

Designing Codes for Making AI Robots that Accompany English Learning

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Abstract—Robots with human movements and facial expressions are easy to approach for children. If such a robot has some artificial intelligence, it can help children learn a variety of things. Therefore, by interacting with this robot, children can learn English and practice daily conversations in English, even learning how to get along with people and develop good social skills. Hence, the purpose of this research is to use an online graphical programming tool -CodeLab- to create a good interaction mode between humans and Kebbi Air robots, and help children learn and talk in English in an interactive way. By using this tool, this research created a function so that users can recognize English Words in a period of time. In this way, preschoolers can easily learn basic English Words and simple daily conversations to lay a good foundation for language education. In addition, parents can remotely observe their children's learning through the AI robot camera, and use the robot to discuss learning content with their children. The research results showed that artificial intelligence robots are beneficial to improve children's learning enthusiasm and attention, build their self-confidence, and encourage them to learn, listen and speak English.

Index Terms—AI robot, CodeLab, Kebbi air robot, interaction, children

I. INTRODUCTION

Through the interactive functions, the AI (Artificial Intelligence) robots can simulate human facial expressions, actions, and behaviors, as well as our way of thinking and emotional expressions. This can improve children's attention to learning and their cognition development. Moreover, AI robots can use natural language to interact with children, not only are children willing to learn, but also parents can interact with them through AI robots, thereby enhancing their parent-child relationship.

With education-accompanying robots, children can learn and converse with simple English words, practice their listening and speaking skills, and understand and apply what has been learned to daily conversations. While children are highly accepting of robot teachers,

preference differs slightly with age and gender. Children are more accepting of robots with a mechanical appearance, while girls prefer human-shaped robots [1]. A previous study on the interactions between children and human-shaped robots found that robots can encourage children to learn how to speak and practice English dialogues; thus, human-shaped robots can play an important role in enhancing human-computer learning interaction [2]. Moreover, during academic teaching, interactive robots can be used as children's learning partner and teacher through bidirectional play, which teaches children how to get along with people, cultivates good interpersonal relationships, enhances their social skills, and provides a learning company [2].

Science and Technology changes with each passing day, and dazzling multimedia acousto-optic displays distract and over-stimulate children, thus, they have gradually lost the ability to actively concentrate as their attention is drawn by the acousto-optic effects.

The current teaching materials are no longer limited to traditional teaching, and learning effects will be significantly enhanced when they can develop across fields and in multiple aspects; therefore, providing a more vivid and interesting teaching resources and media for children will help them create their own enthusiasm for studying and they will aspire to gain more knowledge.

II. MOTIVATION AND PURPOSE

AI education-accompanying robots are mostly built as a complete set, and many people have suggested that robotic technology can be effectively integrated in learning activities. A good learning environment can cultivate students' spirit for active learning and by interacting with robots, learners can enhance their degree of participation, concentration, entertainment, and enjoy the fun of interacting with robots [3].

Robotic technology has enabled us to take a big step towards the future of educational practices, and according to the functions and roles played, robots can do much more than interact with learners. Not only do robots help people with various work, but they can also be applied in education in unlimited ways. Through human-computer interface, which is designed to meet safety and usage

requirements, interactions will be closer and more frequent, and thus, must be user friendly, have social qualities, etc. [1].

English is a tool language, and people around the world use it to communicate with one another; therefore, considering that Taiwan has plans to enhance its international competitiveness, and under the trend of internationalization, the cultivation of English-speaking abilities is important [4]. Children accepting English learning before school is positively related to their learning performance and motivation through Grades 1 to 3 in elementary schools [5]. With a cute human-like or doll appearance and their ability to respond with interesting actions and sounds, robots are very appealing to children.

AI robots can enhance children's learning interests, and children will be more willing to speak English after learning it from robots, which boosts their speaking ability and lays a foundation for basic language education, which is being modeled to international standards.

There is an AI service companion robot (Kebbi Air Robot) for multi-scenario applications which can create unique expressions, actions and dialogues. Hence, the purpose of this research is to use an online graphical programming tool -CodeLab- to create a good interaction mode between humans and Kebbi Air robots and truly create an intelligent robot partner. By using this tool, this research created a function so that users can recognize English words in a period of time. In this way, preschoolers can easily learn basic English words and simple daily conversations to lay a good foundation for language education.

The Kebbi Air robot can be used to accompany English-learning beginners, such as children. Since children are usually curious about novel things, and interactive AI human-shaped robots are an interesting tool, they can talk with children and teach them simple English words and dialogues. In addition to English, children can learn about Science and technology throughout this process, resulting in effective teaching through lifelike activities.

III. LITERATURE REVIEW

A. Age of AI Education Accompanying Robot

If the reading materials is read jointly by parents, and children have the function of emotional company, the behavior joint parent-child reading and children's reading qualities can be affected and further developed, thus, this study discusses the introduction of AI robots with the emotional company function through a quasi-experimental study and case study [6].

Service robots could be used in children's libraries to break through the limitations of libraries regarding labor, space, and attract children to go to libraries, while helping its staff to provide services that meet the children's usage demand [7]. AI robots could also improve autistic children's learning ability to interact with society, observed and recorded their learning from and interaction

with the robots, and cultivated and trained their social skills [8].

Socially assisted robots (SAR), including humanoid robots, have the potential for classroom learning, especially in terms of language learning [9]. Children expressed significantly higher levels of figural creativity while interacting with the robot that modeled creative behavior through its drawings [10].

B. Making

This system is mainly developed for English beginners. The making steps are shown in Fig. 1.

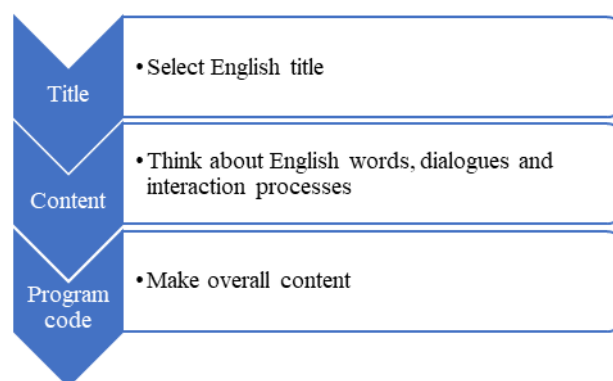


Figure 1. Functional step diagram.

Teaching is started with simple and frequently used words; e.g.: "Hello", "Goodbye", "Thank you", "Sorry", etc., and the words being taught appear in the following conversations. English conversations frequently emerge in daily life, and considering beginners' English ability, conversations are designed to be short and used in life; for example: "What's your name?", "How are you?", etc.

The functional descriptions of the device and software APP are as follows:

- 1) Device: Kebbi Air robots.
- 2) APP: CodeLab (NUWA Robotics Corp.)
- 3) Functional description: The robot's expressions, actions and dialogues are established in the instructions. From the designated action when the robot is booted, the robot is made to describe the operating method by itself. Then, it starts to teach English words and dialogues.
- 4) The program platform is shown in Fig. 2. The detail description of the platform content in Chinese and English are shown in Table I.

The designed codes are researched and developed for young English beginners, and examples are shown, as follows:

1. Hello
2. Goodbye
3. Thank you
4. Sorry
5. Name
6. Hobby

The 6 examples of English dialogue teaching are, as follows:

1. What is your name?

2. My name is Bob.
3. How are you?
4. I am great.
5. What is your hobby?
6. My hobbies are playing guitar and reading books.

The research establishes the expressions, actions and dialogues of the Kebbi Air robot, the results are shown in Table I.

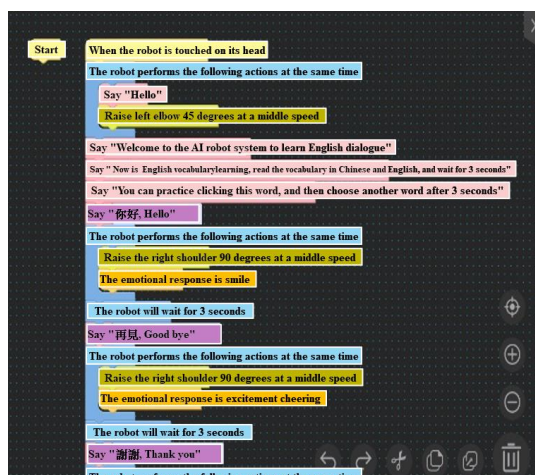












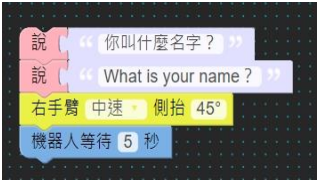





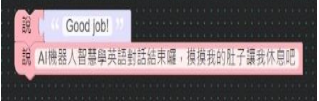

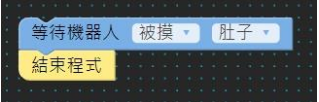
Figure 2. Program platform with English notes.

TABLE I. CONTRASTING DESCRIPTION OF EXPRESSIONS, ACTIONS AND DIALOGUES FOR KEBBI AIR ROBOT

 <p>Expressions and actions</p>	
Chinese dialogue	Description of actions and dialogues
	When touched on the head, the robot will raise its arm 45 degrees with medium speed and say "Hello."
	The user is welcomed and the first step is entered: English vocabulary teaching, and the usage method is explained, as follows. Literal strings of text appear on the interactive display of the Kebbi Air robot, and are presented as a marquee.

		<p>"Hello" is taught: user will read the Chinese and English words once, the robot lifts its arm 90 degrees with medium speed. The robot will wait 3s for the user to read the word.</p> <p>The interactive display for the Kebbi Air robot's emotional reaction is set as "smile".</p>
 <p>Expressions and actions</p>		
Chinese dialogue	Description of actions and dialogues	
	<p>"Goodbye" is taught: user will read the Chinese and English words once, the robot lifts its shoulders 90 degrees with medium speed and smile. The robot will wait for 3s for the user to read the word.</p> <p>The interactive display for the Kebbi Air robot's emotional reaction is set as "cheer excitingly"</p>	
 <p>Expressions and actions</p>		
Chinese dialogue	Description of actions and dialogues	
	<p>"Thank you" is taught: user will read the Chinese and English words once, the robot lifts its arm 90 degrees with medium speed. The robot will wait for 3s for the user to read it the words</p> <p>The interactive display for the Kebbi Air robot's emotional reaction is set as "big smile"</p>	
 <p>Expressions and actions</p>		

Chinese dialogue	Description of actions and dialogues
	<p>"Sorry" is taught: user will read the Chinese and English words once; the robot lifts its arms 90 degrees with medium speed and feel sad. The robot will wait for 3s for the user to read the word. The interactive display for the Kebbi Air robot's emotional reaction is set as "feel sad"</p>
	<p>"Name" is taught: user will read the Chinese and English words once; the robot will wait for 3s for the user to read the word. The robot lifts its arms 90 degrees with medium speed. The interactive display for the Kebbi Air robot's emotional reaction is set as "act like a spoiled child"</p>
	<p>This command completes English word teaching, and the following code is entered: "English dialogue teaching method is described, as follows:"</p>
	<p>Daily dialogue "What's your name?": user will read the Chinese and English dialogue once; the robot lifts its arms 45 degrees with medium speed. The robot will wait for 5s for the user to read the dialogue</p>
 <p>Expressions and actions</p>	
Chinese dialogue	Description of actions and dialogues
	<p>Daily dialogue "My hobbies are": user will read the Chinese and English words once, and hold up their hand. The robot will wait for 5s for the user to read the dialogue. The interactive display for the Kebbi Air robot's emotional reaction is set as "grin". The images of a "guitar" and "book" appear as the hobby's answers</p>
 <p>Expressions and actions</p>	

Chinese dialogue	Description of actions and dialogues
	<p>After finishing the robot will encourage the user and say that the English lesson is over.</p>
 <p>Expressions and actions</p>	
Chinese dialogue	Description of actions and dialogues
	<p>When the robot is touched on the belly, the program will end and it will shut down</p>

Difficulties encountered during program development and the resolutions:

- 1) The initial settings could not be achieved. We planned to make the robot continually act after it read an English sentence and the user had repeated it once. However, after inputting the codes to the robot, we found that the robot was not compatible with the English language and unable to understand the English phonics, thus, the robot would not perform the action, even though the user repeated the sentence. Later on, we found that the robot could only understand and communicate in Mandarin Chinese.
- 2) Resolution: Rewrite the program. Similarly, make the robot say English words, and wait for a period of time for the user to repeat it. When the time is over, the robot will perform the following action.

IV. CONCLUSION

This design is intended to develop a program for Kebbi Air robot to accompany children throughout their English learning, and make this program's creation process a research topic for children and beginners. The execution mode is to first help the user learn simple English words, and test the user's memory. In the future, users can apply these words to daily dialogues, and answer correctly when someone asks them daily life questions.

Each of the word pairs that are being taught have different corresponding emotional expressions on the interactive display, which provide clues to the user about the different words. In order for users to understand and apply the words correctly; the words used in the English dialogues are those taught in the first step.

Learning English dialogues with the company of and AI robot is a game-like interaction teaching method with information and education value. When English words

and dialogues that are frequently used in daily life are put into robots, they can be practiced repeatedly, which gives learners confidence when asked questions in life, thus, daily English dialogues presented on an AI robot have an increased language education quality.

V. RESEARCH SUGGESTIONS

In the information era, technology is updated very rapidly, and there are more and more program languages being developed for each field, thus, we can apply programming languages in information-related fields after learning and designing them on the coding platform.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

The authors organized the research methodology of this article and used the smart robots as a companion learning tool to achieve the language learning work. Weng wrote the AI robot code, and then discussed with Hsu to modify the research method to achieve the feasibility and purpose of this research.

ACKNOWLEDGMENT

This research was funded by Ministry of Science and Technology, Taiwan, (MOST 109-2511-H-158-001).

REFERENCES

- [1] F. W. Tung, "A study on children's perception and evaluation of humanoid robots," *Journal of Design*, vol. 18, no. 3, pp. 23-39, 2013.
- [2] T. Kanda, T. Hirano, D. Eaton, and H. Ishiguro, "Interactive robots as social partners and peer tutors for children: A field trial," *Human Computer Interaction*, vol. 19, no. 1-2, pp. 61-84, 2004.
- [3] D. S. Ridley and B. Walther, "Creating responsible learners," *American Psychology Association*, Washington, 2000.
- [4] Y. S. Wu and C. P. Lin, "A study of the relationship among English learning environment, learning motivation and learning strategies of college students," *Journal of University of Taipei*, vol. 40, no. 2, pp. 181-222, 2009.
- [5] C. C. Tsau and C. H. Hao, "The Influence of the elementary students' early English learning experience on their English motivation and academic achievements," *Journal of Educational Practice and Research*, vol. 23, no. 2, pp. 95-123, 2010.
- [6] R. C. Yen and C. H. Tsai, "The effects of an emotion accompany AI robot on elementary students' parent-child reading behaviors and reading literacy," *Ministry of Science and Technology Project*, 2020.
- [7] Z. L. Shen and J. W. Zheng, "Exploring the feasibility of applying service robots to children's library services" *Bulletin of the Taipei Public Library*, vol. 34, no. 4, pp. 35-49, 2018.
- [8] F. W. Tung and T. C. Yin, "Exploring the use of robots as learning companions for children with Autism," *International Journal on Digital Learning Technology*, vol. 10, no. 2, pp. 87-111, 2018.
- [9] I. Papadopoulos, R. Lazzarino, S. Miah, T. Weaver, B. Thomas, and C. Thomas, "A systematic review of the literature regarding socially assistive robots in pre-tertiary education," *Computers & Education*, vol. 55, 2020.
- [10] S. Ali, H. W. Park, and C. Breazeal, "A social robot's influence on children's figural creativity during gameplay," *International Journal of Child-Computer Interaction*, vol. 28, 2021.

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