Chapter 26
Optimizing Student Engagement in Online Learning Environments:
Intuitionistic Fuzzy Logic in Student Modeling

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ABSTRACT

In today's scenario, e-learning has become a significant part of the academic environment as well as of the corporate training sectors. Advancement in Information and Communication Technologies (ICTS) has brought new intersection of education, teaching, and learning that defines e-learning. E-learning systems deliver information for education at any time and at any place in an efficient manner. E-learning system consists of course content or learning materials in the form of nodes. These nodes are linked such that users can traverse the other nodes in the hypermedia environment. These learning concepts are available synchronously and asynchronously in different ways of representation. This presents learning materials in a disorganized manner to the learners. Due to this, learners may decline to adapt the learning material or may deviate from their goals. This requires a user model to respond to different needs of a learner. To handle the uncertainty of learner's mind while learning the concepts an intuitionistic fuzzy approach is used.

INTRODUCTION

E-learning comprises all forms of electronically supported learning and teaching, which are procedural in character and aim to effect the construction of knowledge with reference to individual experience, practice and knowledge of the learner. It refers to learners using a digital medium to support their learning processes such as digital media include the world wide web, organizational intranets, computer, satellite broadcasts, cassette tapes, videotapes, interactive television and CDs, etcetera (Wulystan et al., 2014).

To improve the learning efficiency and learner engagement in E-learning pedagogical techniques such as good presentation styles, usage of themes and analogies in presenting certain key concepts, game based challenges in exercise, creating and management of customized course contents are used. (Behera, 2013; Farhan, et al.,2017).

Cognitive strategies have played a major role to design the e-learning system. Students select and use the strategies when learning any subject from the learning material. The goal is to better organize the content in such a way that facilitates the different type of students in the learning process.

Cognitive learning and learner's mind processes play important roles in education. Students understand and remember better if they can fit their learning into a framework and are motivated to learn if that framework fits into what they understand as their ultimate goal.

Traditional learning systems were used to teach all categories of students with the same methodology as the student with the low intellect will never maximize the output that we are expecting from the students. Hence to rectify this problem artificial intelligence came in to play. Soft Computing techniques develops intelligent machines which are incumbent on being biased for even a little variation in conditions that they run on just like humans. Hence the picture can be seen a real human teacher where he can differentiate between the students and accordingly varying his teaching methodology. These intelligent systems available today are called as adaptive. Adaptive nature can be implemented through web based education, content sequencing, intelligent analysis of student's solution, interactive problem solving support, example based problem solving support and collaborative support [Beldagli et. Al.2010; Brusilovsky.,1999; Brusilovsky and Maybury, 2002; Brusilovsky and Peylo C, 2003; Hauger and Köck 2007; Froschl, 2005; Phobun, 2010). Adaptive learning approaches also include, monitoring student activity, interpreting results, understanding student requirements and preferences and using the newly gained information to facilitate the learning process [(Colchester, K., et al., 2017; Ruiz M. D. P. P., et al., 2008; Schiaffino S., et al., 2008).

All the adaptive technologies used in the current web based adaptive E-learning systems (AES) are either adopted from Intelligent Tutoring system (Brusilovsky,1999) or from Adaptive hypermedia are . Intelligent system evaluated knowledge of each individual user through goal, preferences. Learning material is displayed according to knowledge and learning style. Teaching a certain concept requires students are to be grouped by their related skills.

Web based education system have been a hot research and development area which has surfaced in the recent years. In web based, AES is the concept of fairness by improving the grading technology by the use of Fuzzy Logic and Multi-Tier Architecture. Classification of the user can be done through user profiling and assessment. Then comes the problems of unknown inputs and uncertain values of input that can cause the final result of any test to be a sudden change.

Adaptive learning system also focused on improving the pedagogical models according to student previous feedback. Most of the research which is previously done is emphasized on pedagogical model. Major drawback of these models is that they do not construct the architecture keeping the learning en-

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