BATCH NO:MI 1119

ASSISTIVE TRANSLATOR FOR BLIND PEOPLE USING SPEECH TO SPEECH TECHNOLOGY

Minor project-I report submitted
in partial fulfillment of the requirement for award of the degree of

Bachelor of Technology
in
Computer Science & Engineering

By

E BHARGAV GANESH	(23UECS0171)	**(24899)**
A MANJUNATHA REDDY	(23UECS0030)	**(24978)**
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Under the guidance of
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
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VEL TECH RANGARAJAN DR. SAGUNTHALA R&D INSTITUTE OF SCIENCE AND TECHNOLOGY

(Deemed to be University Estd u/s 3 of UGC Act, 1956)
Accredited by NAAC with A++ Grade
CHENNAI 600 062, TAMILNADU, INDIA

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CERTIFICATE

It is certified that the work contained in the project report titled "ASSISTIVE TRANSLATOR FOR BLIND PEOPLE USING SPEECH TO SPEECH TECHNOLOGY" by "E BHARGAV GANESH (23UECS0171), A MANJUNATHA REDDY (23UECS0030), K VIKRAM KUMAR REDDY (23UECS0930)" has been carried out under my supervision and that this work has not been submitted elsewhere for a degree.

11/11/25

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Department of CSE

DECLARATION

We declare that this written submission represents my ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

E.BG
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E BHARGAV GANESH

Date: 12/11/25

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A MANJUNATHA REDDY

Date: 12/11/25

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K VIKRAM KUMAR REDDY

Date: 12/11/25

APPROVAL SHEET

This project report entitled ASSISTIVE TRANSLATOR FOR BLIND PEOPLE USING SPEECH TO SPEECH TECHNOLOGY by E BHARGAV GANESH ,23UECS0171, A MANJUNATHA REDDY, 23UECS0030, K VIKRAM KUMAR REDDY, 23UECS0930 is approved for the degree of B.Tech in Computer Science & Engineering.

1. 12/11/25

2. 12/11

Examiners

Supervisor

Dr.S.Karthiyayini M.E., PhD.,

Date: 12 / 11 /2025

Place: Avadi, chennai

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ABSTRACT

The Assistive Translator for Blind People using Speech-to-Speech Technology is designed to bridge the communication gap for visually impaired individuals by enabling seamless interaction through voice. This system allows users to speak in their native language and instantly receive spoken translations in another language, without needing to read or type. By integrating speech recognition, language translation, and speech synthesis technologies, the system provides an accessible and intuitive way for blind users to communicate effectively across linguistic barriers. The project focuses on enhancing accessibility, independence, and inclusivity by using a completely voice-driven interface. Unlike traditional translators that rely on text-based input and output, this solution ensures that every step from recognizing speech to delivering translated audio is handled audibly. The system is built using web technologies and can be easily deployed on mobile or desktop platforms, making it both practical and scalable.

Keywords:
Assistive Technology , Speech Recognition , Blind and Visually Impaired , Speech-to-Speech Translation , Language Translation , Voice Interface , Inclusive Communication.

LIST OF FIGURES

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LIST OF ACRONYMS AND ABBREVIATIONS

AI	Artificial Intelligence
API	Application Programming Interface
ASR	Automatic Speech Recognition
DBMS	Database Management System
DFD	Data Flow Diagram
IOT	Internet of Things
MLP	Multilayer Perceptron
NMT	Neural Machine Translation
NLP	Natural Language Processing
SSD	Speech Signal Data
STT	Speech-to-Text
TTS	Text-to-Speech
UI	User Interface

TABLE OF CONTENTS

Chapter 1

INTRODUCTION

1.1 Introduction

Communication is one of the most essential aspects of human life. For blind or visually impaired individuals, expressing thoughts or understanding others especially in different languages can be a significant challenge. While many modern translation tools exist, most of them rely heavily on reading or typing text, making them less accessible to people who cannot see.

The Assistive Translator for Blind People using Speech-to-Speech Technology aims to overcome this barrier by creating a system that works entirely through voice. The user simply speaks in one language, and the system automatically recognizes, translates, and speaks out the translation in another language. This approach removes the need for visual input or textual interaction, allowing users to communicate freely and independently.By combining technologies such as speech recognition, natural language processing, and speech synthesis, this project offers a practical and inclusive solution that supports real-time multilingual communication.

1.2 Aim of the project

The main aim of this project is to develop an Assistive Speech-to-Speech Translator that helps blind and visually impaired individuals communicate easily across different languages using only their voice. The system is designed to recognize spoken input, translate it into another language, and deliver the translation audibly, eliminating the need for reading.
This project aims to make communication more inclusive, accessible, and effortless for those who face visual challenges, empowering them to interact confidently in a multilingual world and promoting greater independence in everyday life.

1.3 Project Domain

The domain of this project lies at the intersection of Assistive Technology, Artificial Intelligence, and Human-Computer Interaction. Assistive technology focuses on designing innovative tools that help individuals with disabilities lead more independent and fulfilling lives. In this context, the project specifically addresses the challenges faced by blind and visually impaired individuals in communicating across different languages. By integrating AI-driven tools such as speech recognition, machine translation, and speech synthesis, the system transforms spoken words into another language and delivers them back as clear audio output. This ensures that users can interact and exchange information effectively without relying on visual or textual content.

The project also belongs to the Natural Language Processing (NLP) and Speech Technology domain, where human speech is understood and processed by machines. This combination makes the system intelligent, adaptive, and user-friendly. The project not only contributes to technological advancement but also emphasizes social inclusion, equal communication opportunities, and the empowerment of visually impaired individuals through accessible digital innovation.

1.4 Scope of the Project

The Assistive Translator for Blind People using Speech-to-Speech Technology has a broad and meaningful scope that extends beyond simple language translation. Its primary focus is to enable visually impaired individuals to communicate easily and independently in multiple languages through voice interaction. The system's ability to recognize speech, translate it accurately, and respond audibly makes it highly suitable for use in education, travel, healthcare, and social communication.

In addition to helping blind users overcome language barriers, this project can be expanded to support real-time translation on mobile and wearable devices, making it accessible anywhere.

Chapter 2

LITERATURE REVIEW

2.1 Literature Review

Over the past decade, assistive technology and speech recognition have advanced greatly, helping visually impaired individuals through tools like screen readers and voice systems. However, most focus on reading and navigation, with limited real-time speech translation. This project integrates speech recognition, translation, and voice output into a single voice-operated system for accessible communication.

2.2 Gap Identification

Author	Gap Identification	Year	Disadvantages
P. Kumar et al	Limited adaptability to different accents, languages, and natural speaking variations	2021	No integration with advanced AI models for improved accuracy.
S. Nair and R. Sharma	The system did not consider accessibility requirements for blind individuals.	2023	Lack of offline or lightweight deployment.
M. Patel et al	System was voice-command based, not a speech-to-speech translator.	2022	Response accuracy dropped in noisy environments.

Table 2.1: Test Cases

Chapter 3

PROJECT DESCRIPTION

3.1 Existing System

The current assistive communication and translation systems, such as Google Translate, Microsoft Translator, and voice assistants like Siri or Alexa, offer basic speech-to-speech translation capabilities. However, these systems are primarily designed for sighted users and rely heavily on visual interfaces, menus, and text displays for operation. Although screen readers can read text aloud, they often struggle with dynamic translation interfaces and pop-up elements, making these tools less efficient for blind users. Moreover, existing systems focus on general translation accuracy rather than accessibility, limiting their usefulness for visually impaired individuals who depend solely on audio feedback.
Current systems often provide literal translations without understanding conversational context, emotional tone, or cultural nuances. The absence of haptic or audio feedback cues also leads to confusion and delays during interaction. Hence, there is a pressing need for an adaptive, accessible, and context-aware speech-to-speech translator specifically designed for blind users.

3.2 Problem statement

Visually impaired individuals face major communication barriers when interacting across different languages. Most existing translation systems are designed for sighted users, requiring visual navigation through touch screens, text menus, and visual feedback. This visual dependency limits accessibility for blind users who depend entirely on audio interaction. Although speech recognition and translation tools exist, they often lack the ability to provide seamless, real-time communication in a fully voice-controlled environment. In addition, the absence of adaptive feedback and offline functionality further restricts usability in everyday situations, such as traveling, education, or social interaction. Hence, there is a significant gap in creating an inclusive, hands-free translation tool that caters specifically to the needs of blind users.

The proposed Assistive Translator for Blind People Using Speech-to-Speech Technology aims to address these limitations by providing a fully audio-driven and context-aware translation experience. The system will allow users to communicate effortlessly across languages using only their voice, eliminating the need for visual input.

3.3 System Specification

3.3.1 Hardware Specification

- Processor: Intel Core i5 / AMD Ryzen 5 (or higher) – 10th Generation or higher
- Microphone: High-sensitivity digital microphone (built-in or external USB mic)
- Speakers / Headphones: Stereo speakers or Bluetooth headset for clear voice feedback
- Operating System: Windows 10/11 (64-bit) / Linux Ubuntu 22.04 or later
- External USB audio interface (for enhanced speech input/output quality)

3.3.2 Software Specification

- Operating System: Windows 10/11 (64-bit) / Linux Ubuntu 22.04
- Speech Recognition: Google Speech Recognition API
- Text-to-Speech (TTS): gTTS, pyttsx3, or Microsoft Azure Speech SDK
- Translation API: Google Translate API
- Assistive Technologies Integration: NVDA Screen Reader / Speech Dispatcher

3.3.3 Standards and Policies

Anaconda Prompt:

Anaconda Prompt is a specialized command-line interface used for managing Python environments and executing machine learning and artificial intelligence modules efficiently. In the development of the Assistive Translator for Blind People

Using Speech-to-Speech Technology, Anaconda Prompt is used to install, configure, and manage essential Python libraries such as SpeechRecognition. It simplifies the setup process and ensures all dependencies are handled properly across different platforms including Windows, Linux. The Anaconda environment also supports various IDEs such as Jupyter Visual Studio Code, making the coding and testing process more efficient. The user interface for the system can be implemented directly using Python frameworks within this environment.

Standard Used: ISO/IEC 27001

Jupyter:

Jupyter is an open-source web-based application used to create, document, and execute live code, equations, visualizations, and narrative text. For the Assistive Translator for Blind People Using Speech-to-Speech Technology, Jupyter Notebook is used for developing and testing machine learning models, managing data flow between speech recognition and translation modules, and visualizing performance metrics. It provides an interactive environment for model training, debugging, and analysis, which enhances development efficiency and reproducibility. Jupyter also supports real-time collaboration and allows for structured documentation of experiments, which is essential for maintaining development transparency and accuracy.

Standard Used: ISO/IEC 27001

Chapter 4

METHODOLOGY

4.1 Proposed System

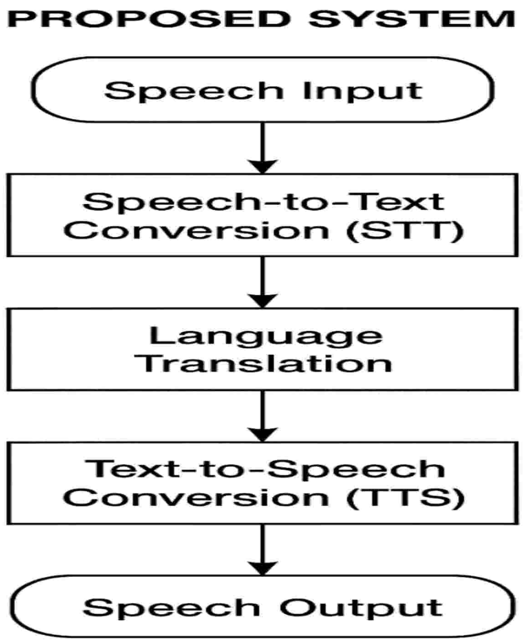

Figure 4.1: **Proposed System**

Description:

The Proposed System aims to develop an intelligent and user-friendly speech-to-speech translation platform that assists visually impaired individuals in overcoming language barriers through complete voice interaction. Unlike conventional translator applications that rely on visual interfaces or manual text input, this system focuses entirely on audio-based communication to ensure accessibility and independence for blind users.

4.2 General Architecture

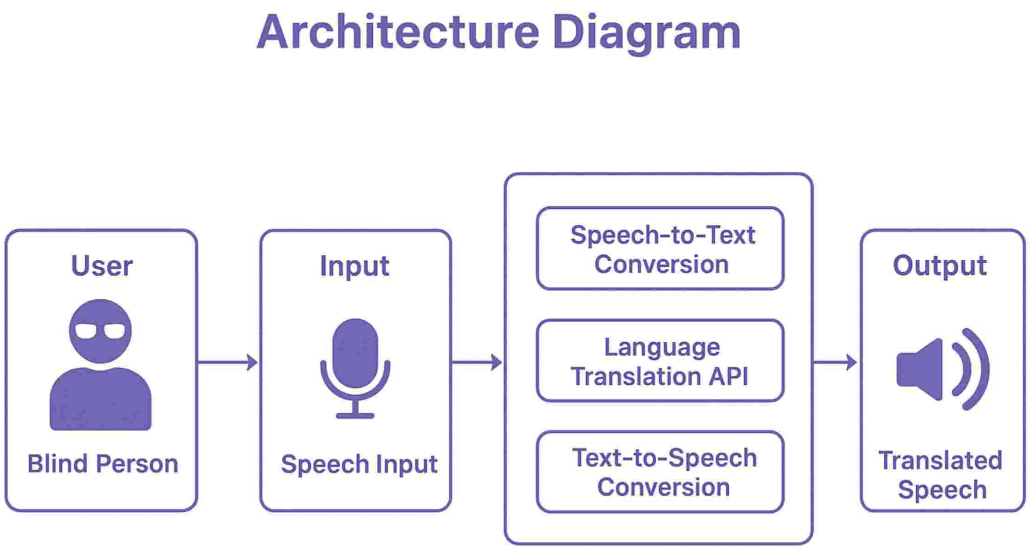

Figure 4.2: **Architecture Diagram**

Description:

It is designed to provide an end-to-end speech-based communication system that eliminates the need for visual interaction. The system primarily focuses on converting spoken input from one language to spoken output in another language, making it fully accessible for visually impaired users.

4.3 Design Phase

4.3.1 Data Flow Diagram

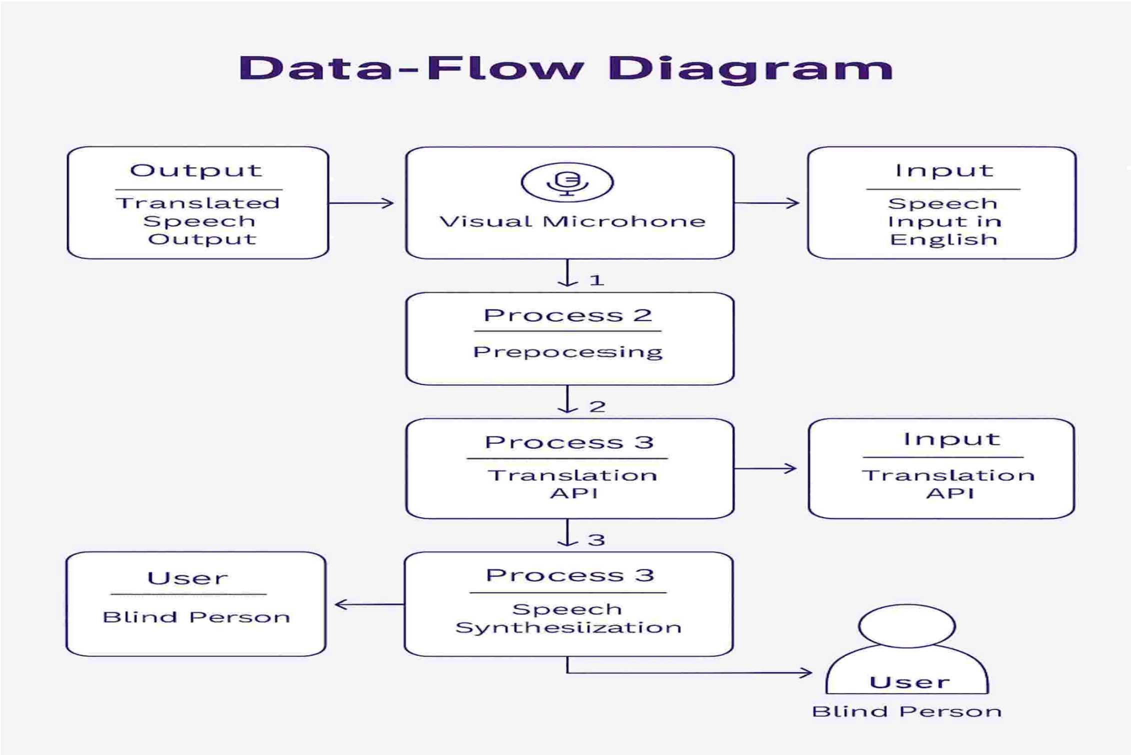

Figure 4.3: **Data flow Diagram**

Description:

The Data Flow Diagram represents how data moves through the Assistive Translator for Blind People Using Speech-to-Speech Technology system. It illustrates the flow of information between various components such as the user, processing modules, and output devices.

4.3.2 Use Case Diagram

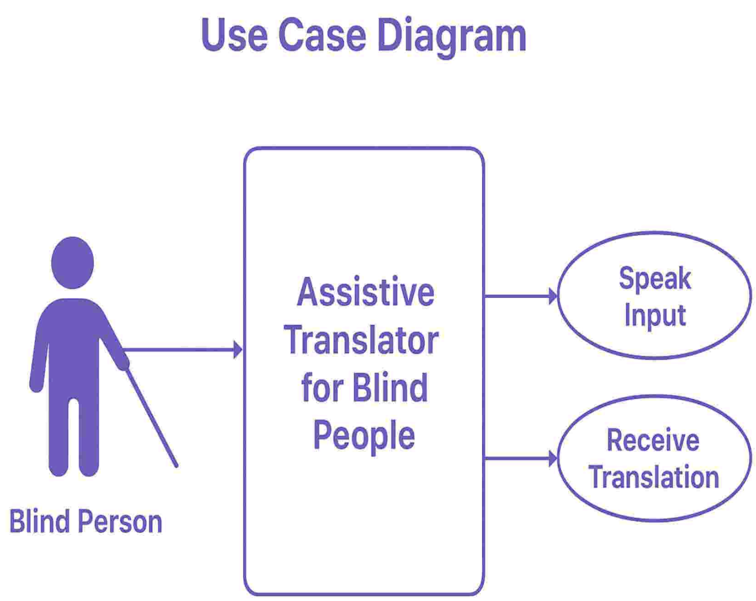

Figure 4.4: **Use Case Diagram**

Description:

The use case diagram shows a blind person using the Assistive Translator by speaking and receiving spoken translations, making communication simple and fully voice-based.It shows the main functionalities provided by the system and how external entities communicate with it.

4.3.3 Class Diagram

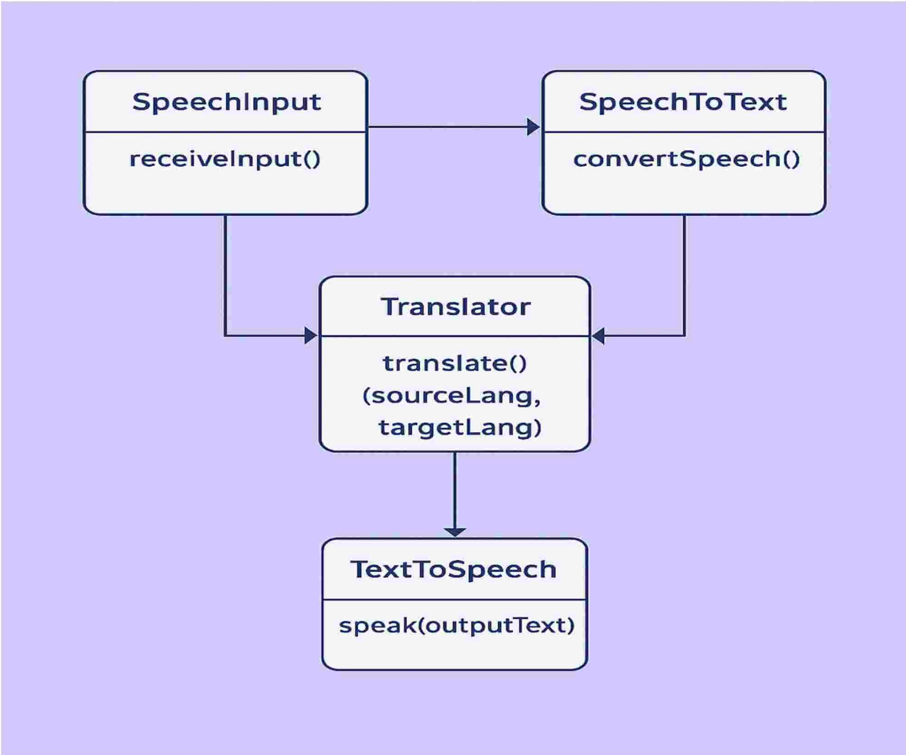

Figure 4.5: **Class Diagram**

Description: The class diagram represents the core structure of the Assistive Translator system by showing its main components and how they relate to each other. It includes classes such as SpeechInput, SpeechToText, Translator, and TextToSpeech, each responsible for a specific task in the translation pipeline. The SpeechInput class captures the user's voice, which is then converted to text by the SpeechToText class. The Translator class processes this text and converts it into the selected target language, while the TextToSpeech class generates spoken audio output for the blind user. This diagram helps visualize the system's organization, responsibilities, and data flow between components. It clearly shows how each class contributes to the overall speech-to-speech translation process, ensuring modularity and easy system maintenance.

4.3.4 Sequence Diagram

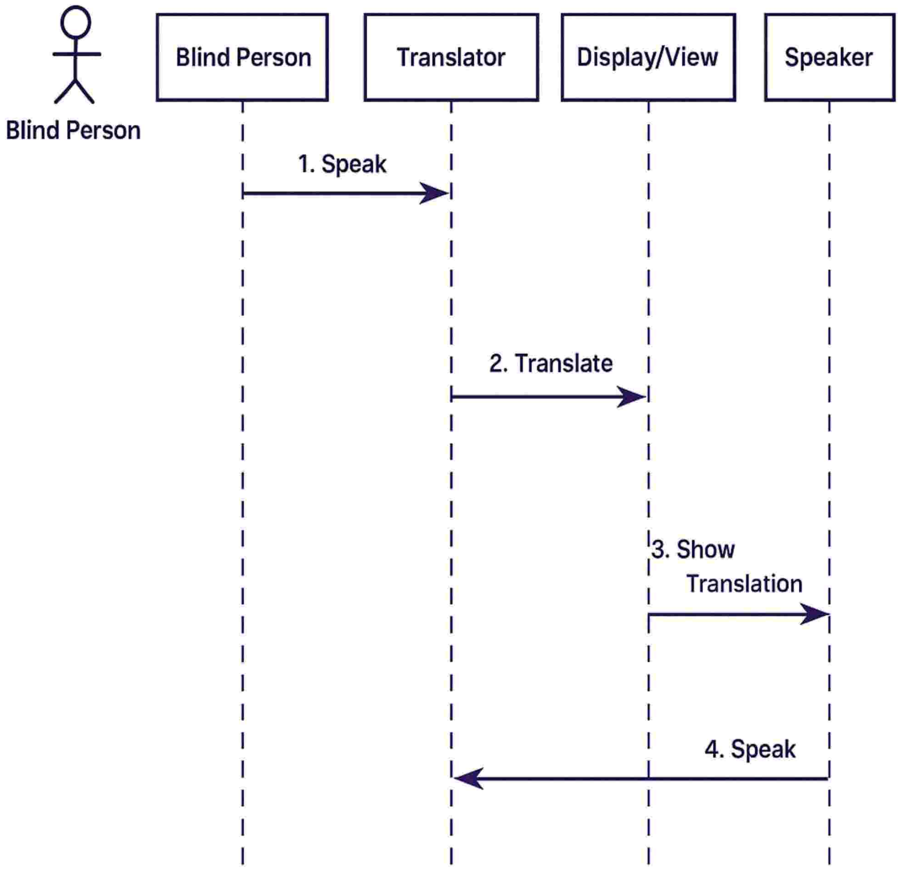

Figure 4.6: **Sequence diagram**

Description: The sequence diagram illustrates the step-by-step interaction between the user and the system during translation. It begins with the blind user speaking into the device, after which the translator module captures and processes the input. The recognized text is translated and then converted into speech, which is finally played back to the user. This diagram highlights how each process happens in a time-ordered manner, ensuring proper coordination between modules. It also shows how the system responds instantly to user input, making the communication flow smooth and user-friendly. Overall, it captures the real-time nature of the system's operation.

4.3.5 Collaboration diagram

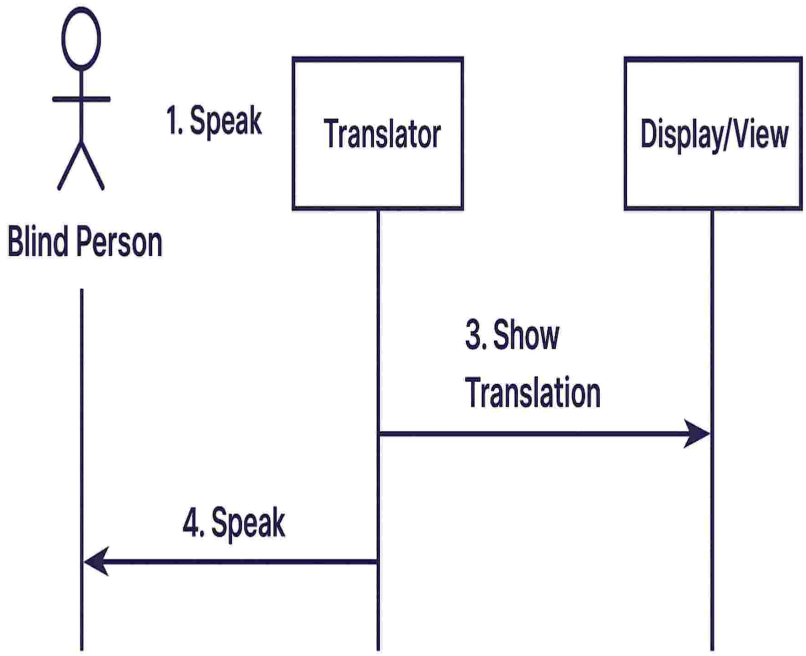

Figure 4.7: **Collaboration diagram**

Description: The collaboration diagram shows the interaction between the blind person, the translator, and the display or output system. The process begins when the blind person speaks, and the translator captures and processes the spoken input. Once the translation is completed, the translated text or audio is sent to the display or output module. Finally, the translator speaks the translated result back to the user. This flow highlights how the system components work together to provide seamless and accessible speech translation for visually impaired users.

4.3.6 Activity Diagram

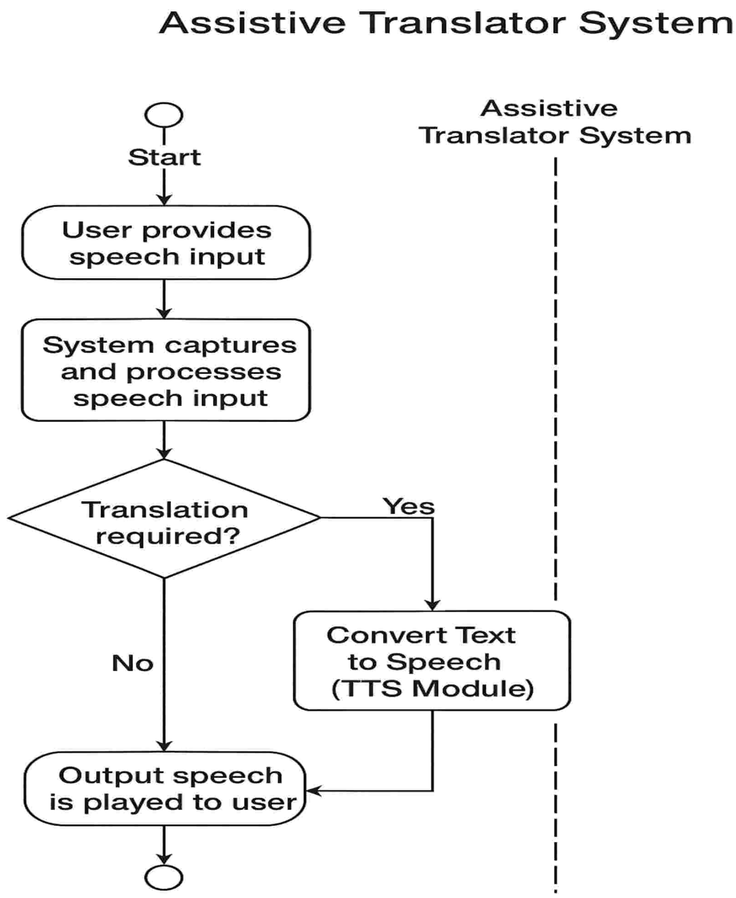

Figure 4.8: **Activity Diagram**

Description: The activity diagram illustrates the workflow of the Assistive Translator System. The process starts when the user provides speech input. The system then captures and processes this input to determine if translation is required. If translation is needed, the system converts the translated text into speech using the Text-to-Speech (TTS) module. Finally, the output speech is played back to the user. This sequence ensures smooth and accessible voice-based translation for visually impaired users.

4.4 Algorithm & Pseudo Code

4.4.1 Algorithm

- Start the system.
- Capture user speech through the microphone.
- Convert the speech input into text using Speech Recognition.
- Detect the input language automatically.
- Translate the recognized text into the selected target language.
- Convert the translated text into speech using Text-to-Speech.
- Play the audio output for the user.
- Wait for the next speech input or stop the system.

4.4.2 Pseudo Code

```
BEGIN
    Initialize microphone
    WHILE system is active DO
        Listen for user speech
        speech_text = SpeechToText()
        detected_lang = IdentifyLanguage(speech_text)
        translated_text = Translate(speech_text, target_lang)
        output_audio = TextToSpeech(translated_text)
        Play(output_audio)
    END WHILE
END
```

4.4.3 Data Set

Data Type	Description	Purpose
User Speech Input	Voice captured through the microphone in real time.	Provides raw audio input for STT processing.
Speech-to-Text (STT) Models	Built-in language models that convert spoken words into text.	Enables accurate transcription of speech.
Translation Dictionaries / APIs	Online or built-in multilingual translation resources.	Converts transcribed text into the target language.
Text-to-Speech (TTS) Models	Voice synthesis models that generate natural audio output.	Produces spoken output for blind users.

Table 4.1: Data Sources Used in the System

4.5 Module Description

4.5.1 Module 1: Speech Input & Recognition Module

This module captures the user's voice using the microphone and converts it into text. It also detects the spoken language automatically. It enables visually impaired users to provide input hands-free without relying on any visual interface.

4.5.2 Module 2: Translation Processing Module

This module processes the recognized text and translates it into the desired target language. It utilizes multilingual translation models to ensure accurate and meaningful output. This module removes language barriers and supports smooth communication.

4.5.3 Module 3: Text-to-Speech Output Module

This module converts the translated text into clear and natural-sounding speech. It plays the audio output for the user, allowing visually impaired individuals to understand the translation without needing a display. It ensures seamless speech-based interaction.

Chapter 5

IMPLEMENTATION AND TESTING

5.1 Input and Output

5.1.1 Input Design

The input design allows users to give speech input through a microphone. The system captures the voice, converts it into text, and prepares it for translation. The interface is simple and user-friendly for smooth interaction.

5.1.2 Output Design

The output design defines how the translated data is presented to the user. Once the translation is complete, the system displays the translated text and provides audio playback using text-to-speech technology. This ensures that users can both see and hear the translated output, enhancing accessibility and usability.

5.2 Testing

Testing is performed to ensure that all modules of the system function correctly and that the overall performance meets user requirements. It helps identify and correct errors in the development process.

5.3 Types of Testing

5.3.1 Unit Testing

Input

```
User speaks: "Hello"
```

Test Result

The system successfully recognizes the spoken input, converts it to text, and produces the translated output accurately, confirming that the speech recognition and translation components are working properly.

output

```
Translation: "                    "
```

5.3.2 Integration Testing

Input

```
User speaks: "Where are you man"
```

Test Result

and provides the audio output correctly, verifying that all modules (speech-to-text, translation, and text-to-speech) are integrated successfully.

output

```
Translation: "                                             "
```

5.3.3 System Testing

Input

```
Complete workflow test:
User provides voice input -> System translates -> Output speech generated
```

Test Result

The system performs the full process smoothly — capturing speech, translating accurately, and delivering the spoken output. The display shows "Translation successful!" confirming correct end-to-end functionality.

5.3.4 Test Result

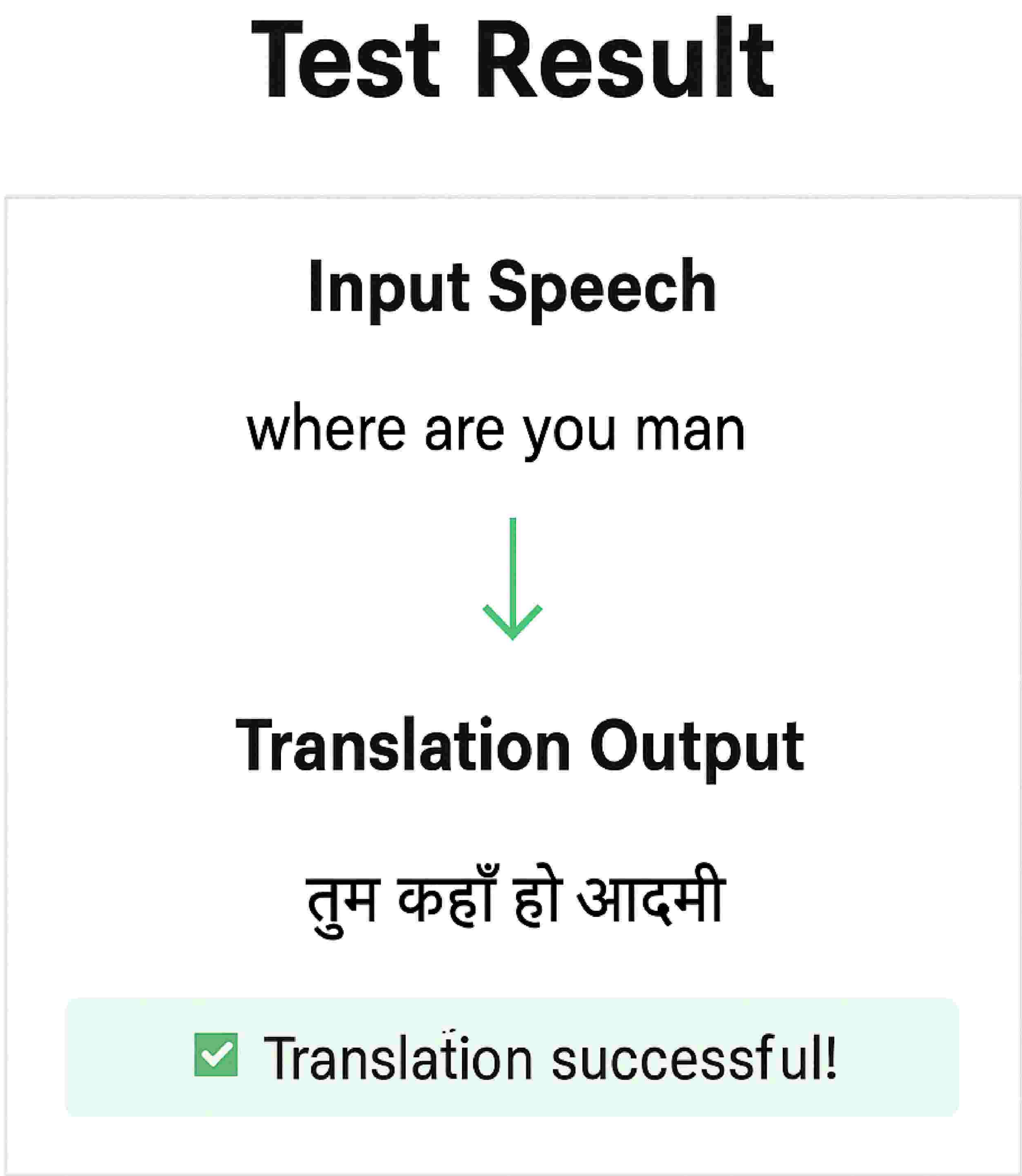

Figure 5.1: **Test Image**

Chapter 6

RESULTS AND DISCUSSIONS

6.1 Efficiency of the Proposed System

The proposed Assistive Translator for Blind People Using Speech-to-Speech Technology is built to be fast, accurate, and easy to use. It uses advanced speech recognition, translation, and text-to-speech techniques to ensure that communication happens almost instantly. The system listens to a user's voice, translates it into another language, and speaks it back clearly — all in real time. Because it uses optimized language processing models, it can handle speech quickly while maintaining accuracy. Even in places with poor internet connectivity, the system can still work efficiently through its offline translation feature. This helps users communicate smoothly without worrying about connection issues or long waiting times.
The system is also designed with accessibility in mind. Since it is completely voice-controlled, blind users can use it easily without needing to look at a screen or press buttons. The clear audio feedback and optional vibration responses make the interaction simple and reliable. The lightweight design of the application ensures it runs well on most modern computers or devices without consuming too much memory or power. Overall, the proposed system is efficient, user-friendly, and dependable — helping blind individuals communicate confidently and independently in different languages.

6.2 Comparison of Existing and Proposed System

Existing system:(Conventional Speech Translation Tools)
In the existing system, translation applications such as Google Translate and Microsoft Translator are used for speech-to-speech communication. These tools are effective for basic translation tasks but are primarily designed for sighted users. They rely heavily on touch and visual feedback, making them difficult for blind individuals to use independently. The interaction depends on selecting languages, pressing buttons, and reading on-screen text, which creates accessibility barriers. Moreover,

these systems require a constant internet connection, which can limit their performance in areas with poor connectivity. While they provide accurate translations, the lack of a fully voice-driven interface and non-visual feedback reduces their efficiency and usability for visually impaired users.

Proposed system:(Assistive Translator for Blind People Using Speech-to-Speech Technology)

The proposed system introduces a more inclusive, voice-based solution designed specifically for visually impaired users. It eliminates the need for any visual or manual input by allowing users to operate the translator completely through voice commands. The system provides real-time translation and instant voice feedback, making communication faster and more natural. In addition, it includes features like offline translation support and optional haptic feedback for better accessibility. Compared to the existing system, the proposed approach offers higher efficiency, greater independence, and improved user experience. It reduces dependency on sighted assistance and ensures smoother communication for blind individuals in multilingual environments.

PROGRAM:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Speech Translator</title>
  <style>
    * {margin: 0; padding: 0; box-sizing: border-box;}
    body {
      font-family: 'Segoe UI', Tahoma, Geneva, Verdana, sans-serif;
      background: linear-gradient(135deg, #667eea 0%, #764ba2 100%);
      min-height: 100vh;
      display: flex;
      align-items: center;
      justify-content: center;
      padding: 20px;
    }
    .translator-container {
      background: rgba(255, 255, 255, 0.95);
      backdrop-filter: blur(10px);
      border-radius: 20px;
      box-shadow: 0 20px 40px rgba(0, 0, 0, 0.1);
      padding: 40px;
      max-width: 800px;
      width: 100%;
      text-align: center;
```

```
}
h1 {
  color: #333;
  margin-bottom: 30px;
  font-size: 2.5rem;
  background: linear-gradient(135deg, #667eea, #764ba2);
  -webkit-background-clip: text;
  -webkit-text-fill-color: transparent;
  background-clip: text;
}
.language-selectors {
  display: flex;
  justify-content: space-between;
  align-items: center;
  margin-bottom: 30px;
  gap: 20px;
}
.language-group {flex: 1;}
.language-group label {
  display: block;
  margin-bottom: 8px;
  font-weight: 600;
  color: #555;
}
select {
  width: 100%;
  padding: 12px;
  border: 2px solid #e0e0e0;
  border-radius: 10px;
  font-size: 16px;
  background: white;
  transition: border-color 0.3s ease;
}
select:focus {outline: none; border-color: #667eea;}
.swap-btn {
  background: linear-gradient(135deg, #667eea, #764ba2);
  border: none;
  color: white;
  padding: 12px;
  border-radius: 50%;
  cursor: pointer;
  transition: transform 0.3s ease;
  margin-top: 25px;
}
.swap-btn:hover {transform: rotate(180deg);}
.input-section {
  background: #f8f9fa;
  border-radius: 15px;
  padding: 30px;
  margin: 30px 0;
```

```
      display: flex;

    .status.success {background: #d4edda; color: #155724; border: 1px solid #c3e6cb;}
    .status.error {background: #f8d7da; color: #721c24; border: 1px solid #f5c6cb;}
    .status.info {background: #cce7ff; color: #004085; border: 1px solid #b3d9ff;}
  </style>
</head>
<body>
  <div class="translator-container">
    <h1>      Speech Translator</h1>

    <div class="language-selectors">
      <div class="language-group">
        <label for="fromLang">From:</label>
        <select id="fromLang">
          <option value="en">English</option>
          <option value="hi">Hindi</option>
          <option value="te">Telugu</option>
          <option value="ta">Tamil</option>
          <option value="kn">Kannada</option>
          <option value="ml">Malayalam</option>
          <option value="bn">Bengali</option>
          <option value="gu">Gujarati</option>
          <option value="mr">Marathi</option>
          <option value="pa">Punjabi</option>
          <option value="ur">Urdu</option>
          <option value="or">Odia</option>
          <option value="as">Assamese</option>
          <option value="sa">Sanskrit</option>
        </select>
      </div>

      <button class="swap-btn" onclick="swapLanguages()" title="Swap Languages">  </button>

      <div class="language-group">
        <label for="toLang">To:</label>
        <select id="toLang">
          <option value="hi">Hindi</option>
          <option value="en">English</option>
          <option value="te">Telugu</option>
          <option value="ta">Tamil</option>
          <option value="kn">Kannada</option>
          <option value="ml">Malayalam</option>
          <option value="bn">Bengali</option>
          <option value="gu">Gujarati</option>
          <option value="mr">Marathi</option>
          <option value="pa">Punjabi</option>
          <option value="ur">Urdu</option>
          <option value="or">Odia</option>
          <option value="as">Assamese</option>
```

```
          <option value="sa">Sanskrit</option>
        </select>
      </div>
    </div>

    <div class="input-section">
      <textarea class="text-area" id="inputText" placeholder="Speak or type your message here..." rows="4"></textarea>
      <button class="mic-button" onclick="toggleListening()" id="micBtn">    </button>
    </div>

    <div class="output-section">
      <h3>Translation:</h3>
      <div class="output-text" id="outputText">Your translation will appear here...</div>
      <button class="speak-btn" onclick="speakTranslation()" id="speakBtn" style="display: none;">    Speak Translation</button>
    </div>

    <div id="status" class="status" style="display: none;"></div>
  </div>

  <script>
    let recognition;
    let isListening = false;
    let currentTranslation = "";

    async function askMicPermission() {
      try {
        await navigator.mediaDevices.getUserMedia({ audio: true });
        console.log("   Microphone permission granted");
      } catch (err) {
        showStatus("Please allow microphone access in browser settings.", "error");
      }
    }

    function setupRecognition() {
      const SpeechRecognition = window.SpeechRecognition || window.webkitSpeechRecognition;
      if (!SpeechRecognition) {
        showStatus("Speech recognition not supported in this browser.", "error");
        return;
      }

      recognition = new SpeechRecognition();
      recognition.continuous = false;
      recognition.interimResults = false;
      recognition.lang = document.getElementById("fromLang").value;

      recognition.onstart = () => {
        isListening = true;
        document.getElementById("micBtn").classList.add("listening");
```

```
      showStatus("    Listening... Speak now!", "info");
    };

    recognition.onresult = (event) => {
      const text = event.results[0][0].transcript;
      document.getElementById("inputText").value = text;
    };

    // When user stops speaking
    recognition.onend = async () => {
      document.getElementById("micBtn").classList.remove("listening");
      isListening = false;
      showStatus("  Stopped listening. Translating...", "info");
      await translateText(); // Auto translate when mic stops
    };

    recognition.onerror = (event) => {
      console.error("Speech recognition error:", event.error);
      showStatus("Speech recognition error. Try again.", "error");
      document.getElementById("micBtn").classList.remove("listening");
      isListening = false;
    };
  }

  function toggleListening() {
    if (!recognition) setupRecognition();

    if (isListening) {
      recognition.stop(); // Stop listening manually
    } else {
      recognition.lang = document.getElementById("fromLang").value;
      recognition.start(); // Start listening
    }
  }
  async function translateText() {
    const text = document.getElementById("inputText").value.trim();
    const from = document.getElementById("fromLang").value;
    const to = document.getElementById("toLang").value;

    if (!text) return showStatus("No speech detected to translate.", "error");

    try {
      const res = await fetch(
        https://translate.googleapis.com/translate_a/single?client=gtx&sl=${from}&tl=${to}&dt=t&q=
            ${encodeURIComponent(text)}
      );
      const data = await res.json();
      const translated = data[0].map(x => x[0]).join("");

      currentTranslation = translated;
```

```
        document.getElementById("outputText").textContent = translated;
        document.getElementById("speakBtn").style.display = "inline-block";
        showStatus("   Translation successful!", "success");
        speakTranslation();
      } catch (err) {
        showStatus("Translation failed. Try again.", "error");
      }
    }
    function speakTranslation() {
      if (!currentTranslation) return;
      const utterance = new SpeechSynthesisUtterance(currentTranslation);
      const to = document.getElementById("toLang").value;
      const langMap = {
        en: "en-US", hi: "hi-IN", te: "te-IN", ta: "ta-IN",
        kn: "kn-IN", ml: "ml-IN", bn: "bn-IN", gu: "gu-IN",
        mr: "mr-IN", pa: "pa-IN", ur: "ur-PK", or: "or-IN",
        as: "as-IN", sa: "sa-IN"
      };
      utterance.lang = langMap[to] || "en-US";
      utterance.rate = 0.9;
      speechSynthesis.speak(utterance);
    }
    function showStatus(msg, type) {
      const box = document.getElementById("status");
      box.textContent = msg;
      box.className = "status " + type;
      box.style.display = "block";
    }
    function hideStatus() {
      document.getElementById("status").style.display = "none";
    }
    document.addEventListener("DOMContentLoaded", () => {
      askMicPermission();
      setupRecognition();
      showStatus("Ready! Click mic to start speaking.", "info");
      setTimeout(hideStatus, 3000);
    });
    function swapLanguages() {
      const fromSelect = document.getElementById("fromLang");
      const toSelect = document.getElementById("toLang");
      const temp = fromSelect.value;
      fromSelect.value = toSelect.value;
      toSelect.value = temp;
    }
  </script>
</body>
</html>
```

Output

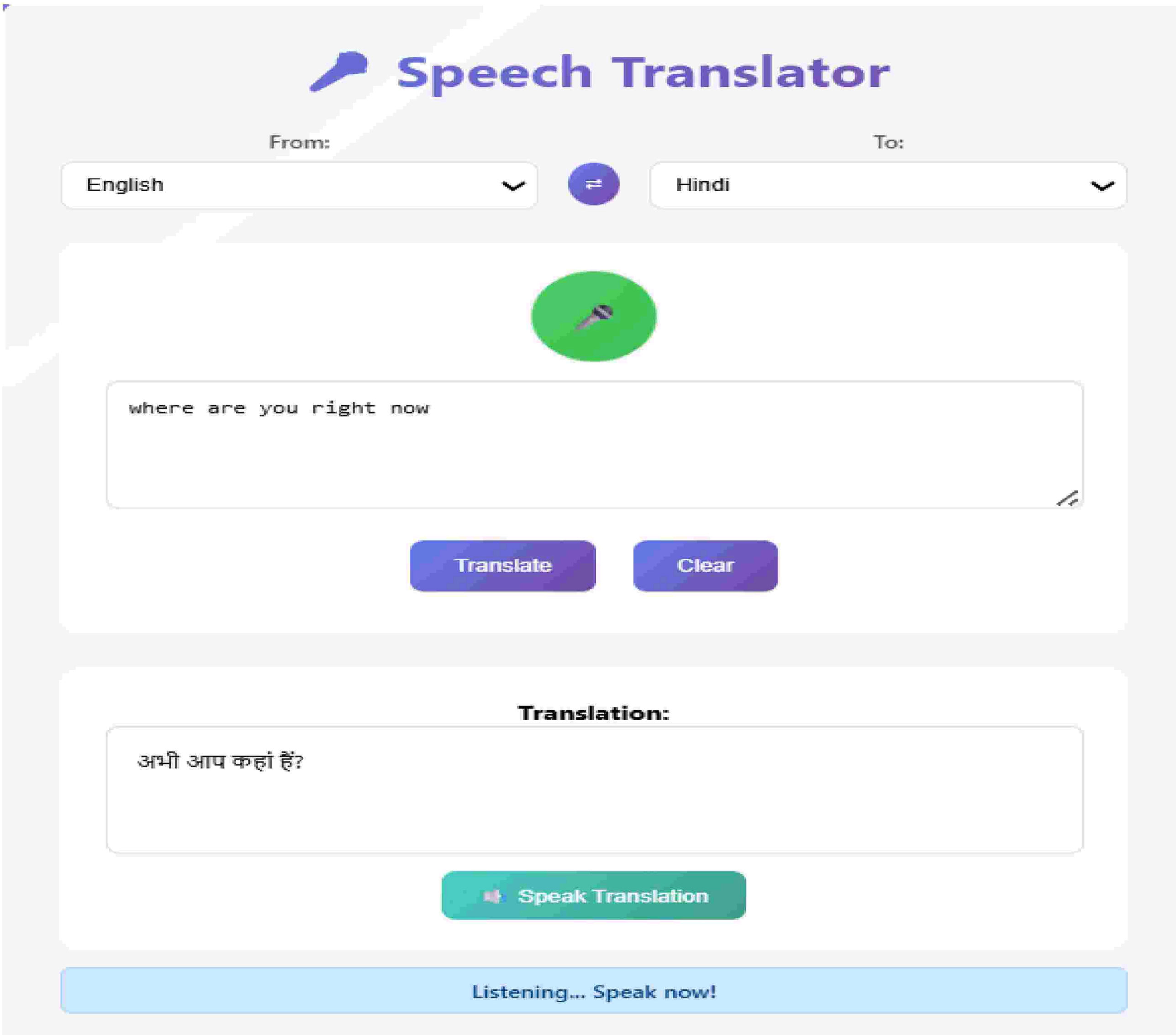

Figure 6.1: **Output 1**

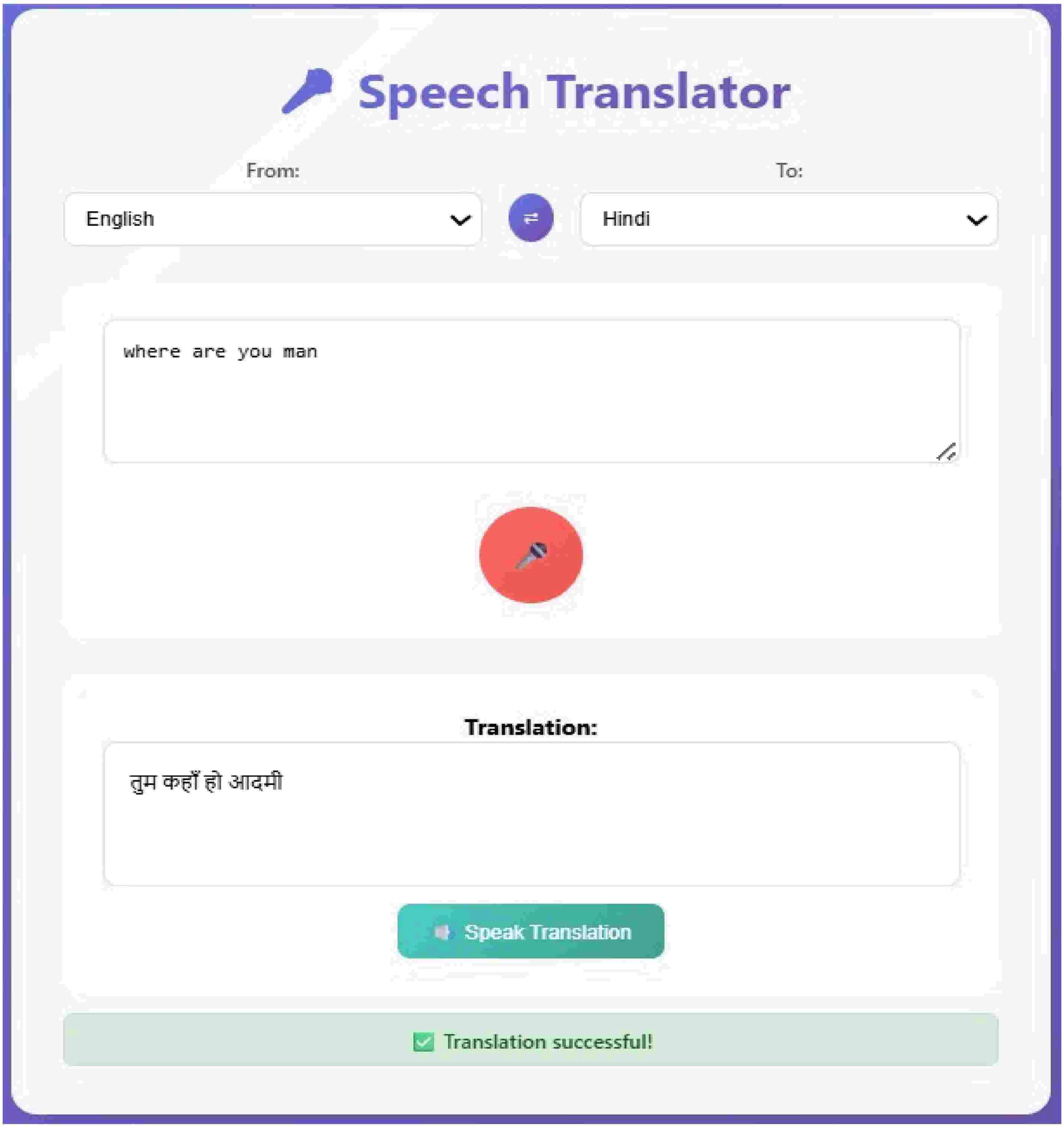

Figure 6.2: **Output 2**

Chapter 7

CONCLUSION AND FUTURE ENHANCEMENTS

7.1 Conclusion

The Assistive Translator for Blind People using Speech-to-Speech Technology is designed to help visually impaired individuals communicate easily across different languages. By using speech recognition, translation, and text-to-speech, the system enables real-time voice communication without any visual interaction. This makes it highly suitable for users who depend on audio feedback. The project reduces communication barriers by accurately understanding speech, translating it, and providing clear audio output. With its voice-controlled interface and accessible design, the system supports independent use and promotes inclusive communication. Future upgrades, such as more language support and integration with other assistive tools, can make it even more powerful and user-friendly.

7.2 Future Enhancements

In the future, the Assistive Translator can be improved to become more intelligent and accessible. Features like AI-based emotion detection, support for regional accents, and natural-sounding translations can enhance communication. The system can also be connected with wearable devices such as smart earbuds or wristbands for a fully hands-free experience. Cloud synchronization could store user preferences for personalization. Adding multilingual and group conversation support would help blind users communicate smoothly in different situations. These improvements can transform the system into a complete, smart communication assistant for visually impaired individuals.

Chapter 8

SUSTAINABLEDEVELOPMENTGOALS(SDG)

8.1 Alignment with SDG

The Assistive Translator for Blind People aligns strongly with the UN Sustainable Development Goals by promoting accessibility, reducing inequalities, and supporting inclusive digital innovation. By enabling visually impaired individuals to communicate easily across different languages using speech-based interaction, the system directly contributes to equal opportunities in education, workplaces, and daily life. Its affordable, web-based design ensures that the benefits of technology reach underserved communities, reflecting the SDG principle of “leave no one behind.” Through its focus on accessibility, independence, and disability-friendly communication, the project supports sustainable and socially responsible technological development.

8.2 Relevance of the Projectto Specifc SDG

***SDG 10 – Reduced Inequalities:**

This project helps reduce inequalities by giving visually impaired people the ability to communicate on their own without depending on others. With real-time speech recognition, translation, and audio feedback, it breaks both language barriers and disability challenges. It enables blind users to access information, education, and services more easily, helping them participate confidently in everyday life.

***SDG 11 – Sustainable Cities and Communities:**

The translator supports more inclusive and accessible communities. It helps visually impaired users communicate smoothly in public places like hospitals, banks, and transport services. By offering clear voice-based translation, it makes navigating multilingual environments easier and safer. This contributes to cities that are more friendly, independent, and supportive for all individuals.

8.3 Potential Social and Environmental Impact

***Social Impact:**

- **Enhanced Accessibility:** Removes the need for visual interfaces, allowing visually impaired users to communicate independently.
- **Reduced Communication Barriers:** Real-time translation improves participation in social, educational, and work environments.
- **Greater Independence:** Decreases reliance on others for language assistance, boosting user confidence.
- **Inclusivity and Equal Opportunities:** Helps marginalized groups by providing equal access to communication tools.
- **Improved Quality of Life:** Smoother communication leads to stronger social connections and better everyday engagement.
- **Support for Community Integration:** Enables visually impaired individuals to use public services and navigate multilingual spaces more easily.

***Environmental Impact:**

- **Low Resource Consumption:** Being web-based, the system avoids the need for extra hardware, reducing e-waste.
- **Supports Digital Sustainability:** Utilizes existing devices like smartphones and laptops, minimizing material use.
- **Energy Efficiency:** Lightweight design keeps processing needs low, saving energy compared to large translation systems.
- **Encourages Sustainable Technology Use:** Promotes long-lasting, adaptable software solutions instead of disposable hardware.

Chapter 9

PLAGIARISM REPORT

Figure 9.1: **Plagiarism**

Chapter 10

Appendix

SOURCE CODE:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Speech Translator</title>
  <style>
    * {margin: 0; padding: 0; box-sizing: border-box;}
    body {
      font-family: 'Segoe UI', Tahoma, Geneva, Verdana, sans-serif;
      background: linear-gradient(135deg, #667eea 0%, #764ba2 100%);
      min-height: 100vh;
      display: flex;
      align-items: center;
      justify-content: center;
      padding: 20px;
    }
    .translator-container {
      background: rgba(255, 255, 255, 0.95);
      backdrop-filter: blur(10px);
      border-radius: 20px;
      box-shadow: 0 20px 40px rgba(0, 0, 0, 0.1);
      padding: 40px;
      max-width: 800px;
      width: 100%;
      text-align: center;
    }
    h1 {
      color: #333;
      margin-bottom: 30px;
      font-size: 2.5rem;
      background: linear-gradient(135deg, #667eea, #764ba2);
      -webkit-background-clip: text;
      -webkit-text-fill-color: transparent;
      background-clip: text;
    }
<body>
  <div class="translator-container">
    <h1>        Speech Translator</h1>
```

```

    <div class="language-selectors">
      <div class="language-group">
        <label for="fromLang">From:</label>
        <select id="fromLang">
          <option value="en">English</option>
          <option value="hi">Hindi</option>
          <option value="te">Telugu</option>
          <option value="ta">Tamil</option>
          <option value="kn">Kannada</option>
          <option value="ml">Malayalam</option>
          <option value="bn">Bengali</option>
          <option value="gu">Gujarati</option>
          <option value="mr">Marathi</option>
          <option value="pa">Punjabi</option>
          <option value="ur">Urdu</option>
          <option value="or">Odia</option>
          <option value="as">Assamese</option>
          <option value="sa">Sanskrit</option>
        </select>
      </div>

      <button class="swap-btn" onclick="swapLanguages()" title="Swap Languages">  </button>

      <div class="language-group">
        <label for="toLang">To:</label>
        <select id="toLang">
          <option value="hi">Hindi</option>
          <option value="en">English</option>
          <option value="te">Telugu</option>
          <option value="ta">Tamil</option>
          <option value="kn">Kannada</option>
          <option value="ml">Malayalam</option>
              </select>
      </div>
    </div>
```

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