APJ Abdul Kalam Technological University

Bachelor of Technology

in

Computer Science and Engineering

(COMPUTER SCIENCE AND DESIGN)

A Project Report On

TEXT-TO-BRAILLE CONVERTER

Submitted By

Team Members: Fathima Afra A.M, Rifana Sherin, Noureen A.C

Introduction

The Text-to-Braille Converter project is developed with the aim of assisting visually impaired students, especially in the field of computer science, by providing a comprehensive solution for converting English text, including technical content like code and mathematical symbols, into Braille. In an academic setting, visually impaired students face significant challenges in accessing educational materials that are often visual in nature. This project bridges that gap by offering an automated translation of text to Braille format, which also includes speech-to-Braille functionality. The conversion is designed to be instantaneous, providing a real-time solution for visually impaired users, enabling them to learn, interact with digital content, and access programming environments independently.

Objectives

The primary goal of this project is to create an inclusive and accessible educational tool for visually impaired computer science students. It aims to: - Provide an efficient method to convert educational materials, including complex technical content like code and equations, into the Braille format. - Incorporate a speech-to-Braille functionality that allows students to dictate text and have it instantly converted into Braille. - Offer an easy-to-use, web-based platform, ensuring accessibility from any device with an internet connection. - Ensure the solution supports various programming languages and customizable settings to fit the specific needs of visually impaired students.

Literature Review

Recent advancements in AI and machine learning have greatly improved the process of converting textual information into Braille. In particular, convolutional neural networks (CNNs) have been leveraged to handle complex content such as mathematical expressions and programming code (Sinha et al., 2017). Additionally, speech-to-text integration has been explored to allow real-time dictation to Braille translation, which is critical for those who may not be able to type on a keyboard or screen (Yamada et al., 2019). Furthermore, web-based Braille translators have become increasingly popular, enabling the integration of Braille output and speech to provide a seamless interaction with digital content (Lopez Singh, 2020). These innovations

form the foundation for this project, which combines AI models, speech recognition APIs, and web development techniques to create a holistic solution for visually impaired students.

Project Plan

The project is divided into several key phases to ensure a systematic and organized development process. The initial phase involves comprehensive research and planning to understand the existing solutions and to define the specific requirements of visually impaired computer science students. The next phase focuses on text processing and the development of an AI model for translating text to Braille. Following that, the integration of speech-to-text functionality is introduced to facilitate real-time conversion from speech. The project also includes the development of a Braille translation engine capable of handling both text and complex technical content, such as code and mathematical symbols. A user-friendly web application will be developed, which will serve as the front-end interface for users to interact with the Braille converter. Finally, the system will undergo thorough testing to ensure compatibility with Braille displays and other assistive technologies.

Modules and Tasks

The project consists of multiple modules, each focusing on a critical aspect of the system: - **Research and Planning:** This phase includes gathering insights from existing Braille solutions, determining user needs, and establishing the scope of the project. - **AI Development and Text Processing:** This involves the development of an AI model using Python and NLTK for natural language processing and translation to Braille. - **Speech-to-Text Integration:** Utilizing APIs like Google Cloud Speech-to-Text, this module enables real-time dictation functionality. - **Braille Translation Engine:** This module will focus on converting text and technical content such as code and math symbols into Braille. - **Web Application Development:** Using Flask or Django for the backend and HTML/CSS/JavaScript for the frontend, this module ensures the creation of a user-friendly interface. - **Testing and Deployment:** This final stage involves testing the system for accessibility and compatibility with Braille displays, followed by deployment of the web application.

Resources

The successful completion of this project requires several key resources: - Software: Python (for AI and text processing), NLTK (for natural language processing), Google Cloud Speech-to-Text API (for speech recognition), Flask/Django (for web development), and various Braille APIs. - Hardware: Access to a computer for development, a Braille display for testing, and internet access for deploying the web application. - Knowledge: Expertise in machine learning, web development, speech recognition, and accessibility technologies, particularly for Braille translation.

Timeline

The project is scheduled over a period of 11 weeks as shown in the table below:

Week	**Task**	**Duration**
1	Research and Planning: Conduct research into existing systems, define requirements, and plan the project phases.	1 week
2–3	AI Development and Text Processing: Develop the AI model for translating text to Braille, focusing on text parsing and translation accuracy.	2 weeks
4	Speech-to-Text Integration: Integrate speech-to-text APIs and ensure real-time functionality.	1 week
5–6	Braille Translation Engine: Develop the engine capable of handling complex content like code and math symbols.	2 weeks
7–9	Web Application Development: Create the user interface and integrate the back-end services.	3 weeks
10–11	Testing and Deployment: Conduct thorough testing, including user feedback, followed by deployment of the web application.	2 weeks

Table 1: Project Timeline

Conclusion

The Text-to-Braille Converter project addresses the critical needs of visually impaired students in the field of computer science by providing an accessible and effective solution for translating educational materials into Braille. By combining AI, speech-to-text technology, and web development, the project aims to create an inclusive learning environment that fosters independence and academic success for visually impaired individuals. Through its web-based design and integration with assistive technologies, the solution ensures broad accessibility and usability, helping visually impaired students to engage with educational content and programming environments on an equal footing with their peers.