Chen, W. et al. (Eds.) (2017). Proceedings of the 25th International Conference on Computers in Education. New Zealand: Asia-Pacific Society for Computers in Education

A Telexistence Robot Combined with Virtual Reality for Teaching English

Wen-Chi Vivian WU[a], Tosh Yamamoto[b], Cheng-Hao Hu[c] &Rong-Jyue Wang[c*]
[a]Department of Foreign Languages and Literature, Asia University, Taiwan
[b]The Center for Teaching and Learning, Kansai University, Japan
[c]Department of Electronic Engineering, National Formosa University, Taiwan*
*orffwang@nfu.edu.tw

Abstract: Learning English has been a global trend since English is widely regarded as an international language for effective communication in the global village where we live today. However, Taiwan is a non-English speaking country; the lack of professional English teachers in Taiwan is still a serious problem both in the countryside and the city. In order to solve this problem, in our study the telexistence robot comes to play. To make teachers feel a sense of telepresence, more feedbacks were prepared for the scene and more focal points for the scene were enriched on teaching scenario. The robot was designed in the newest technological way where virtual reality (VR) and diverse sensors were employed to receive telepresence and feedback. Teachers could become even more engaged in teaching scenarios and operate the robot from a distance through wireless communication technology. The application of telexistence robot has been commonly recognized, and users can operate the robot by sensors whose wireless signal transmits from the user to the robot. The user wears wearable devices on both arms, both feet and the head to control the remote robot to display the same body movement and position. In this way, the application of the telexistence robot to teaching in the elementary school seems practical and feasible. The findings of this study reveal that RALL (Robot Assisted Language Learning) group did make students more motivated and create a more joyful learning environment, compared to the traditional teaching method without RALL.

Keywords: English Learning, RALL, VR, telexistence robot, guidelines, scenario

1. Introduction

In the last few years, it has become more and more popular that using robots for supporting teaching and learning (Hung et al., 2012). Through the TPR (Total Physical Response) teaching method can really make learners reduce a sense of nervousness and learn a language with no pressure (Asher, 1982). However, how to design such a robot that children love on the one hand and how to design the instructional program with above teaching methods on the other are extremely important issues that we care about. Goetz et al. (2003) claim that the humanlike robot is more suitable than the machinelike robot to be an assistant or a teacher in the class. Tanaka, et. al. (2014) show that it has more advantages that teaching students through a remote robot is much more prominent than the traditional teaching method using TV and Video that only provide children with sound and video with one way communication, and thus children are unable to discuss problems immediately with teachers who are on the TV or Video screen. That is why we create the telexistence robot to improve the learning environment. Kwon, et. al. (2010) show that using a telexistence robot to teach students who live in the countryside resolved the trouble that many teachers are unwilling to travel and teach there. Thus, in the paper, the telexistence robot is used as a teacher in the class and a human teacher can operate the robot from a distance with wearing the wearable devices and the virtual glasses over the wireless communication.

2. Hardware and Software Design of the Telexistence Robot

The design of the telexistence robot in the paper should become like an anthropomorphic robot or humanlike robot with the size of 120 cm in height and 40 cm in width and it should look adorable, cute,

kindly and friendly. Further, the body structure is composed of aluminum bars to connect with each other with screws, and the AI-motors serve the movement of the components. For example, one hand has five motors to demonstrate its movements. Two motors serve the movement of the head. The signals from the robot are sent from the controller or a transmitter board connected to a gyro sensor, a bending sensor, and a pressure sensor that are installed in the body of the robot. And the signals to the robot are sent to the controller or a receiver board connected to the motors installed in the various body parts of the robot. When a teacher wears wearable devices and the VR glasses, he/she can feel as if being in the remote class to interact with students there.

The signal delivery system and the motion detection of the different parts are as follows: In order to make students improve their English before and after class, researchers particularly designed an English learning system that collocates with the kinematic motions or body language and the teaching method based on the CLT and TPR. The robotic kinematics are computer programmed precisely to make the body movements smooth and natural. In this way, the robot can stimulate and arouse students' learning interest and desire.

Moreover, the sound recognition system is incorporated with the robotic system with the CLT, TRP and body language. Furthermore, MEILA (Mobile English Idioms Learning Assistant) system is installed to execute lessons before and after class through the interactive performance with the robot.

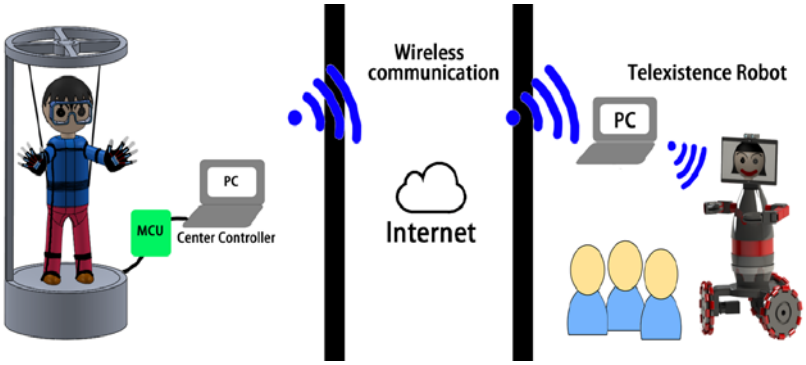

Figure 1. Wireless Signal Delivery System

Figure 2. Scenes: the Demonstration of Motions

3. Method and Outcome

The experiment of the study was conducted with two groups. They are RALL Group (with the robot) and Conventional Group (without the robot). Both groups were given the same amount of the learning for the experiment. The learning period of the whole study lasted five periods, each of which was 50 minutes in length. In the lessons, students learned how to determine the meaning of sentences with rising tone or falling tone. From the academic standpoint, students learning English through r-learning and TPR with the telexistence robot had better performance than the students learning English without robot. The students in the RALL group enjoyed the class well and felt interesting in taking classes. In addition, the Conventional Group instructed with a real teacher, where the instructional program was

based on the teaching method of r-learning and TRP, including the intonation patters of three types of questions, story-telling and sentence guessing.

Figure 3. Demonstration of the Telexistence Robot in the Remote Class

It follows that both groups demonstrated significant improvement. Following the experiment, we also interviewed students individually to analyze their thoughts about taking classes with instruction by a robot and by a human teacher. For RALL Group, some students said '*never thought the robot could be a teacher and teach us English'*. For the Conventional Group, some said that 'the robot was not attractive enough compared with a real teacher'. Above all, students thought that they were motivated to learn more and the experiment gave them positive learning experience.

4. Conclusion

In the paper, our aim is to solve the problem that is the lack of professional English teachers in the countryside in Taiwan and that most of teachers are unwilling to travel and teach there. Therefore, we created the telexistence robot that can be controlled and operated from a long distance. The problem was resolved now to make the professional English teachers in the city be able to teach anywhere. Furthermore, such system will replace the traditional teaching systems that employ TV-learning, radio-learning and the like. Moreover, the teaching method of r-learning, TPR and CLT enhanced with the telexistence robot is expected to establish much more high performance and excellence in teaching in English. Last, but not the least, the result of the analysis of the personal interview revealed that the telexistence robot in the class demonstrated more learning efficiency than the class without it.

Acknowledgements

This research was partially supported by the Ministry of Science and Technology in Taiwan through Grant MOST 102-2221-E-150-059-MY3 and MOST 104-2511-S-126 -003 -MY2.

References

Asher, J. J. (1982). Learning another language through actions: The complete teacher's guidebook (2nd ed.). Los Gatos, CA: Sky Oaks Productions.

Fumihide Tanaka, Toshimitsu Takahashi, Shizuko Matsuzoe, Nao Tazawa, and Masahiko Morita. (2014). Telepresence robot helps children in communicating with teachers who speak a different language. *In Proceedings of the ACM/IEEE international conference on Human-robot interaction*, pages 399–406. ACM, 2014.

Goetz J., Kiesler S., & Powers A. (2003). Matching robot appearance and behavior to tasks to improve human-robot cooperation. IEEE Ro-Man 2003, 55-60.

Hung, I.-C., Chao, K.-J., & Chen, N.-S. (in press). Designing a robot teaching assistant for enhancing and sustaining learning motivation. Interactive Learning Environments.

O.-Hun Kwon, S.-Yong Koo, Y.-Geun Kim, D.-Soo Kwon, (2010). "Telepresence Robot System for English Tutoring," *Advanced Robotics and its Social Impacts (ARSO), 2010 IEEE Workshop on*, pp. 152 - 155, 2010.