Design and Evaluation of a Reading Miscue Detector for a Computer-Aided Ilocano Language Learning System

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ABSTRACT

The system has a built-in assessment subsystem that evaluates the user's learning based on three categories: reading, listening, and comprehension. The assessment uses a Reading Miscue Detector (RMD) that basically employs force alignment method. An HMM-based Automated Speech Recognition (ASR) system was developed using the phoneme-level transcribed speech corpus as training data and the Viterbi Alignment as the main method for likelihood scoring. The 3-state HMMs were generated using the Hidden Markov Model Toolkit (HTK) [15]. There are two modes for the system: the LEARN mode where the user study the different Ilocano phrases categorized into 24 for basic purposes and needs, and the ASSESSMENT mode where the user's knowledge on the Ilocano language will be rated into three categories: *Pagbasa* (reading), *Pakikinig* (listening), and *Pagintindi* (comprehension).

A six-week pilot study was conducted to measure the extent of the users' learning of the language gained from the system. The offline test set contains three subsets of full system passages by three users wherein each phrase has one phoneme with wrong pronunciation. The test set was used to measure the False Alarm Rate (FAR) and Misdetection Rate (MdR) of the RMD, which have shown fairly low percentages or may be considered as a good RMD according to previous studies presented in the literature [4] [10] [11] [12] [13].

Categories and Subject Descriptors

I.2.7 **[Computing Methodologies]**: Artificial Intelligence --- Natural Language Processing

G.3 **[Mathematics of Computing]**: Probability and Statistics --- Markov Networks

H.5.2 **[Information System]**: Information Interfaces and Presentation --- User Interfaces --- Natural Language, Graphical User Interface

General Terms

Algorithms; Design; Experimentation

Keywords

Hidden Markov Model (HMM), Reading Miscue Detector (RMD), Force Alignment Method, Automated Speech Recognition (ASR), Viterbi Alignment, Computer-Aided Language Learning (CALL), Natural Language Processing

1. INTRODUCTION

Language is such an important part of our lives such that studying languages of others is in very real sense learning about those people [1]. Like studying culture, lack of knowledge in the language may lead to intolerance. A person can learn a language if he knows someone whose mother-tongue is that language and has available time for teaching him. In the case where there is an absence of a personal language teacher, the system presented in this paper may be useful. A Computer Aided Language Learning (CALL) is the search for and study of applications of the computer in language teaching and learning [2]. Thus, using the technology can solve the problem.

In year 2000, CALL platforms and systems evolved because of the widespread of the usage of computers and other technologies in education [9]. According to a research conducted in New York, USA, learning a second language has increased due to the improvement and influence of the vast-growing of technology [9]. But it is important to use such language systems with complete guidance of the teachers and these systems must be used efficiently [9]. In the Philippines, there are no existing CALL systems available specially those for Philippine languages and dialects but there are similar systems available like automated reading tutors (ART) [4].

The CAILL system aims to help individuals learn and understand the Ilocano language using computers that will help and guide them through the learning process.

2. SYSTEM DESIGN

The aim of the CAILL system is to teach the Ilocano language with the correct pronunciation, intonation, and stress. In this way, the user may have a higher learning and comprehension of the Ilocano language still with the aid of an Ilocano language expert.

The system has two modes: LEARN and ASSESSEMENT modes. The LEARN mode is where the user learns Ilocano phrases that are categorized into 24 categories. Through this mode, the user may listen to the correct pronunciation of the Ilocano phrase and at the same time understand it with the help of the Tagalog

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