

Proposal for a Conversational English Tutoring System that Encourages User Engagement

Michal MAZUR^{a*}, Rafal RZEPKA^a & Kenji ARAKI^a

^a*Graduate School of Information Science and Technology, Hokkaido University, Japan*

*mazzi@media.eng.hokudai.ac.jp

Abstract: The need for successful communication between people from different countries has become a growing necessity of modern times. The necessary medium for cross-cultural communication, English, has gained the status of an international language. In our paper propose a free-talking dialogue system designed for tutoring English as a second language. We also discuss the development and capabilities of such conversational agent and possible applications. Among the key features of such system we emphasize the principals of gamification, a notion of integrating game mechanics into non-game systems, applications and services in order to encourage user interaction. Next, we present the novel idea of teaching foreign languages to users by sentential context-learning method. Finally, we underline the importance of emotion recognition by introducing a potential foundation for verifying the assumption that certain words containing emotional content can improve learning.

Keywords: Human-Computer Interaction, Natural Language Processing, Second Language Acquisition, Code-Mixing, Emotion Recognition

Introduction

In recent years, various non-task oriented conversational agents for second language acquisition have been developed [1][2][3]. The object of our scientific interest embraces pedagogical conversational agent that would assist students by providing a support to their learning efforts. Fryer et al. assessed the usefulness of chatterbots as language learning tools [5]. Nowadays, when access to real teachers is often limited, the demand for inexpensive solutions has increased and the systems already proposed to respond to this issue have been too expensive to use on a large scale [4]. One of the possible ways to significantly reduce the costs of studying is to deploy an automated solution - a tutoring system that might be used to replace or at least support human teachers in situations where there are no other alternatives.

1. State of the Art

Over the last decade, there have been a few attempts to satisfy the demand for artificial partners in learning. CSIEC (Computer Simulation in Educational Communication) is an Artificial Intelligence (AI) framework developed at Peking University [6]. Even though CSIEC provides learners with a chatting partner, there are still many unsolved problems regarding the ability of understanding and generating natural language or dealing with textual ambiguity. In another project, a prototype of a computer dialogue system, Let's Chat, allowed students to practice second language in social situations [7]. This project is only using pre-stored utterances, so conversation topics in the dialogue system were significantly limited. In other approach to create a conversational language tutor, an AI chatterbot architecture called CLIVE was presented by Zakos et al. [8]. CLIVE accepts input messages in two languages and thereby allows learning also for students with a limited knowledge of the second language. However, this system is built on top of a commercial

stand-alone AI technology platform, which makes it incapable of retrieving new vocabulary and topics and is entirely dependent on its limited knowledge base.

2. System Development

In our work we incorporated the methodology previously used in a casual conversation system using modality and word associations retrieved from the Web, developed by Higuchi [9]. This system has been originally designed to operate on Japanese utterances and we currently work on an extension of its functionality to perform a textual conversation environment also in English. Our system will harness a few independent modules that will cooperate with each other to achieve anticipated results.

2.1 Gamification Module

In CSIEC system a scoring mechanism has been used to motivate users and facilitate self-studying and progress evaluation [6]. The main disadvantage of this approach is the outdated score calculation system that may be useful to monitor students' progress by a teacher, but do not fully respond to the expectations and needs of a user. To improve this idea, we propose the "gamified" scoring mechanism, reinforced by adding some game design mechanics on top of its main functionality. Gamification is an informal term for the use of elements of video game design in non-gaming systems. Recent psychological studies brought the evidence that such systems may bring motivation by creating the reward and reputation systems inspired by the principles of video game design [10]. We believe that our approach may build users' competitive spirits and improve the overall user experience since, as stated by Detering et al., "Gamification may bring the ability to shape user behavior in directions intended by the project of a given system" [11].

2.2 Co-Mix Module

In our research, we implement a context learning method based on the phenomenon of code-mixing into chatterbot in order to generate code-mixed phrases. Code-mixing is the transition between linguistic units (words or phrases) from one language into another, within one sentence, where original grammar of the native language is usually preserved unchanged [12]. During conversations, students will encounter second language lexis and thereby establishing a connection between the meaning of a certain difficult word in the first (L1) and second (L2) language. The results of preliminary experiments described by Mazur et al. [13] indicate that code-mixed sentences may be an effective way of expanding one's L2 vocabulary.

2.3 Emotion Recognition and Humor Module

The ambiguity is a significant drawback in processing, recognition and analysis of emotions. Currently, there are many existing classifications of emotions but there is no universally accepted emotional model. Darwin and Tomkins first proposed so-called basic emotions [14][15]. Pluchtik defined 8 basic emotions and enhanced his theory with the aspect of intensity [16]. In our research, we use the classification of emotions proposed by Nakamura [17]. To recognize speakers' emotions and words with certain emotional load we plan to adapt a system for affect analysis, developed by Ptaszynski et al. [18]. To boost user interaction with the chatterbot we will use system developed by Dybala et al. [19] which has proved to successfully activate humans with humor.

2.4 Language Normalization Module

We would like to address the current problem of user creativity and individuality of the language, caused by its irregularity and a problem to understand the English language used in social media (like Twitter). The research performed by Clark et al. [20] responds to this issue by presenting a system for automatic normalization of the English language - CECS (Casual English Conversion System). Applying certain functions of this system such as aiding non-native speakers' reading comprehension on informal English may reinforce our system and create the opportunity of expansion of the project into less-formal aspects of language.

3. Conclusions

A novel Open-domain Conversational Tutoring System specialized in teaching English has been proposed in this paper. It is still a work in progress and we plan to improve its design by incorporating additional components such as dialog management module, user-specific knowledge module or machine learning module.

References

- [1] Jia J. (2009). CSIEC: A Computer Assisted English Learning Chatbot Based On Textual knowledge and Reasoning. Elsevier B.V.
- [2] Tatai G., Csordas A., Kiss A., Szalo A., and Laufer L. (2003). Happy chatbot, happy user. *Intelligent Virtual Agents*, vol. 2792, 5-12.
- [3] Stewart I., File P. (2007). Let's chat: A conversational dialogue system for second language practice. *Computer Assisted Language Learning*, 20, 97.116.
- [4] Sang-Hun C. (2010). Teaching machine sticks to script in South Korea. *New York Times*, July 10, p. A19.
- [5] Fryer L. and Carpenter R. (2006). Emerging technologies: Bots as language learning tools. *Language Learning & Technology*, 10(3), pp. 8-14.
- [6] Jia J. (2009). CSIEC: a computer assisted English learning chatbot based on textual knowledge and reasoning, *Knowledge-Based Systems* 22 (4) ,pp. 249.255.
- [7] Stewart I., File P. (2007). Let's chat: A conversational dialogue system for second language practice. *Computer Assisted Language Learning* , 20, 97.116.
- [8] Zakos J., Capper L. (2008). CLIVE - An Artificially Intelligent Chat Robot for Conversational Language Practice. Springer Link.
- [9] Higuchi S., Rzepka R., Araki K. (2008). A casual conversation system using modality and Word associations retrieved from the Web. *Proc.EMNLP `08*. Pp.382-390, Honolulu, USA.
- [10] Rashid A., Ling K. (2006). Motivating participation by displaying the value of contribution. *Proc. CHI 2006*, ACM Press.
- [11] Deterding S., Dixon D. (2011). Gamification: Using Game Design Elements in Non-Gaming Contexts. *CHI 2011 Extended Abstracts*.
- [12] Sridhar, S.N. and Kamal K. (1980). The syntax and psycholinguistics of bilingual code-mixing. *Canadian Journal of Psychology* 34(4):407-416.
- [13] Mazur M., Rzepka R. and Araki K. (2010). Co-Mix Project: Towards Artificial Tutors Using Code Mixing as Foreign Language Teaching Method. *IWMST 2010*, pp.196-201.
- [14] Darwin C. (1872). "The expression of emotions in man and animals". D. Appleton and Co.
- [15] Tomkins S.(1962). *Affect, imagery, consciousness: The positive affects*. Springer, New York.
- [16] Pluchtik R. (1980). "A general psychoevolutionary theory of emotion". Plutchik, R. and Kellerman, H., eds.: *Emotion theory, research, and experience*. vol. 1,[1] Theories of emotion. pp 3-33. Academic Press.
- [17] Nakamura A. (1993)*Kanjo hyogen jiten*. Tokyodo Publishing, Tokyo. 1993.
- [18] Ptaszynski M., Maciejewski J.Dybala P., Rzepka R., Araki K. (2009). A System for Affect Analysis of Utterances in Japanese Supported with Web Mining. *Journal of Japan Society for Fuzzy Theory and Intelligent Informatics*, Vol. 21, No. 2 (April), pp. 30-49 (194-213).
- [19] Dybala P., Ptaszynski M., Rzepka R., Araki K. (2009). Activating Humans with Humor - A Dialogue System that Users Want to Interact With, *IEICE Transactions on Information and Systems Journal*.
- [20] Clark E., Araki K. (2011). Text Normalization in Social Media: Progress, Problems and Applications for a Pre-Processing System of Casual English. Elsevier B.V.