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A CALL System for Practicing Speaking Proficiency: Pronunciation, Morphology and Syntax

Abstract

Recent research has shown that a properly designed ASR-based CALL system is capable of detecting pronunciation errors and of providing comprehensible corrective feedback on pronunciation. In the DISCO project we extend this approach to other aspects of speaking proficiency like morphology and syntax. For detecting syntactic errors it is sufficient to know which words were spoken in which order. Morphological and pronunciation errors require a more detailed analysis at the segmental level. Specific speech technology algorithms are developed for detecting errors on pronunciation, morphology, and syntax. These algorithms will be tested off-line with non-native data, and online with language learners.

Short Paper

Language learners are known to fare best in one-on-one interactive learning situations in which they receive optimal corrective feedback. However, one-on-one tutoring by trained language instructors is costly and therefore not feasible for the majority of language learners. In the classroom, providing individual corrective feedback is not always possible This particularly applies to oral proficiency, where corrective feedback has to be provided immediately after the utterance has been spoken.

CALL systems that make use of ASR can offer extra learning time and material, specific feedback on individual errors and the possibility to simulate realistic interaction in a private and stress-free environment [1]. In order to do so, a CALL system should properly detect performance problems, and provide feedback that is embedded in a realistic communicative setting. However, existing CALL systems hardly begin to fulfil these requirements. Recent research has shown that a properly designed ASR-based CALL system is capable of detecting pronunciation errors and of providing comprehensible corrective feedback on pronunciation [2]. This system, called Dutch-CAPT, was designed to provide feedback on a selected number of speech sounds that had appeared to be problematic for learners of Dutch [3]. Scoring accuracy appeared to vary between 75% and 92% for the 15 speakers in the experimental group [4]. The results showed that for the experimental group that had been using the system for four weeks the reduction in the addressed pronunciation errors was significantly larger than in the control group [2]. These results show that it is possible to use speech technology in CALL applications to improve pronunciation. We therefore decided to study how speech technology can best be applied to other aspects of speaking proficiency like morphology and syntax. This research is carried out in the project DISCO (Development and Integration of Speech technology into COurseware for language learning). In the present paper we explain which specific aspects we intend to address, why and how.

It is generally acknowledged in the L2 literature that the fact that L2 learners are aware of grammatical rules does not automatically entail that they also manage to marshal this knowledge while speaking. In other words, L2 learners need to practice speaking and receive feedback on their performance on line, both on pronunciation and on morphology and syntax. In morphology and syntax we will address errors that are known to cause problems in communication and that are known to be made at the lower proficiency levels that are required in national language citizenship examinations in the Netherlands.

For instance, as a consequence of L1 transfer, Turkish learners are known to produce sentence-final verbs as in (A).

(A) * Jong mandarijn sneeuwman neus maakte (intended form is: maakt)
[Boy tangerine snowman nose made (makes)]
target: De jongen maakt met een mandarijn de neus van de sneeuwman
[The boy makes the snowman's nose with a tangerine]

A second syntactic phenomenon to acquire is the obligatory presence of the subject in Dutch. If pronominal subject omission is allowed in the L1 it is frequently produced in early L2 developmental stages, as in (B).
(B) * Loop naar huis
[Walk home]
target: Ik loop naar huis
[I walk home]

The last syntactic phenomenon to be tackled is Verb Second following an adverbial adjunct. Dutch is a verb-second language that requires subject inversion following an adverbial in initial position, as in (C.2), but many learners construct an SVO clause, as in (C.1).
(C.1) * Dan hij gaat tv kijken
[Then he goes tv watch]
(C.2) Dan gaat hij tv kijken
[Then goes he tv watch]
Problems with morphology are persistent in L2 learning [5]. Phonetic-phonological properties play a prominent role in this learning process, as stated by [5: 2]: "The meaning of morphemes and the distribution of their allomorphs cannot be acquired without the phonological capacity to extricate them from the flood of sounds in every sentence". To develop this capacity learners first have to notice the contrast between their own erroneous realization and the target form, following Schmidt's Noticing Hypothesis [6].
Difficulties in learning Dutch morphology are related to perception and production of L2 phonemes such as schwa and /t/ in word-final position. As to perception, it is crucial to perceive the differences in (D) in order to understand the Dutch agreement paradigm, and in (E) in order to understand the tense system.
(D) /maak/, /maakt/, /make(n)/
(E) /maakt/, /maakte/

On the production part, difficulties in pronouncing consonant clusters may lead learners to say (F) instead of /koopt/.
(F) /kopet/, /koopte/

For detecting syntactic errors it is sufficient to know which words were spoken in which order. Morphological and pronunciation errors require a more detailed analysis at the segmental level. This will be explained in the full paper.

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Keywords

ASR-based CALL, oral proficiency, pronunciation, morphology, syntax, corrective feedback

Bio Data

Helmer Strik has a Ph.D. in physics, and now is assistant professor at the Language and Speech Technology section of the Department of Linguistics of the University of Nijmegen. His research activities include automatic speech recognition (ASR), pronunciation variation modelling, reduction, multiword expressions, spoken dialogue systems, the relation between speech technology and (psycho-)linguistic research, ASR-based assessment of spoken language proficiency, computer assisted language learning (CALL), ASR for dysarthric speech, and automatic phonetic transcription. He has published over 100 refereed papers, and has been involved in several national and international projects. He has been co-organizer of three international (ISCA) events: two workshops and InterSpeech 2007.

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