ABSTRACT

The success of any educational program depends on its evaluation system. Examinations are a part of learning process which acts as an element in evaluation. For the smooth conduct of examinations of various universities and academic institutions, the question paper generation process would be helpful. However, examination question paper composition is a multi-constraint concurrent optimization problem. Question selection plays a key role in question paper generation systems. Also it is the most significant and time consuming activity. The question selection is handled in traditional question paper generation systems by using a specified question paper format containing a listing of weightages to be allotted to each unit/module of the syllabus. They do not consider other constraints such as total time duration for completion of the paper, total number of questions and the difficulty level of the questions in the question paper etc. In this paper, the authors have modeled the Question Selection Problem as a multi-constraint optimization problem and proposed an Evolutionary Approach for the implementation same. The authors have experimented with this approach on a case study. The results obtained in this case study are interesting and promising to continue its implementation work and further research.

Keywords: Educational Taxonomy, Evolutionary Approach, Genetic Algorithm, Multi-Constraint Optimization, Question Paper Generation, Question Selection

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1. INTRODUCTION

Automatic question paper composition uses certain set of algorithms to automatically select questions from a question bank. The Question Selection problem (QSP) is one of the most fundamental assignment problems in Educational Research (Ravindra & James & Ashish, 2000). This problem has been widely studied by many researchers and is identified as a complex constraint satisfaction problem (Joshua 2010). The paper (Dimple & Shankar & Priyanka & Jyoti, 2012) guaranteed the generation of a question paper with proportionate allocation of weightages to modules and also proportionate allocation of weightages to cognitive processing levels, but failed to assure the quality of a question paper based on other criteria such as the time duration, the total number of questions and the difficulty level of the questions in the question paper etc. To the best of our knowledge no work has been done which considers all these constraints while automatically selecting the questions in order to generate an examination question paper. This paper is structured as follows- Section 2 presents the literature review, the problem statement is presented in Section 3, the case study conducted is explained in Section 4 and Section 5 concludes the paper.

2. LITERATURE REVIEW

The approaches commonly used till date for selecting questions for question paper generation by paper setters fall under the following two broad categories – Manual and Automated. The manual approach mostly includes the following steps:

1. Get set of questions from different faculties spread across different place;
2. A committee, which scrutinizes and consolidates all questions collected from faculties.

The automated tools listed below are for multiple choice question paper generation and they are reported to be randomly selecting the questions from a common question bank (Huband & Hingston, 2006; Mehmet, 2010; Zhenhua & Hao-shuai & Hun-e, 2011):

1. **ExamBuilder**: A web-based application to administer and conduct exams over the internet-http://www.exambuilder.com;
2. **TestGenerator**: An online testing and assessment application designed to simplify the entire process of test creation, delivery and administration for automatic generation of examination question paper-http://www.testshop.com.

The selection of questions in these online systems uses random item sequencing algorithm. The purpose of this algorithm is to ensure that each candidate is administered with the test items in a different sequence. Although randomization may reduce the security risk of adjacent students copying from one another, it may increase the test anxiety for some other candidates (Anthony 2007). The automated approach has un-
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