An adaptive e-assessment to estimate examinees' ability based on neural network approach

ABSTRACT

The advancements in computer-based assessment provide the technological foundation for e-assessment in measuring students' learning. The knowledge of a student (also known as an examinee) is measured through exams. A key purpose of using an exam is to determine the proficiency level of each examinee based on his/her responses to the administered test. The main problem of traditional test is that the asked questions did not match the actual ability of examinees and did not measure examinee's proficiency accurately. Therefore, Computer Adaptive Testing (CAT) has been developed to address this issue. In CAT, each examinee has to answer the questions that are tailored to his/her ability level. It uses models of proficiency estimation such as Item Response Theory (IRT). IRT model relates the response of an examinee to a specific item to his/her ability level and characteristics of the item. However, in IRT model, the relationship between items characteristics and person's skill are very complex and nonlinear. In this work, we proposed a neural network model to estimate examinees' ability for small sample size and based on the experiments, we obtained a low mean square error (MSE) compared to IRT model.

Keyword: Computer adaptive testing; E-assessment; Examinee ability; Item response theory; Neural network; Mean square error