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Team Number : 52

Team Name: DotSense

Title: Ai-Based Text-to-Braille Converter for Visually Impaired Students

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Problem Statement:

Visually impaired individuals face significant challenges in accessing written information due to the high cost and limited availability of Braille display systems. Most existing solutions are expensive, bulky, and support only a few languages, restricting their usability. The lack of multilingual support further widens the accessibility gap. Affordable and portable Braille technologies are essential to bridge this divide. Without such solutions, a large population remains excluded from basic educational and informational resources.

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Introduction

Access to educational materials is a persistent challenge for visually impaired students. Braille is a critical tool for literacy, but Braille resources are often limited and expensive to produce. Traditional text-to-Braille conversion methods are slow and cannot keep up with modern educational demands. With advancements in artificial intelligence, there is now an opportunity to bridge this gap. AI technologies like **Optical Character Recognition (OCR)** and **Natural Language Processing (NLP)** enable automatic, real-time conversion of text to Braille. An AI-based Text-to-Braille converter can empower visually impaired students with immediate access to textbooks, notes, and online content. Such a system fosters greater independence, confidence, and inclusion in the classroom. This project aims to develop an affordable, efficient AI solution to support equal educational opportunities for visually impaired learners.

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OBJECTIVES

Multilingual Braille Translation: Convert printed or digital text into Braille format, supporting multiple languages to cater to diverse learners.

Voice Assistance: Provide real-time voice translation in various languages, enhancing accessible learning for visually impaired users.

AI-Powered Accuracy: Utilize deep learning techniques to improve the quality of translations, ensuring accurate and reliable output.

Methodology:

Methodology for AI-Based Image/Text-to-Braille.

1. Text Input Acquisition:

Digital Text: Accept user-inputted text via the interface.
Printed Text: Capture images of printed material using a camera or scanner.

2. Language Detection and Translation:

Utilize **Natural Language Processing (NLP)** techniques to detect the language of the input text. Translate the text into the desired target language using multilingual translation models.

3. Text-to-Braille Conversion:

Implement **Braille Encoding Algorithms** to convert the translated text into Braille format. Ensure support for various Braille standards corresponding to different languages.

4. Text-to-Speech (TTS) Conversion:

Use **Text-to-Speech (TTS)** engines to convert the translated text into audible speech. Provide real-time voice output to assist users in understanding the content.

5. User Interface and Interaction

Design a user-friendly interface that allows users to:Input text or upload images ,select source and target languages and Choose between Braille output and voice assistance. Ensure the interface is accessible and intuitive for visually impaired users.

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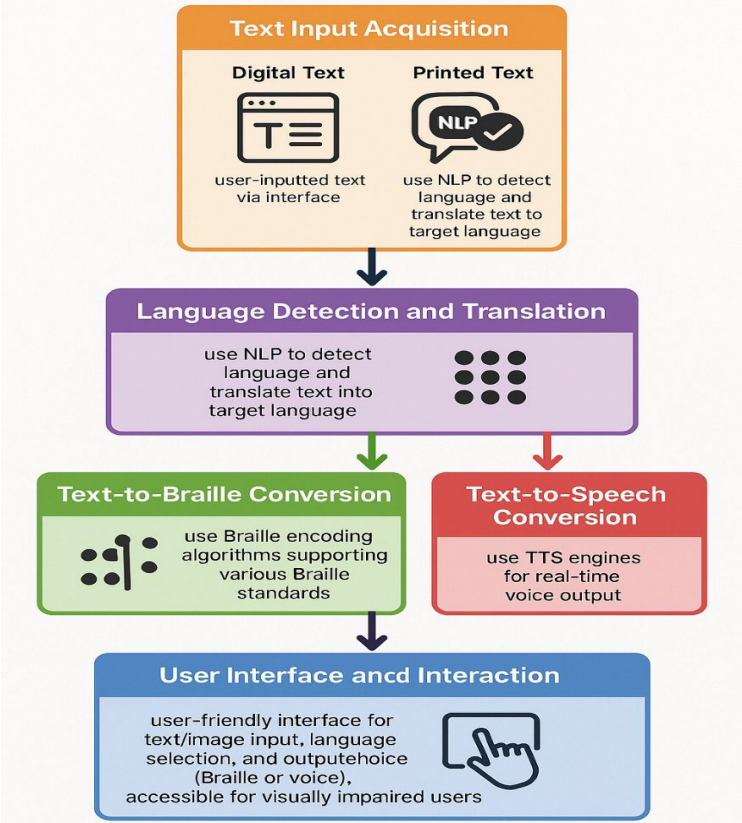

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INNOVATIVE SOLUTION

1. AI-Driven Multilingual Engine

- Leverages advanced Natural Language Processing (NLP) and Machine Translation to detect and convert any input language into the user's preferred language.
- Breaks the barrier of language dependency — a major limitation in existing Braille systems.

2.Seamless Dual Output: Braille + Voice

- Simultaneously provides **Braille output** and **Text-to-Speech (TTS)** audio in the target language.
- Users can **read** and **hear** the content together — enhancing comprehension and learning.

3. Smart Image-to-Braille Technology

- Integrates a **camera or scanner module** to capture printed text.
- Uses **OCR + AI** to recognize and translate text from books, signs, documents, etc., into Braille and speech.

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SCOPE AND RESULTS

- **Target Users**
  - Visually impaired individuals needing access to multilingual text
  - Schools, NGOs, and accessibility support organizations

- **Key Features**
  - Accepts digital text and printed materials (via OCR)
  - Detects and translates text across multiple languages
  - Converts translated text into **Braille** and **real-time speech**
  - Accessible user interface with voice and tactile options

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🔹 **Core Technologies**

- NLP for language processing & translation
- OCR for image-to-text extract
- Text-to-Speech (TTS) for audio output
- Microcontrollers (optional, for hardware version)

✔️ Accurate multilingual **language detection and translation**

✔️ Smooth and reliable **Braille conversion** for supported languages

✔️ Real-time **voice feedback** with natural-sounding speech

✔️ **Accessible UI** successfully tested with visually impaired users

✔️ Positive impact on **education and independent reading** for blind users

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THANK YOU

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