

Advanced Language Understanding and Dialogue Management for Language Learning

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Abstract

Language learning is a complex cognitive task which involves many dimensions such as the student motivation, attitudes, other individual factors, as well as access to effective language learning resources (teaching material, teacher's training, etc.). The incorporation of progressively more sophisticated Information-oriented technologies has proven quite useful to the process of language learning. However, a truly effective adaptation to such technologies requires an interdisciplinary approach, where Artificial Intelligence in general, and Language Technologies in particular, must play a crucial role, in conjunction with Pedagogical and Psycholinguistic models, or the Human-Computer Interaction design principles.

As part of the Milao project we have explored the application of Advanced Language Understanding and Dialogue Management for Language Learning [1]. This paper describes the main challenges of this project, the main results obtained and the current development of the Milao Language Learning platform.

The incorporation of Language Technologies in the broad field of Tutoring Systems [2] has mainly focused on the use of language as a communicative tool, where the tutoring systems have quite reduced linguistic capabilities: both the system and the student implicitly agree on the linguistic scope, and complex communicative phenomena such as ambiguity are ignored (usually as a side effect of the domain-oriented nature of the tutoring system) [3]. However, aside from the learning of grammar and vocabulary -which so far have been the focus of ICT [4] - language learning requires an advanced and detailed handle of the learners' linguistic abilities. Most importantly, as some previous projects have highlighted [5], language learning is a communicative and dynamic process and any technology applied to learning a foreign language must reflect these characteristics.

Our approach emphasizes the use of language in context through a progressively more complex set of learning scenarios where the student is involved in natural language-oriented dialogues. Consequently, the technical framework must integrate different technologies such as the use of Advanced Dialogue Management [6,7], knowledge modeling with Ontologies [8], and Natural Language Understanding and Generation.

This paper presents the main methodological guidelines we are applying to the creation of the Milao platform. First, Language Learning must be modeled as a continuous and progressive task where the student is engaged in real-life conversational scenarios. Second, these scenarios must be quite open in comparison with standard approaches where the scenarios are based on fixed and rigid scripts. This flexibility is obtained by the implementation of a very innovative use of linguistic frameworks and artificial intelligence techniques, such as the use of the Information State Update to Dialogue Management [7]. Third, the scenarios must adapt to the linguistic abilities and knowledge of the student, allowing a flexible and progressive learning process. Fourth, the linguistic level (based on Language Technologies) must connect at a very low-level with the ontological framework [8].

References

- [1] Quesada, J.F.; Nuñez, C.; Suárez, J.L. "Dialogue Systems for Language Learning". IE Comunicaciones, 17 2013 (January-June).
- [2] Paviotti, G.; Rossi, P.G.; Zarka, D. (eds): *Intelligent Tutoring Systems: an Overview*. EU I-TUTOR project. Available at <http://www.intelligent-tutor.eu/2012/11/30/e-book-on-intelligent-tutoring-system-an-overview/>

- [3] Vanlehn K., Jordan P.W., Rose C.P., Bhembé D., Boettner M., Gaydos A., Makatchev M., Pappuswamy U., Ringenberg M., Roque A., Siler S., Srivastava R. "*The architecture of why2-atlas: A coach for qualitative physics essay writing*". Proceedings of Intelligent Tutoring Systems Conference. Springer. Berlin. 158-167. 2002.
- [4] Dela Rosa, K.; Eskenazy, M. "*Effect of Word Complexity on L2 Vocabulary Learning*". Proceedings of the 6th Workshop on Innovative Use of NLP for Building Educational Applications. ACL/HLT 2011.
- [5] Wolska, M.; Horbach, A.; Gerstenberger, C; Steffen, D; Pinkal, M. "*Towards Communicative CALL: Specifying Dialogue-based Activities*". ICT for Language Learning, 5th edition.
- [6] Lee, G.; Jung, S.; Kim, K.; Lee, D.; Lee, G. G. "*Recent Approaches to Dialog Management for Spoken Dialog Systems*." Journal of Computing Science and Engineering, Vol. 4. N.1. 2010.
- [7] Traum, D; Larsson, S. "*The Information State Approach to Dialogue Management*". Current and New Directions in Discourse and Dialogue, Text, Speech and Language Technology. Volume 22, pp. 325-353. 2003.
- [8] Basili, R.; Pennacchiotti, M.; Zanzotto, F.M.: "*Language Learning and Ontology Engineering: an Integrated Model for the Semantic Web*." 2nd Meaning Workshop, Trento, Italy, February 2005.