

Research and Development Plan of Language-Learning Self-Study System that can Detect Learners' Conditions over Time and Space

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Abstract

This research aims to develop a self-study system equipped with an artificial teacher who gives advice to students by detecting the learners and to evaluate language learning in a unified framework. “Detecting the learners” means that the system understands the learners’ learning conditions, such as each learner’s degree of understanding, the difference in each learner’s thinking process, the degree of concentration or boredom in learning, and problem solving for each learner, which can be interpreted from learning behavior. We will conduct analysis from different viewpoints of language learning, such as learning English and programming languages, which have been treated separately up to now. In doing so, we will aim to dramatically improve the accuracy of analysis of learning conditions. This will enable us to develop a self-study system that implements an artificial teacher who determines the learner's learning conditions over time and space, and gives appropriate instructions for language learning. We will evaluate the effectiveness and development of prototype system and aim to realize the creation of a self-study learning system that can cope with increasingly diversified learning styles.

In this study, we will develop a self-study system that measures each learner's biological information and learning history and presents learning material suitable for each student's learning conditions, even when that student is outside of class, and it is impossible for teachers to assist in

real time. We will also conduct demonstration experiments and evaluations using the developed system (see Figure 1).

Our research can be divided into four main sections.

- (a) Development of a self-study system equipped with an artificial teacher
- (b) Evaluation by experiment for English and programming languages
- (c) Integrated analysis of a learning log of different languages such as English and programming languages
- (d) Research on possible substitutes with non-wearable measuring instruments to popularize the system

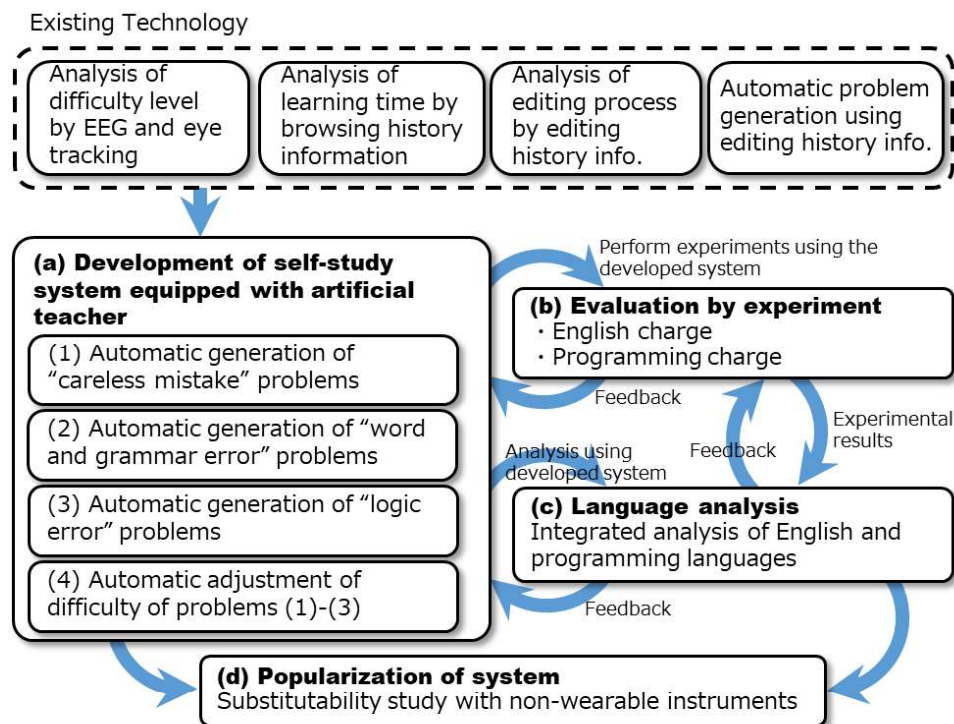


Figure 1 Research overview

As mentioned in (a), we will develop a self-study system with the following four functions: (1) a function to judge careless mistakes from brain wave information and answer time and to ask questions for which it is easy to make such mistakes, (2) a function that determines errors in spelling and grammar (syntax) of words (words in English and reserved words in programming languages) and that asks questions for which it is easy to make such mistakes, (3) a function that determines grammatically correct but logically erroneous answers and that asks questions for which it is easy to make such mistakes, and (4) a function that determines the state of the learner such as “not focusing on learning,” “finds learning content too easy,” “finds learning content too difficult,” and “finds

learning content incomprehensible or partially incomprehensible,” and adjusts the difficulty level of the task in real time, combining biological information such as brain waves and eye tracking information from the above (1) to (3) with learning-history information.

In (b), the system developed in (a) will be evaluated with experiments using English and programming languages. In (c), we will perform analysis based on the results of the demonstration experiments to see whether there is any correlation between an individual learner's learning process for English and programming languages and whether synergy effects can be expected to be utilized for education of both of these topics. In (d), to disseminate our research results, we will pursue the possibility of using non-wearable instruments that produce the same results (such as measuring blinks with a web camera) as judgment results with an electroencephalograph.

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