A Procedure to Engage Children in the Morphological and Syntax Analysis of Pedagogic Conversational Agent-Generated Sentences to Study Language

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ABSTRACT

Pedagogic Conversational Agents are computer applications that interact with the students in natural language. They usually focus the dialogue on a certain topic under study. In this paper, the author proposes the possibility of children studying morphology and syntax by using a Pedagogic Conversational Agent. The main benefit is that the agent is able to generate an infinite number of sentences and, it automatically generates the morphological and syntactical analysis from a given grammar. That way, students can practise with all the sentences they need, receive immediate feedback with automatic evaluation, at their own rhythm and, the level of difficulty can be adapted to their particular competence of analysis. Given the originality of this new computer assisted learning initiative, the author has devised a procedure to engage the students in the dialogue with the agent to carry out the morphological and syntax analysis at five different levels of difficulty, and test the validity of the approach with a limited number of users according to the principles of User-Centered Design. The results gathered provide evidence of the goodness of the procedure and, they encourage us to keep working on this promising field of using pedagogic agents as computer teaching language assistants.

Keywords: Blended Learning, Human-Computer Interaction, Language Learning, Natural Language Interface, Pedagogic Conversational Agent, User-Centered Design

1. INTRODUCTION

Education is key in any society to improve both the individual and social welfare (Spanish Education Law, 2006). In particular, in Primary Education children start to develop their personality, and to acquire the basic oral communication, reading, writing and calculus skills. Teachers at this stage are encouraged to foster the individual and team work of the children with effort and responsibility according to each child learning rhythm.

Essential to any other learning, children are required to improve their learning of reading.

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This is because children who are unable to read are prone to fail in the learning of any other knowledge (Montero-Vivo, 2001). Some of the factors that seem to be related in the ability of correctly learning are the following (González-Trujillo, 2005): speed and efficiency decoding words, vocabulary development, understanding the text structure, making inferences, self-assessment, morphology, syntax, prosody.

In this paper, the focus is on morphology and syntax. Traditionally, teachers choose some sentences to morphologically and syntactically analyze them in class. However, while some children may have already understood simple sentences and are ready for more complex sentences, other children may need more practice with simple sentences. This is an issue both for the more advanced children who are prevented to keep developing their ability of reading, and for the less advanced children who may feel that they need more time.

However, time in regular lessons is limited and cannot be further extended. On the other hand, Blended Learning (Graham, 2005) provides an alternative in which traditional lessons are complemented by the use of computers for education. That is, Blended Learning can be defined as a combination of traditional face-to-face (F2F) lessons and computer-based education. There are different methodologies to mix the F2F lessons and the use of the computers.

One possible Blended Learning methodology, as proposed by Dethare & Perez-Marin (2010), is to keep the schedule of the school, and provide the students with on-line educational systems so that the students can work on their own. That way, the exercises can be adapted to the level of difficulty that can be tackled by the students. Moreover, if procedures to automatically generate the exercises are implemented, teachers will not be overloaded by having to design exercises for F2F and non F2F teaching hours.

Natural Language Processing has been studied since the fifties (Mitkov, 2003). During this time, many resources have been built, and lexical and parsing techniques have been developed (Indurkhya & Damerau, 2010). Thanks to these advances, in this paper, our focus is to devise a procedure to automatically generate simple sentences so that children can morphologically and syntactically analyze them.

Moreover, in the last decades, it has been studied how children enjoy interacting with the computer and, 71% of the children have stated that they would like to talk to their computers (Narayanan, 2002). It is our hypothesis that this is possible by devising Pedagogic Conversational Agents (PCAs) defined by Johnson et al. (2000) as “lifelike autonomous character that cohabite the learning environment creating a rich face-to-face interface with the student”. Several benefits of using PCAs have already been reported in the literature such as the Persona effect, the Proteus effect and, the Protégé effect.

Lester et al. (1997) discovered the Persona effect, according to which, just the presence of an interactive agent in an educational computer environment has a positive influence in the students’ perception of the learning experience. Similarly, Yee and Bailenson (2007) discovered the Proteus effect, according to which students are motivated to achieve the features of the agents to become more like them; and, Chase et al. (2009) discovered the Protégé effect, according to which child students can make greater efforts to teach their agents than to study on their own.

In this paper, the authors present Lingu, a Pedagogic Conversational Agent that implements a new procedure to generate Spanish or English sentences to be morphologically and syntactically analyzed by children in an interactive way. In this way, children can work on their own, at their rhythm and with an infinite number of sentences. Moreover, it is our expectation that they will find the use of the agent easy and satisfactory.

Given the originality of this new computer assisted learning initiative, the authors have checked the validity of the approach with an initial limited number of users according to the principles of User-Centered Design (Abascal et al. 2001; ISO 9241-210:2010), i.e. to start with prototypes and to find out the opinion of the users before working on bigger computer.
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