“KANNADA BRAILLE IMPLEMENTATION USING OCR”

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Introduction:

In this era of technology, the knowledge resources are at the figure tips. There are so many sources like television, newspapers, internet etc., but in the world of blind people, they have only two sources of knowledge, one is audio and the other is the Braille script.

- AUDIO: One of the possibilities with audio source is that the visually impaired people depend on others to read out the books or newspapers aloud for them.

As a next option, the blind people have to rely on the broadcasting audio. It’s difficult for them to always depend on such systems, for many reasons.

- BRAILLE SCRIPT: Braille is a tactile writing system used by the blind and visually impaired. It is found in books, on menus, signs, elevator buttons, and currency. Braille characters are small rectangular blocks called cells that contain tiny palpable bumps called raised dots. Its characters are six- dot cells, two wide by three tall. Any of the dots may be raised, giving 64 possible characters. The number and arrangement of these dots distinguish one character from another. It is the way for blind people to participate in a literate culture. Braille has developed in the nineteenth century. It has become the pre-eminent tactile alphabet.
There are very limited knowledge resources for blind persons available in braille script. More often, they can only get their academic books. Other books like novels and news sources are hardly available in braille. To help them, some tools and software are currently available that reads English language from printed text. But this alternative way is not available for most of the regional languages.

The proposed tool deals with the conversion of printed Kannada text into braille and then to speech for the benefit of visually disabled persons using an image capturing device. This helps them to make use of the available resources to gain knowledge, rather than depending on the limited Braille converted resources. The literacy rate is low and for their education books in braille script are not available in adequate numbers. They need to depend on readers for their study and writers for appearing examinations or any other reading or writing work. The proposed tool helps in these aspects.

The tool is least expensive which would provide advantage over the commercially available systems. It is a friendly interface for visually impaired people. They should be able to easily operate this tool.

**Motivation**

Blind people cannot see, but they can read by their fingers using Braille. Braille is a system of raised dots that is to read with finger. The script had helped many blind people to read over the ages. Nowadays, there are many devices such as typewriter and printer to produce Braille text which is time consuming. Because of which, the demands for easy, cheap and portable system/devices are needed to convert image/test documents into Braille. Hence an idea is proposed to help initial learner of Braille who have difficulty in analyzing embossed Braille script. This device helps to convert printed Kannada text to Braille code which is easily accessible to blinds. Hence it has motivated the urgency of Kannada Braille implementation using OCR.

**Problem Statement**

The Braille system is developed to eradicate the darkness of Blind people and to gain knowledge in various aspects. Kannada braille implementation using OCR (Optical Character Recognition) deals with designing and developing a system for the conversion of Kannada text into Braille and then to respective voice for the benefit of initial blind learners.
Objectives:

- Built up a dataset of Kannada characters as knowledge base to be used in the recognizing stage.
- Capture the image of the printed Kannada text to be translated.
- Segment the individual words and characters from the scanned page into lines, words and characters.
- Recognize the segmented character.
- Matching the recognized characters to respective Braille and related audio clip and thereby convert character into equivalent audio.

Methodology:

Captured image → Recognition → Text to voice

Segmentation into lines
Segmentation into words
Segmentation into characters

Determine the character from look-up table
Choose the respective audio clip of Braille

Figure 4.1: Architectural diagram of Kannada Braille implementation using OCR.
CAPTURING IMAGE

Image is captured by using high resolution camera. The Graphical User Interface (GUI) transforms the printed Kannada character into a jpeg format (image) as shown in the figure 4.2. The orientation differs based on the input image position.

![Figure 4.2: Captured image using web camera.](image)

SEGMENTATION

The Segmentation phase is divided into 3 parts.

- Segmentation into lines.
- Segmentation into words.
- Segmentation into characters.

The given input image is segmented into separate lines. It is as shown in the figure 3.3.

![Figure 4.3: line segmentation](image)

The lines are further sub divided into words by using row sum value shown in the figure 4.4.

![Figure 4.4: word segmentation](image)

The words are again divided into individual character and excess spaces are removed, it is shown in the figure 4.5.

![Figure 4.5: character segmentation](image)
Recognition

The image of the character obtained from the segmentation module is compared with that of the characters stored in the character database. Image subtraction is performed between the input character and every other character in the data base. The input character and the database characters are resized to a fixed size and absolute difference between the binary versions of them are computed. The resultant matrices are reduced to single values by taking the row sums to get a row vector and then sum of the row vector. The minimum value of the subtraction results is identified and the character corresponding to the minimum value will be the considered as the recognized character.

![Figure 4.6: database system](image)

Display Of Braille Code

The recognized character is mapped with corresponding character and Braille code. Hence it is displayed as shown in the Figure 4.7.

![Figure 4.7: Displaying of Braille code with letter.](image)
**Audio Play**

After displaying the Braille code of recognized character, the corresponding audio clips are selected from the audio database and then they are played as shown in the figure 4.8.

![Playing Audio of Character](image)

**Figure 4.8: playing audio of character**

The overall flow of the above modules is to perform the regular operation such as taking the input from the end-user, capturing from the web camera, carrying out segmentation such as line, word, character and recognizing corresponding letter and displaying with braille code with vocal voice. If unformatted input is given then it discard the given input.

**Conclusions:**

The input is a kannada text image. The font size of letter should be 33 in Baraha. The captured image should be 320*240. Image should be clear from external sources such as noise. The snapshot 7.1 shows the input image.

![Input Kannada Text Image](image)

**Snapshot 7.1 : input kannada text image**

The given input is then segmented into lines. It performs row sum operation for input parameters by which the image gets segmented into lines. The resulting output is in snapshot 7.2 and 7.3.
This image is again segmented into words by using column sum values and the resulting image is shown in snapshot 7.4.

The words are again divided into individual character and excess spaces are removed from text image. The first word segmentation into character is shown in snapshot 7.5, snapshot 7.6 and snapshot 7.7
After character segmentation, the minimum difference between the segmented character and database characters are determined. The letter with minimum difference is matched. Then corresponding character with Braille image is displayed and the first three character recognition is shown in snapshot 7.8, snapshot 7.9 and snapshot 7.10.
In this project, there is an attempt to convert printed Kannada text into Braille code and then to speech form. Here the input text is in the image form and it is segmented into lines then in turn to words and finally it is converted into letters followed by recognition and hence displaying of Braille code with speech. By the development of such a tool, it would be helpful for initial learners in blind schools who has difficulty in identifying the Braille scripts.
by which they can understand in better manner and helps to gain knowledge from the available resources like books and newspapers etc.,

**Scope for Future Work:**

Several future enhancements could be made to the system.

- Inclusion of input printed kannada character can be examined for different size other than 33.
- The input of character can be enhanced by using vathakshara, derakahara.
- The input printed kannada character can be obtained from different tools like nudi etc.,
- Better searching algorithm can be implemented to increase the speed of searching of character in the database.
- Inclusion of character stresses recognition and punctuation marks and also inclusion of the naturalization of the voices like human expressions.
- It includes reading of special cases like date and number.
- Further inclusion of different kinds of voices can also be done.
- Controlling the reading speed and skew correction of captured image thereby reducing the difficulty of requiring the printed text to be aligned horizontally are the major future enhancements of this Braille project.