Chapter 2
Bangla Braille Adaptation

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ABSTRACT

Braille, a tactile writing system, is used by visually impaired and partially sighted people for reading and writing in everyday life. Visually impaired persons in Bangladesh are deprived of basic education due to inadequate textbooks and sufficient reading materials written in Bangla Braille. This is widening the knowledge gap and disparity within the society with progress of time. In order to improve this scenario, an automated information system for facilitating machine translation of Bangla text to readable and recognizable Braille code is essential. In this book chapter, a detailed research on Bangla Braille has been accomplished and necessary grammatical rules as well as conventions are identified for rule-based Bangla Braille translation. Through the analysis of investigations, a computational model is proposed using Deterministic Finite Automata (DFA) for the machine translation. The proposed DFA demonstrated very acceptable conversion, which is validated by the visually impaired community. Based on the computational model, another software architecture is also proposed for the implementation of machine translation of Bangla to Braille using open source technology. The translator is tested with Bangla Unicode-based text contents, and the generated Braille code is validated after printing in the Braille printer. The performance of the conversion of Bangla to Braille code has been found accurate and also free from grammatical errors.

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INTRODUCTION

Bangla (or Bengali), one of the more important Indo-Iranian languages, is the sixth-most popular in the world and spoken by a population that now exceeds 250 million. Geographical Bangla-speaking population percentages are as follows: Bangladesh (over 95%), and the Indian States of Andaman & Nicobar Islands (26%), Assam (28%), Tripura (67%), and West Bengal (85%). The global total includes those who are now in diaspora in Canada, Malawi, Nepal, Pakistan, Saudi Arabia, Singapore, United Arab Emirates, United Kingdom, and United States.

It is one of the most spoken languages (ranking sixth) in the world, with nearly 300 million total speakers (Bangla, 2009). According to Titumir (Titumir & Hossain, 2005) about 0.75 million people are blind in Bangladesh. Blind person cannot read text written on a plain paper and use Braille system in their reading and writing. Braille is a universal code for mapping character sets of various languages to Braille cells. Series of Braille cells are embossed on paper so that visually impaired persons can read them by touching the raised dots of the cells using their fingers. Like other languages Bangla has its own representation for Braille system.

There are few schools, institutes and organizations for blind people in Bangladesh where they can get their education. But they always face problem with inadequate reading materials, books and notes available in the form of Braille. Rewriting of books into Braille code is accomplished by certified Braille experts. But this process takes time and cost of translation is also higher. For this reason books written in Braille code are insufficient. This is a potential constraint in the education for visually impaired. This constraint can be overcome by an automated translation system which will be able to convert Bangla text to Bangla Braille code with all grammatical considerations and standards without any error.

This book chapter elaborates on the adaptation of Braille for Bangla. The discussion includes detail literature review on Braille and related works. The chapter also discusses the coding convention, the grammatical rule devised from a standard based on Unicode which is elaborated in detail for the purpose of design and implementation of the machine translation system. The chapter also includes implementation of the proposed model and thereafter the development of a software solution based on proposed model. The chapter concludes with the future research issues and challenges.

LITERATURE REVIEW

Generally, the communication between two people for writing becomes an easy task since both can read and write the same language. However if this communication takes place between a sighted and a visually impaired person, then this will cause problems since the sighted person really does not understand the language of the visually impaired which is called Braille. In this case, a translator of any sort is needed to convert the print message into Braille, which works as a mediator for a blind person in order to read as well as produce expressions.

The Braille system is a method that is widely used by blind people to read and write. Braille was devised in 1821 by Louis Braille, a blind Frenchman. Each Braille character or cell is made up of six dot positions, arranged in a rectangle containing two columns of three dots each. A dot may be raised at any of the six positions to form sixty-four (2^6) permutations, including the arrangement in which no dots are raised. For reference purposes, a particular permutation may be described by naming the positions where dots are raised, the positions being universally numbered 1 to 3, from top to bottom, on the left, and 4 to 6, from top to bottom, on the right. For example, dots 1-3-4 would describe a cell with three dots