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AN ICELANDIC TEXT-TO-SPEECH SYSTEM FOR THE DISABLED*

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INTRODUCTION

This paper reports on the development of an Icelandic text-to-speech system for the disabled. The total number of people speaking the Icelandic language amounts to only about 250,000. The language is clearly distinct from the other Nordic languages both as to structure and vocabulary. The only realistic alternative for creating a text-to-speech system for a small language community is through adaptation of an existing system. In this way, product and application development costs can be avoided. If the selected system is flexible enough, the specific language expertise can be integrated in a relatively inexpensive cooperative project. The system described here is based on the KTH multi-lingual system (Carlson, Granström, & Hunnicutt, 1982; 1990) and uses the Infovox text-to-speech board. The project has been sponsored by the Nordic Committee on Disability as part of the "Nordic text-to-speech converter" initiative that has already resulted in versions for Norwegian and Danish (Granström & Gustafsson, 1986; Granström, Molbæk Hansen, & Grønnum Thorsen, 1987).

SPECIAL FEATURES OF THE ICELANDIC LANGUAGE

In this presentation we will concentrate on some of the phonetic and practical problems that we have had to solve in the development of the Icelandic system. Since we started out with the Swedish version of the rules for the system (the system itself being language-neutral), several adjustments and changes had to be made because of the different sound systems of the two languages. Vowel qualities were different, of course, and rules of quantity had to be changed. Some of the more interesting phonetic issues involved the synthesis of voiceless /l/, voiceless /r/, preaspiration, palatalized stops, short diphthongs etc, to mention a few of the special features of the Icelandic sound system (Garnes, 1976; Petursson, 1979; Roegvaldsson, 1989; Thráinsson, 1978). One hard nut that has not been cracked yet is that the names for the Icelandic digits 1-4 are inflected for gender and case so it is very difficult to teach the system to read numbers correctly – in fact not possible without access to a much larger dictionary and more sophisticated linguistic analysis than one presently would want to include in a system of this sort. In most applications, this will not jeopardise the usefulness, but will obviously give a somewhat unnatural impression. Eventually solutions to the above problem should be considered. The improved linguistic analysis will also be useful for other improvements such as more natural prosodic synthesis.

DEVELOPMENT AND TESTING

Testing of the system was done in various ways. First, a frequency-ordered list of about 12,000 word forms was run through the system, the phonetic transcription of the word forms checked, and a preliminary dictionary made, including all the word forms that the system did not transcribe correctly. These were then checked and the problems involved eliminated to the extent possible by adding new rules to the system. Second, we tested the system by running several types of texts (parts of novels, short stories, articles from journals, etc) through it. Third, we used a VCV-test designed by Carlson & Granström (1989).

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This test had all the Icelandic consonants occurring in a symmetric context of the vowels /a/, /i/, and /u/. The test uses an open response word format and the subjects were about ten students of Icelandic at the University in Reykjavik. The consonants that do not occur in the context in question came out worst, as was to be expected, but the test was a very helpful tool in the development of the segmental qualities.

The text-to-speech system uses a standard 7 bit ASCII code internally to be compatible with any computer. The fact that Icelandic has a few extra characters, including the accented vowel symbols á, é, í, y, ó, ú, and the consonants þ and ð, created some problems in the beginning, but these were dealt with in due course.

FINAL REMARKS

The system has been introduced to speech pathologists, members of the Icelandic association for the blind and others and has been very well received. The development of this system is actually an interesting test case since the Icelandic speech community is a very small one. If it succeeds, it will show that members of small language communities can also expect some help from the development of speech technology in rehabilitation.

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