

# Chapter 29

## Intelligent Questioning System Based on Fuzzy Logic

**Omer Deperlioglu**

*Afyon Kocatepe Üniversitesi, Turkey*

**Guray Sonugur**

*Afyon Kocatepe Üniversitesi, Turkey*

**Kadir Suzme**

*Afyon Kocatepe Üniversitesi, Turkey*

### ABSTRACT

*One of the most important functions of distance learning systems is determining the student knowledge level and performance clearly. In traditional education systems, students can be assessed in single-stage via tests and homework studies, which consist of multiple-choice questions. However, this method cannot provide accurate results since it is not able to evaluate student knowledge level and question difficulty level. In this chapter, a system and software structure that can determine student knowledge levels, topic difficulty level, and question difficulty levels according to instant student answers for the exam is introduced. In forming student knowledge levels, content monitoring and test data taken from distance education vocational school were used. In this way, more accurate results have been obtained. The fuzzy logic technique has been used to determine (classify) student knowledge levels and topic difficulty levels clearly. In order to determine next questions adaptively, the stored questions have been classified with division clustering methods, and the most suitable questions for the related student knowledge level have been found by using the nearest neighbor algorithm.*

### INTRODUCTION

As the Internet gains wide popularity around the world, e-learning is taken by the learners as an important study aid. In the past few years, designing useful learning diagnosis systems has become a hot research topic in the literature (Cheng, Lin,

Chen, & Heh, 2005). With accelerated growth of computer and communication technologies, researchers have attempted to adopt computer network technology for research on education. Notable examples include the development of computer-aided tutoring and testing systems (Hopper, 1992). According to a research result,

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contribution of e-learning to success is about 50%. So, e-learning can be much more effective than other single direction, passive learning methods. There is a growing interest in online learning all over the world (Elango, Gudep, & Selvam, 2008) (Dadone, 2011).

In recent decades, the interactions of teachers and students are continually enriched and changed because of explosive growth in computer and internet technologies. There are more and more e-learning environments being developed for instructors and learners to take lessons or assessments (Chen, Huang, & Chu, 2005) (Huang, Chen, Huang, Jeng, & Kuo, 2008).

People interest in distance education systems has increased with developments in internet technologies. The main advance in distance education system has been comprised with passing from Web 1.0 to Web 2.0. Users were passive consumers of content with these tools as many of them have been called Web 1.0. To fulfill the shortages of Web 1.0 and to provide more effective interaction and collaboration, investigation for the ways of using blogs effectively, wikis, podcasts and social network in education has been started. The main characteristic of these tools called Web 2.0, is users' active participation in the content of creation process. In studies of learning and teaching, as well as efficacious evolution of technology, importance of active participation, critical thinking, social presence, collaborative learning and two way communications are also underlined for quality learning (Beldarrin, 2006) (Kocak, Usluel, & Mazman, 2009). With great support of Web 2.0 technologies, e-learning and distance education system's proportions increased rapidly in the teaching and learning sector. For this reason types of e-learning and distance education software has been increased in recent years.

E-learning systems, or Virtual Learning Environments (VLEs), are rapidly becoming an integral part of the teaching and learning process (Pituch & Lee, 2006). VLEs present a number of opportunities to business schools, including

the potential to leverage a business school brand across geographical borders and the enhancement of face-to-face teaching. Furthermore it enables improvements in communication efficiency, both between student and teacher, as well as among students (Martins & Kellermanns, 2004). A VLE is a web-based communications platform that allows students, without limitation of time and place, to access different learning tools, such as program information, course content, teacher assistance, discussion boards, document sharing systems, and learning resources (Martins & Kellermanns, 2004) (van Raaij & Schepers, 2008).

Despite the recent interest in online distance education in the higher education setting, there is scant literature concerning how to assess student performance in the online distance education environment. Since assessment is an important lens through which education is viewed (Bransford, Brown, & Cocking, 2000) (Kim, J.S., & Maeng, 2008). Because of the nature of the instruction of distance education courses, assessment and measurement become an even more critical part of the educational process. In the absence of the face-to-face interactions that enable teachers to use informal observations to gauge student response, online assessments become the singular means by which mastery over material is measured (Kerka & Wonacott, 2000).

In distance education assessment systems, students must be assessed with their current knowledge levels which is changing depend on different topics. A student may have different knowledge levels in different topics. System has to use this differences to increase student knowledge level each topic with preparing exams which is suitable to current student level.

The main goal of this study, developing a model and software about student assessment system which is depending on the student knowledge level to help instructors and trainers with producing useful feedback. This feedback information is used by instructors to assess their students fairly and accurately. In this way, the lecturers whom

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