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## Enhancing a Fuzzy Inference System-Based Criterion-referenced Assessment with an Analogical Reasoning Schema

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### Abstract

In this paper, a fuzzy inference system (FIS) that incorporated with an analogical reasoning schema-based criterion-referenced assessment (CRA) is proposed. For a multi input FIS-based CRA, a large set of fuzzy rules are usually required. With the use of the grid partition strategy, the number of fuzzy rules required increases in an exponential manner and this phenomenon is known as the *curse of dimensionality* or *combinatorial rule explosion* problem. It is a tedious work in getting a complete set of fuzzy rules in practice. The main objective of this paper is to propose a new FIS-based CRA that allows fuzzy rules to be reduced. We suggest to adopt a systematic approach to select a set of fuzzy rules that to be gathered, and to incorporate an analogical reasoning schema to predict these unknown fuzzy rules. An FIS-based CRA procedure with an analogical reasoning schema is proposed. A case study relating to assessment of students' laboratory projects in Universiti Malaysia Sarawak is reported.

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*Keywords:* Fuzzy inference system, Criterion-referenced assessment, Analogical reasoning schema

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### 1. Introduction

Education assessment is an important yet complicated task for lecturers as it would influence students in their learning outcomes (Ma & Zhou, 2000). Assessment in higher education can be conducted with the criterion-referenced assessment (CRA). CRA determines students' grades by comparing their achievements with a clearly stated criterion and the standards for particular levels of performance are also clearly stated. It can be a simple pass-fail grading schema, a series of key criteria rather than as a single grade or percentage (Sadler, 2005).

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