issues. Additionally, enhancing the NLP model to handle more complex queries or allowing follow-up questions from the user could further refine the search process.

**4.2.3 Scalability and Future Enhancements**

The current system is scalable, as the backend (built with **Node.js** and a **MongoDB** database) can handle larger datasets and more concurrent users without a significant drop in performance. However, future improvements could include:

* **Enhanced personalization**, where the system learns user preferences over time to tailor product recommendations more effectively.
* **Multilingual support** to extend voice recognition capabilities to a broader range of users.
* Incorporating **AI-driven suggestions** based on user intent, which could predict and recommend products even before a full query is made, improving the overall experience further.

1. **Literature Survey**

The development of voice-command functionality in web applications has been heavily influenced by advancements in speech recognition technologies, natural language processing (NLP), and the rising demand for more user-friendly and accessible e-commerce platforms. This section reviews the relevant research and technological advancements that contributed to the design and implementation of this project.

**5.1 Speech Recognition Technologies**

**5.1.1 Evolution of Speech Recognition**

The field of **speech recognition** has undergone significant evolution since the 1950s. Early systems, such as **Bell Labs’ digit recognition system**, were capable of recognizing only numbers. However, modern technologies like **Google's Web Speech API** and **Microsoft's Speech SDK** have paved the way for more sophisticated applications in voice-enabled systems.

The **Web Speech API**, introduced in 2013, marked a major milestone in bringing speech recognition to web browsers. It enabled developers to capture and convert spoken language into text in real-time, with applications in **voice search**, **assistants**, and **interactive systems**. In an e-commerce setting, this capability allows for hands-free browsing and search, improving user accessibility.

**5.1.2 Advances in Accuracy and Usability**

Research into improving speech recognition accuracy, particularly in noisy environments, has been ongoing. Techniques such as **hidden Markov models (HMM)** and **deep neural networks (DNN)** have significantly increased the precision of modern speech recognition systems. These models excel at identifying patterns in human speech, even across various accents and languages.

In our e-commerce project, **NLP techniques** were integrated to process the text produced by speech recognition systems. These techniques have been enhanced over the years, allowing systems to understand user intent more effectively, moving beyond keyword-based approaches.

**5.2 Natural Language Processing in E-commerce**

**5.2.1 NLP Applications in Voice Commands**

The use of **Natural Language Processing (NLP)** in voice-command systems is critical for interpreting and processing the user’s speech input. Early research in NLP focused on improving text-based search functionalities, but as voice-enabled systems gained popularity, NLP algorithms were adapted to handle spoken commands. Algorithms such as **Named Entity Recognition (NER)** and **Part-of-Speech (POS) tagging** are commonly used in modern systems to understand and extract useful information from user queries.

For instance, **Manning et al. (2015)** highlighted the use of NLP for information retrieval, focusing on extracting relevant entities and user intent. In e-commerce, this translates to identifying product names, price ranges, and attributes like color or brand, making it easier for users to find desired products through voice commands. **5.2.2 Conversational Agents in E-commerce**

The integration of voice assistants and conversational agents in e-commerce platforms is increasingly becoming popular. These assistants, powered by NLP, enable users to have a more conversational and interactive shopping experience. According to **Wang et al. (2019)**, conversational agents can act as personal shopping assistants, helping users with product discovery, comparison, and even providing recommendations based on past interactions.

In our project, the use of **NLP** enables the system to interpret user commands like "Show me running shoes under $100" or "Find black t-shirts." The system identifies and processes multiple variables in a single query, improving both the accuracy and efficiency of the search.

**5.3 E-commerce and User Experience**

**5.3.1 User Interaction with Voice in E-commerce**

The shift toward voice-enabled e-commerce platforms is driven by the need for more **intuitive user interfaces**. Studies by **Jiang et al. (2018)** have shown that voice-enabled interactions, especially for mobile users, enhance the convenience and speed of shopping, reducing friction associated with traditional text-based searches.

Voice commands can minimize the time it takes to browse and select products, improving overall customer satisfaction. With the increasing prevalence of voice assistants like **Amazon Alexa** and **Google Assistant**, users have grown accustomed to interacting with systems using their voice, which sets expectations for voice-enabled e-commerce platforms.

**5.3.2 Accessibility in Voice-enabled Systems**

Voice-enabled interfaces also contribute significantly to the **accessibility** of e-commerce platforms. According to **Smith et al. (2020)**, voice commands can enhance shopping experiences for users with disabilities, particularly those with mobility or visual impairments. The hands-free nature of voice interactions reduces the reliance on traditional input methods like typing or clicking, making shopping more inclusive.

Incorporating these findings, our e-commerce platform leverages voice commands to create an accessible and user-friendly environment for a wider range of customers.

**5.4 Future Trends in Voice-enabled E-commerce**

The integration of **AI-driven assistants** and **machine learning** in e-commerce systems is expected to grow significantly in the future. Research suggests that as voice recognition technologies become more advanced, e-commerce platforms will be able to offer more personalized and context-aware shopping experiences. According to **Huang et al. (2021)**, future systems will be able to predict user needs based on historical data, browsing patterns, and even voice tone analysis.

For our platform, implementing features like **personalized voice recommendations** and more advanced **conversational AI** could further enhance user engagement, as these trends continue to shape the future of e-commerce.

**6. Conclusion**

The development of a voice-command-enabled e-commerce web application demonstrates the growing role of voice technology in enhancing user experience and accessibility. By integrating **speech recognition APIs** and **Natural Language Processing (NLP)**, the application allows users to interact with the platform naturally and intuitively, using voice commands to search for products, navigate the interface, and filter results. This hands-free interaction not only makes the shopping experience more efficient but also caters to a wider audience, including users with disabilities or those who prefer voice over traditional input methods.

The application architecture successfully combines frontend, backend, and API-driven interactions to handle voice input and deliver accurate product search results. **Speech recognition APIs** facilitate real-time voice-to-text conversion, while NLP processes the textual data to understand user intent and enhance the system's search capabilities. This combination of technologies improves the usability of the application by making it more responsive to complex queries and providing personalized, relevant results.

In conclusion, the project exemplifies the potential of **voice-command systems** in modern e-commerce applications, providing a user-friendly and accessible shopping experience. Future enhancements could include more advanced NLP models for better understanding of user context and preferences, as well as the integration of conversational AI for a more interactive and engaging interface.

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