

Adaptive learning system using big data based machine learning

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Intelligent scaffolding system to provide adaptive hints.

Over the past few decades, many studies conducted in the field of learning science have reported that scaffolding plays an important role in human learning. To scaffold a learner efficiently, a teacher should predict how much support a learner must have to complete tasks and then decide the optimal degree of assistance to support the learner's development. Nevertheless, it is difficult to ascertain the optimal degree



of assistance for learner development.

In this study, we assumed that optimal scaffolding is based on a probabilistic decision rule: given a teacher's assistance to facilitate the learner development, an optimal <u>probability</u> exists for a learner to solve a task. To ascertain the optimal probability, we developed a scaffolding system that provides adaptive hints to adjust the predictive probability of the learner's successful <u>performance</u> to the previously determined certain value, using a statistical machine learning technology.

Furthermore, using the scaffolding system, we compared learning performances by changing the predictive probability. Our results showed that scaffolding to achieve 0.5 learner success probability provides the best performance. Also experiments demonstrated that a scaffolding system providing 0.5 probability decreases the number of hints (amount of support) automatically as a fading function according to the learner's growth capability.

More information: Maomi Ueno and Yoshimitsu Miyazawa, IRT-Based Adaptive Hints to Scaffold Learning in Programming, *IEEE Transactions on Learning Technologies*, IEEE computer Society, 11, No.4, 415-428, (2018).

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