論 文 の 要 旨

題目 ADAPTIVE FEEDBACK BASED ON CONCEPT MAP AND CONFIDENCE INFORMATION
(概念マップと確信度情報に基づく適応的フィードバックに関する研究)

氏 名　JARUWAT PAILAI

The feedback is a key to improve the learning achievements, which appropriate feedback should be adapted the content of feedback regarding the evidence of learners. The concept map is a graphical tool that is utilized to representing and organizing knowledge. The learning evidence in the form of concept map can be gathered and assessed for representing the current understanding of learners through the ability of Kit-Build concept map (KB map). Thus, the KB map can visualize the assessment results where the instructor can access and adapt the correctness of learner maps for designing and providing feedback. The confidence information is another evidence of learners that is available in KB map where the system can associate the correctness and confidence information to visualize the current learning situation. The instructor can adapt these information for designing and providing the feedback, and the system can also utilize these information for generating and providing individual feedback adaptively.

Formative assessment is utilized to create an opportunity for improving learning achievements through three critical tasks: certifying a learning goal, gathering and assessing learning evidence, and providing feedback. A primary objective of the formative assessment is monitoring the learning of learners before providing feedback for helping the learners to achieve the learning goal. The Kit-Build concept map (KB map) is a digital tool for supporting the concept map strategy, which its ability can be arranged for implementing the formative assessment adequately. A framework of KB map can encourage an instructor to create a learning goal of class in the form of a goal map. The learners can create a learner map for representing the learning evidence by integrating the decomposed components of the goal map. Diagnosis results are generated automatically via a propositional level exact matching assessment method, which is a comparison between the goal- and learners-map. The variety visualization of diagnosis results can indicate the learning achievements where the learners can reach the learning goal and indicate the learning gaps where the learners struggled to understand the lecture. Furthermore, the analyzer of KB map can inform the valuable information in both individual- and group-diagnosis results, which the instructor can access the diagnosis results immediately for estimating the correct understanding of learners before designing feedback for helping the learners to reach the learning goal. The adaptive feedback of an instructor is a strategy to improve learning achievements in the classroom situations.

The Kit-Build concept map with confidence tagging (KB map-CT) was developed for more eliciting learning evidence and associating the correctness- and confidence-information. The learners can represent their understanding and can indicate the certainty of the understanding via KB map-CT. The reinforced diagnosis results can visualize the association between the correctness and confidence for illustrating the quality of learner's understanding. The instructors accepted and utilized the reinforced diagnosis results for implementing the formative assessment in lecture classes, which the correctness and confidence of learners are the learning evidence. In addition, an adaptive feedback was developed as a learning evidence-based strategy for providing individual feedback in a reading situation. The goal map structuring task is associating each component of a goal map with each sentence of learning material for matching the related sentence of each proposition during a learning goal was defining. The correctness- and confidence-information are utilized to classify the characteristic of each proposition. The adaptive feedback will provide the different activity based on each characteristic in a reflection task, and the related sentences are also utilized in the reflection task for improving the understanding and increasing the confidence of learners.

The thesis consists of six chapters. In **Chapter 1**, the research context and the goals, contribution, evaluation methods, and the structure of the thesis are described. **Chapter 2** outlines relevant research on the formative assessment and digital tools for supporting the concept map strategy. **Chapter 3** presents the arrangement of KB map on the formative assessment and the results of practical uses for illustrating the valuable information of the diagnosis results. In **Chapter 4**, the mechanism of KB map-CT is described that includes the confidence tagging and reinforced diagnosis results. The results of experimental uses in lecture classes demonstrate the encouraging of the diagnosis results in the behavior of the instructors. **Chapter 5** presents the adaptive feedback of KB map-CT, which comprises the goal map structuring task, the reflection task, and the correctness- and confidence-based adaptive feedback. The conclusion of this thesis and future work directions are given in **Chapter 6**.