Developing Swedish Spelling Exercises
on the ICALL Platform Lärka

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Abstract. In this project we developed web services on the ICALL platform Lärka for automatic generation of Swedish spelling exercises using Text-To-Speech (TTS) technology which allows L2 learners to train their spelling and listening individually at home. The spelling exercises contain five different linguistic levels, whereby the language learner has the choice between word, inflected word, phrase, sentence and performance based levels. The embedded avatar pronounces a random item of the desired level, which the user has to spell. Furthermore, the users have the possibility to train their own words for different linguistic levels. A result tracker containing a total and correct answer score keeps track of the language learner's performance. In order to analyse typical spelling errors and provide better feedback, misspellings are collected in a database. The usability of the spelling exercises, concerning the different linguistic levels and the quality of speech, has been evaluated through a questionnaire with 10 participants.

Keywords: Swedish spelling game, ICALL, text-to-speech, spelling errors, L2.

1.   Introduction

The motivation behind this project is to support the ICALL platform Lärka (Volodina & Borin, 2012) in broadening the spectrum of exercises by implementing spelling exercises and integrating text-to-speech technology (Pijetlovic, 2013). The web-based platform Lärka is used for computer-assisted language learning that generates a number of exercises based on corpora available through Korp (Borin,

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Forsberg, & Roxendal, 2012), using also lexical resources through Karp (Borin, Forsberg, Olsson, & Uppström, 2012).

Spelling constitutes a part of vocabulary knowledge, therefore it is indispensable when it comes to language learning. Spelling errors can be broadly distinguished between performance-based errors, e.g. accidental typing errors and knowledge-based errors, i.e. a user not knowing how to spell a word or confusing words. A more detailed distinction could be, for instance, non-word errors, real-word errors, orthographical errors, or phonological errors. Furthermore, different aspects of word knowledge such as word form, its spelling, pronunciation, word inflection and derivation, meaning of words, grammatical functions and collocations are trained in the implemented exercises (Volodina, 2010).

The project consists of four main tasks: (1) Implementing web services for adaptive spelling exercise generation using TTS for Swedish, where target words, inflected words, phrases or sentences are pronounced and the user has to type what he/she hears. The user can either choose different linguistic levels or let the generator decide according to the user's performance. (2) Implementing the user interface for the spelling exercise to be used on the ICALL platform Lärka. (3) Creating a database for storing all possible misspellings associated with each individual word for providing better feedback, the latter by performing user tests and analysing logged errors. (4) Evaluating the usability of the exercise type for Swedish language learners by means of a questionnaire.

The project addresses two main research questions: (1) Is text-to-speech technology for Swedish mature enough for the use in L2? (2) Does the spelling game meet the requirements set by the Common European Framework of Reference (CEFR, 2001) for listening and orthography?

2.   Material and method

The Swedish spelling game is integrated as a separate module in Lärka while the layout of the spelling exercises is inherited from Lärka's already existing exercises in order to have a coherent layout within the application. First, several available text-to-speech systems have been evaluated regarding their performance quality. Sitepal (www.sitepal.com) has been selected due to the mature text-to-speech technology, user-friendliness and availability of avatars. Second, four linguistic levels have been considered for exercise generation motivated by pedagogical considerations: word level, inflected word level, phrase and sentence levels, described shortly below.

The *word level* provides the user with random words in base form selected from the frequency based vocabulary list Kelly-list (Volodina & Johansson Kokkinakis, 2012), which is simple in implementation. At the *inflected word level* the user has the possibility to train inflected words retrieved from Karp's morphology lexicon Saldom (Borin & Forsberg, 2009). The *phrase level* allows the user to train words in phrase context. In order to find the best method for retrieving suitable phrases, different approaches have been tested. A selection of Korp's corpora is reused for setting the target vocabulary item into a suitable phrase-long context. On the *sentence level* the user trains spelling and listening on the basis of sentences. The challenge at this level is to both spell and at the same time remember the pronounced sentence. Sentences are retrieved by calling a web service for ranking sentences selected from Korp corpora according to their readability (Pilán, 2013). The *performance-based level* has been implemented in order to allow language learners to train all above-mentioned linguistic levels according to their performance in an adaptive fashion.

Figure 1. Lärka's architecture for automatic generation of spelling exercises
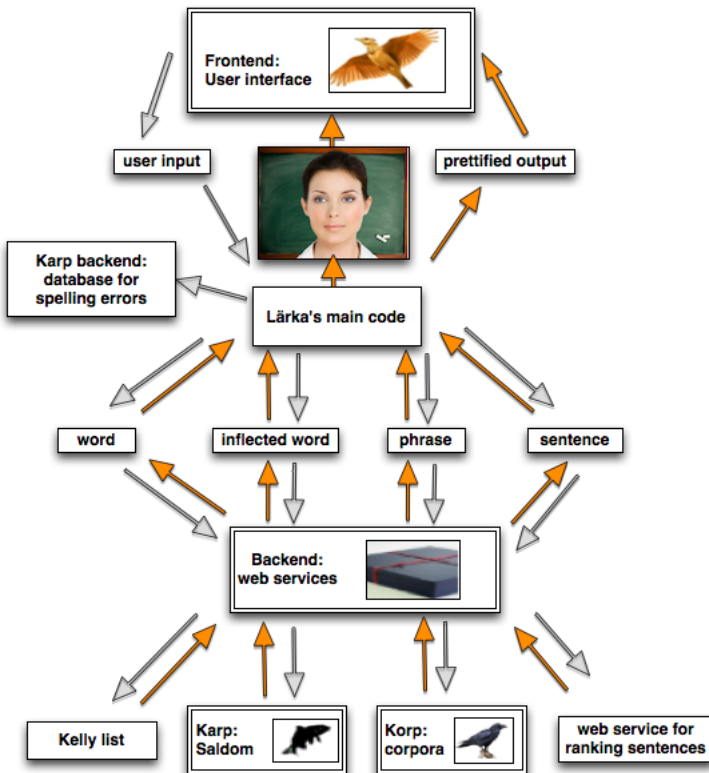
After all necessary resources have been analysed, a number of tests on appropriateness of extracted items have been performed; the web services have been linked to the user interface and an evaluation with 10 participants has been undertaken. The spelling errors have been saved to the spelling errors database (SPEED) during the evaluation stage and analysed in order to provide language learners with useful feedback in the future (Figure 1).

3.   Spelling exercise functionality

Two exercise modes are available for the spelling exercises: 'self-study' and 'test mode'. The 'self-study' mode allows language learners to improve their answers, as the correct answer is not revealed. In the 'test' mode the language learner has only one chance to answer each item as the correct answer is revealed immediately after the submission.

Figure 2. User interface for word level
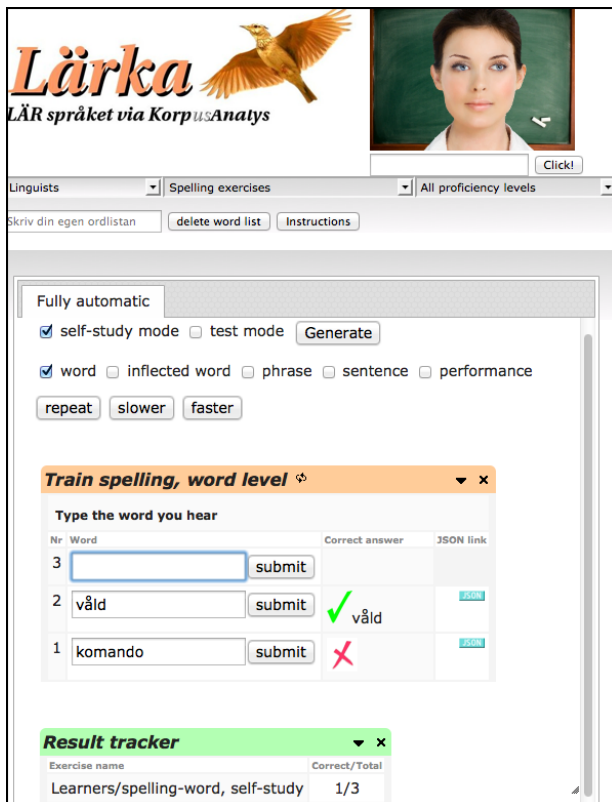
The language learner has the possibility to train words in different contexts by selecting the relevant linguistic level (word, inflected word, phrase, sentence and performance-based). Once the language learner selects a linguistic level, the avatar pronounces the item to be spelled. The user has also the option to rehear an item in a normal, slower or faster rate by clicking the corresponding buttons.

All the user selections are automatically added to the URL in order to save the user's effort of going through the menus on the main webpage (Figure 2).

4. Evaluation

The evaluation of the spelling exercises was carried out with 10 participants of which eight belong to the category language learners, one to linguists and one to native speakers. In order to provide the evaluation participants with detailed information, an evaluation page was created, containing the project description, the spelling game instructions, the evaluation questionnaire in English and Swedish as well as a link to Lärka (http://spraakbanken.gu.se/eng/larka/tts). Each of the participants spelled 10 items for the word and inflected word levels, 5 for phrases and 5 for sentences, all results being saved to the spelling error database.

For the analysis of the evaluation results, the evaluation participants were divided into 4 subgroups according to their proficiency levels (A – Basic User, B – Independent User, C – Proficient User, Native speaker). In order to evaluate the spelling exercise, a questionnaire containing a scale from 1 to 5 was applied (1 = very good and 5 = very poor). Additionally, the evaluators had the possibility to add extra comments for every question as well as free comments at the end of the questionnaire.

The purpose of the evaluation was, besides collecting spelling errors, to evaluate the user interface for its user friendliness as well as to assess the text-to-speech usability in a language learning environment, but primarily to assess the usefulness of the exercise regarding the different linguistic levels.

According to the evaluation results (Figure 3), the avatar (5) appears to be the least effective element for the spelling exercises. The unsatisfying results for the avatar are firstly based on the missing facial expressions and secondly on its location within the spelling game. The user interface (2) and the quality of pronunciation (7) were the most satisfying criteria in this evaluation. Comparing the word (including inflected word) (9), the phrase (10) and the sentence level (11), the diagram clearly shows that the word level was the most appropriate level for

training spelling followed by the phrase level. However, phrases have to be more adapted to the respective proficiency level in order to achieve the best possible learning success. The sentence level was assessed as the least appropriate level, as the length and the speed rate were perceived as unsuitable for training spelling and listening. Furthermore, an appropriate error feedback was missing, for example, an indication of misspelled words or characters within a sentence, which is planned for later implementation based on error log analysis.

Figure 3. Diagram with evaluation results for all proficiency levels
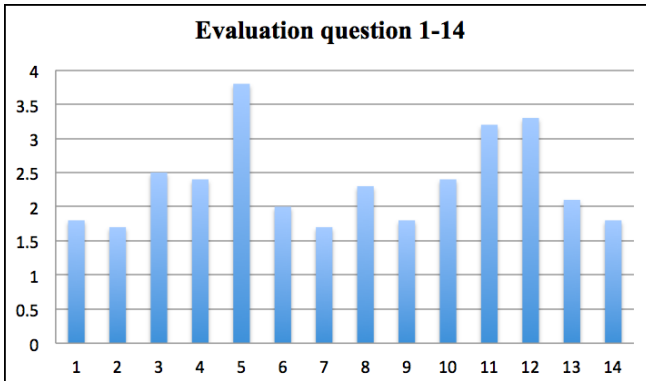
5.   Conclusions

The goal of this project has been, firstly, the implementation of Swedish spelling exercises on an already existing ICALL platform in order to provide language learners with a tool for training spelling and listening on the basis of different linguistic levels. Secondly, the evaluation of the newly implemented module regarding its effectiveness and usefulness. The main focus of the evaluation was to find out whether the TTS technology is mature enough for the use in L2 context and to verify whether the spelling exercises meet the expectations of CEFR.

Overall, the evaluation results show that the implemented spelling game, which fulfills the expectation of CEFR, is an effective tool for training spelling and listening at home. Moreover, the TTS technology for Swedish has proven to be mature enough for use in L2 context. However, since the spelling game was evaluated specifically from the language learner's point of view, an evaluation from the teacher's position has to be carried out in the future, since the pedagogical perspective is essential for implementing exercises for L2 learners.

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