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Automated Test Evaluation Techniques for E-learning

A thesis submitted for

A Master Degree

in

Computer Science

by

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Research title in English language:

“Automated Test Evaluation Techniques for E-learning”

Research title in Arabic language:

"تقييم الاختبارات الالكترونية في التعليم عن بعد"

The plan of the research in English language:

1. Collect the evaluation techniques in e-learning tests.
2. Evaluate their advantage and disadvantages.
3. Compare between evaluation techniques in soft copy and hard copy tests.
4. Display the algorithm of using AI techniques to ameliorate e-learning tests.
5. Implement the proposed solution in real system.

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Table of Contents

List of FiguresIV
Abstract1

Chapter 1: Introduction

1.1 Background3
1.2 Problem Statement .....	.3
1.3 Significance and Purpose of Study .....	.4
1.4 Thesis's Structure .....	.5

Chapter 2: Overview and background of e-learning

2.1 E-learning System Overview .....	.6
2.2 The Advantages and Disadvantages of e-Learning.....	.7
2.3 E-Learning Standards .....	.9
2.3.1 Categories of E-Learning Standards .....	.10
2.3.2 Standards-Based Integrated Teaching and Learning System's Benefits.....	.11
2.3.3 E-Learning Standards' Objectives .....	.11
2.3.4 E-Learning Standards' Organizations.....	.12
2.3.4.1 Advanced Distributed Learning Initiative (ADL).....	.12
2.3.4.2 Aviation Industry Computer Based Training Committee (AICC) .....	.12
2.3.4.3 IEEE Learning Technology Standards Committee (LTSC) .....	.13
2.3.4.4 Instructional Managements Systems Project (IMS)...	.13
2.3.4.5 International Standardization Organization (ISO) .....	.14
2.3.5 Standards in Detail .....	.14
2.4 E-learning platforms Tools .....	.16
2.4.1 Drupal.....	.17
2.4.2. eFront20
2.4.3 Moodle21
2.4.4 ATutor.....	.21
2.4.5 Docebo LMS22
2.4.6 OLAT23

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- 2) “Automatic Evaluation of mathematical open questions” International Conference on Mathematics Trends and Development (ICMTD12) The Egyptian Mathematical Society 27 – 29 DEC. 2012. Cairo, Egypt 2012 www.ETMS-EG.org.**

Table of Contents

List of Figures	IV
Abstract	1

Chapter 1: Introduction

1.1 Background	3
1.2 Problem Statement	3
1.3 Significance and Purpose of Study	4
1.4 Thesis's Structure	5

Chapter 2: Overview and background of e-learning

2.1 E-learning System Overview.....	6
2.2 The Advantages and Disadvantages of e-Learning	7
2.3 E-Learning Standards	9
2.3.1 Categories of E-Learning Standards	10
2.3.2 Standards-Based Integrated Teaching and Learning System's Benefits	11
2.3.3 E-Learning Standards' Objectives	11
2.3.4 E-Learning Standards' Organizations.....	12
2.3.4.1 Advanced Distributed Learning Initiative (ADL).....	12
2.3.4.2 Aviation Industry Computer Based Training Committee (AICC)	12
2.3.4.3 IEEE Learning Technology Standards Committee (LTSC)	13
2.3.4.4 Instructional Managements Systems Project (IMS) ..	13
2.3.4.5 International Standardization Organization (ISO).....	14
2.3.5 Standards in Detail.....	14
2.4 E-learning platforms Tools	16
2.4.1 Drupal	17
2.4.2. eFront	20
2.4.3 Moodle	21
2.4.4 ATutor.....	21
2.4.5 Docebo LMS	22
2.4.6 OLAT	23

2.5 On-Line Testing in e-learning.....	.24
2.5.1 Question Characteristics .....	.25
2.5.2 Adaptive Testing Principles.....	.27
2.5.3 Evaluations Types.....	.27
2.5.4 Automated Scoring Issues on Assessment Programs' ..	.30

Chapter 3: Overview of Ontology based Systems

3.1 Ontology Definitions .....	.32
3.2 Ontology Structure .....	.33
3.3 The Importance of Using Ontology .....	.34
3.4 Ontology Development .....	.34
3.5 Ontology Languages and Editors .....	.36
3.5.1 SGML (Standard Generalized Markup Language).....	.38
3.5.2 RDF (Resource Description Framework) .....	.38
3.5.3 RDFS (RDF Schema) .....	.39
3.5.4 OIL (Ontology Inference Layer).....	.40
3.5.5 DAML+OIL (DARPA Agent Markup Language – OIL) .....	.41
3.5.6 OWL (Web Ontology Language) .....	.41
3.6 Ontology Re-Engineering “Merging & Mapping” .....	.47

Chapter 4: Related Work

4.1 Automatic Evaluation of Software Code .....	.50
4.2 Automatic Evaluation of Learning Network Services.....	.51
4.3 Automatic Evaluation of Graphics and Vector Graphics Images .....	.52
4.4 Automatic evaluation of Reading Comprehension Questions.....	.54
4.5 Semi-Automatic Evaluation of Open-Ended Questions .....	.55
4.6 Automatic Evaluation of Learner’s State of Knowledge .....	.56

Chapter 5: Proposed Method and Implementation

5.1 Experimental Requirements .....	.61
5.2 Proposed Method .....	.61
5.2.1 Proof Open Questions (POQ) .....	.61
5.2.2 Multi Operations Question (MOQ).....	.62

5.3 Implementation .....	.66
5.3.1.1 Create Learning Object Materials Ontology .....	.66
5.3.1.2 Handle Proof Open Questions (POQ) .....	.71
5.3.2 Handle MOQ .....	.77
5.3.3 Handel Closed Questions .....	.80

Chapter 6: Conclusion and Future Works

Conclusion and Future Works.....	.83
References .....	.86
Appendix .....	.96

List of Figures:

Figure 2.1: Drupal home page	18
Figure 2.2: Admin's drupal home page	18
Figure 2.3.a: admin accesses drupal control panel	19
Figure 2.3.b: Admin/teacher adds a new course contents	19
Figure 3.1: Ontology Components.....	34
Figure 4.1: Screen shot of testing module for ER diagrams	53
Figure 4.2: Relationships between questions.....	57
Figure 5.1: the system architecture	60
Figure 5.2: structure of the proposed system	63
Figure 5.3: Ways of evaluation for sets, and vector of values.....	64
Figure 5.4: Boolean algebra Rules' classes and subclasses Ontology model	68
Figure 5.5: define data type properties and their classes' domain.....	69
Figure 5.6: The Boolean algebra Rules' Ontology visualization model	70
Figure 5.7: represent XML tree ontology model	71
Figure 5.8: Drupal Home page.....	72
Figure 5.9: teacher sends exam item through GUI	72
Figure 5.10: A part of converter code XMLtoPHP	73
Figure 5.11: Two students' answers for the same question.....	73
Figure 5.12: student DB's table	74
Figure 5.13: the student's score code.....	75
Figure 5.14: Part of weight matrix	75
Figure 5.15: The score for solutions in figure 5.11.....	76
Figure 5.16a: the student's incomplete answer.....	76
Figure 5.16b: the student's score	76
Figure 5.17: online open mathematical question	77
Figure 5.18.a: student's scores.....	79
Figure 5.18.b: student's scores	80
Figure 5.19: multiple choice closed question	81
Figure 5.20: student solves a multiple choice closed question	81
Figure 5.21: system checks submitted values and give it a score.....	82

Abstract

In the last few years, new and quick advancements in knowledge evaluation techniques have entered the field of e-learning, focused on automated evaluation exam items.

Students usually have various academic knowledge and teachers have to provide them with material and achievement tests of appropriate levels. No one can deny that, the constructed answers for each student represent his/her own way of thinking, knowledge, and cognitive ability in solving problems. A crucial issue in the teaching/learning process is the evaluation of the student abilities. Indeed, the perceived knowledge and skills of the learner to solve problems remain a fundamental aspect of any educational system, permitting the learner and his or her human tutor to perceive the strengths and weaknesses of the learner. Many new technological and electronic tools have been developed paving the way to develop several kinds of e-learning evaluation techniques.

The purpose of this thesis is to enhance evaluation techniques of different types of open questions in hybrid exams. This is for empowering the automatic evaluation tools. The study focuses on a methodology to enhance the evaluation tools in semantic e-learning systems. The proposed methodology have been applied to the case study of a mathematical multi operations question, the mathematical proof question on a logic course and closed questions in a hybrid exam. This thesis shows that the proposed technique in the first type MOQ (Multi Operations Question) uses the matrix concept for fuzzy score, which proposes a fuzzy automatic evaluation web method. This proposed method uses the fuzzy concept in open questions mathematical evaluation in e-learning. The question type has a variable number of mathematical operations, where the solution steps are not unique. So the proposed method uses the combination of sets and vectors to generate a one multiple dimensional matrix.

In addition, a POQ (Proof Open Question) is more complicated so we use a direct connection set between learning objects and POQ's solutions. That is by using the domain knowledge representation (Ontology based method). Also, we take into consideration the dependence among learning material concepts so we merge the universal ontology with a W-matrix (weight matrix). The last closed questions type uses the traditional evaluation methods.

The proposed method empowers tutors and students to preview the evaluated answers ensuring the strengths and weaknesses for each solution item.

The thesis also shows that the emerged different open and closed questions' types in general, have been successfully evaluated in the hybrid exam. This material is oriented to the problematic of practical task evaluation.

The results of this research indicate that the mathematical multi operations question, the proof question on a logic course and the closed questions solved in a hybrid exam successfully have been automatically evaluated.

However, the exam's items evaluation processes which measure individual knowledge abilities automatically are require more improvements in integrating the different systems techniques and applications, and need more involvement by the administrators, developers and tutors, within the context of e-learning, so as to maximize the effectiveness of evaluation strategies and e-learning approach.

Key words: Ontology based Systems, W- matrix, E-learning, Evaluation tools, Hybrid exam, fuzzy evaluation, open question, predictive, e-learning, Inferences.

CHAPTER 1

Introduction

1.1 Background:

Recently, using computers and information technology are making revolution in education systems and that offers new challenges and opportunities in distance education and e-Learning. Many of the ineffective evaluative educational systems provide little immediate feedback to students, require teachers to spend hours grading routine assignments and they are not very proactive about showing students how to improve comprehension, and fail to take advantage of new developed resources that can improve the learning process. On the other hand, the effective e-learning evolution environment proposes a good number of tools; it provides powerful tools supporting students during the knowledge acquisition process.

1.2 Problem Statement:

Nowadays, online exams are widely used. Online exams are more convenient and flexible relative to traditional exams. They have many advantages as low cost and ubiquity. They reduce the overall expenses of processing exams especially in saving papers, storage, and materials' costs.

For many areas of education, the testing by using closed questions based on variant answers is un-useful, and do not represent the knowledge of current student. However, grading closed questions is straightforward and does not require any Artificial Intelligence (AI) or Natural Language Processing (NLP) techniques or algorithms [37].

However, closed questions can limit the skills of students in writing and expressing knowledge. On the other hand, open questions are the most appropriate question type, because they are the most natural and they produce a better degree of thought. They help to evaluate the understanding of ideas, the student's abilities to organize material and develop reasoning, and to evaluate the originality of the proper thoughts. Many educators prefer to have open questions to grade students' skills. However, they are much more difficult to evaluate than more restricted tests such as multiple choice tests. When a student calculates some mathematical formula; not