ProTutor: Historic Open Learner Models for Pronunciation Tutoring

Carrie Demmans Epp[1] and Gordon McCalla[2]

[1] TAGlab, Department of Computer Science, University of Toronto, Bahen Centre for Information Technology, 40 St. George Street, Room BA4242, Toronto, Ontario, Canada
[2] ARIES Laboratory, Department of Computer Science, University of Saskatchewan, 178 Thorvaldson Building, 110 Science Place, Saskatoon, Saskatchewan, Canada
cdemmans@cs.toronto.edu, mccalla@cs.usask.ca

Abstract. Acquiring proper pronunciation is difficult for second language learners. We built a Russian pronunciation tutor, called ProTutor, that uses open learner models (OLMs). Of particular interest is ProTutor's "historic OLM" that incorporates historic information about learner performance to encourage reflection and maintain learner motivation. In a formative evaluation participants indicated that ProTutor was helpful and fun to use.

Keywords: Open Learner Models, Computer Assisted Language Learning.

1 Introduction

Learners face many challenges. One of these is motivation, especially in areas where progress can be difficult to detect, like pronunciation [1]. Learners need safe practice environments [2]. So, we created a second language (L2) Russian pronunciation tutor (ProTutor) to meet this need. It has an Open Learner Model (OLM) and incorporates historic information about learner performance to maintain their motivation. A formative evaluation was performed to see if ProTutor maintained learner motivation or could be improved. It indicated that ProTutor and its learner models are motivating and that including historic information in the OLM is useful. It also confirmed that an OLM that includes audio information about learners' performance is desirable.

2 Related Literature

Many Computer Assisted Language Learning (CALL) systems use varied modes of interaction and feedback. ProTutor uses historic information in its OLM and several modes of interaction. Many older CALL systems (e.g., L2tutor and Word Munchers) rely on text-based interactions, but this is changing as more systems (e.g., INTELL and RosettaStone) incorporate audio materials as input or output. Simulation-based systems, such as the TLTS [3], use all input and output modes to replicate an immersive environment for intermediate or advanced learners. Many other CALL systems rely on combinations of instruction, tests, or games to help introductory learners; they

focus on written L2 skills and vocabulary acquisition. See [4] for a complete CALL survey. As in other CALL systems, ProTutor uses games, instruction, and test-like activities to help novice learners develop pronunciation skills. ProTutor surpasses such CALL systems by incorporating OLMs to encourage learner reflection and self-awareness [5]. OLMs are common in intelligent tutoring systems (ITS) [6], but such ITSs rarely provide learners with information about how their performance changes over time. In contrast, ProTutor adds historic information to an OLM to provide learners with rich feedback about their progress.

3   System Overview

ProTutor's activities are sequenced to match the order of material in an accompanying course, and learners can progress through the activities at their own pace by following a prescribed learning path or by delving into personalized activity recommendations that come with instructional material. ProTutor tracks the performed activities and analyzes all utterances recorded by the learner. It determines the accuracy of the learner's pronunciation for each character of the alphabet and logs it in a pronunciation model. The diagnosis results are shown in the OLM by listing the three characters that the learner most often pronounces correctly (best) and incorrectly (worst). These lists provide positive and corrective information together, which helps maintain motivation by preventing the dismay that can accompany being told only your errors [7]. Learners are also shown an L2 sentence that highlights their pronunciation strengths and weaknesses. How an expert would pronounce the sentence is shown below how the learner would pronounce the sentence. This allows learners to compare their pronunciation to that of an expert so that they can see the ideal and work towards it.

Once learners have used the OLM for at least three weeks an open learner model with historic information (the HOLM) is presented to them; it adds information about the learner's previous performance and facilitates learner reflection about performance changes and the causes of these changes. The HOLM adds a previous pronunciation mapping immediately below the learner's current pronunciation mapping for the selected sentence. It also adds the previous best and worst pronounced characters beside the learner's current best and worst characters. The final feature of the HOLM is a chart that shows how the learner's pronunciation accuracy has changed over time.

4   System Evaluation and Results

A formative evaluation of ProTutor was performed in a university L2 Russian course. Participation required continued system use over nine weeks. All system use was tracked and feedback was collected through surveys following 3-week long stages of system use: no OLM or HOLM, OLM only, and HOLM only.

Five students participated in the evaluation; they attempted over 120 activities and recorded over 800 utterances. Four participants completed personalized activities based on information in their learner models. Three worked on improving characters in their worst list and one worked on characters from her best list because of the emphasis that the instructor had placed on them. On average participants viewed their

OLM 1.4 times (s.d. 0.55) and their HOLM 3.6 times (s.d. 1.82), which indicates that the HOLM was at least as useful to them as their OLM. Four participants continued to use ProTutor after the study's completion. One of them used ProTutor until mid-way through the next term when the course textbook changed, indicating that ProTutor was useful as long as it complemented the course material. Multiple participants said that ProTutor was helpful, easy to use, and fun. Responses to Likert-scale statements (1 – agree, 7 – disagree) revealed that ProTutor "reinforced what [they] were learning in class" (mean 1.8, s.d. 0.4) and facilitated "practising to speak in Russian" (mean 1.8, s.d. 0.4). Participants also liked many aspects of the learner model, including seeing the sounds that they were good at (mean 1.6, s.d. 0.5) and those that needed improvement (mean 1.8, s.d. 0.8). Participants also "felt that [their] pronunciation of Russian words improved" (mean 2.4, s.d. 1.1), and some requested that features be added to ProTutor. They wanted the ability to hear the pronunciation models.

5   Conclusions and Future Work

ProTutor uses a "snapshot" OLM of a learner's abilities and knowledge, but extends this by incorporating historic information into the model in order to maintain learner motivation and encourage reflection over time. This approach was well received by learners. Historic open modeling should be further investigated for its effectiveness in maintaining motivation and improving learner outcomes. Another future direction is to incorporate audio representations of pronunciation accuracy into the OLM.

Acknowledgements

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