EXAMINATION TIMETABLE SCHEDULING USING TABU SEARCH

A thesis submitted to the College of Arts & Sciences in partial fulfillment of the requirement for degree Master of Science (Information Technology), University Utara Malaysia

by

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ABSTRACT

Examination Timetables are utilized to schedule exam-timeslots in field of Applied Science. It involved assigning times and places to suitable events by creating use of available resource. Badly designed examination timetables are not just inconvenient but proved high-priced in terms of wasting time and money. Hence, the major aim of this research is to investigate the internal method of Tabu Search in solving and improving exam-timetable problem. The research have targeted on class examination timetabling problem. Hence, Tabu search is an iterative search method. It uses a local search algorithm at every iteration to search for the finest solution in some subset of the neighborhood, which came from the finest solution obtained at the last iteration. This paper reports the powerful techniques using Tabu Search in scheduling. Examination Timetabling problem is one of the applications in scheduling. In one aspect, it deals with courses such that it executes the process time slot. These aspects are important for the examination timetabling so it can be done in a smooth way and no student can sit more than one exam in a same time slot.

Keyword: Tabu Search, FAS Examination Timetabling
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CHAPTER 1

1.0 INTRODUCTION

The aim of this report is to discuss on the project background that was conducted at the Field Applied Science (FAS), for generating examination timetabling using Tabu Search (TS). The problem statement, the objective and the significance of the study and scope are discussed in this section.

1.1 Background to the study:

In achieving Malaysia's aspiration to become a developed nation by year 2020, the government has put a greater emphasis on technology-based industries as the catalyst to improve the nation's economic growth. Thus, a well trained labour force is essential to lead and manage these high technology industries. To meet the abovementioned demand, University Utara Malaysia (UUM) has taken the initiative by officially establishing the Faculty of Information Technology.

Field of applied sciences was formally known as the School of Information Technology (SIT) before the faculty system was officially launched in September 2003. SIT was established on March 1, 1990 and was the first school to offer Information Technology programmes in Malaysia. It has since expanded its programmes from just one bachelor degree program to three bachelor degree programmes, four master programmes, PhD and collaboration programmes with local
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References


Enric Crespo.(1997). Department of Financial and Mathematical Economy. Universitat de Val'encia


Ghaith Mohammad Hasan Jaradat (2006), Improving Secondary School Examination Timetabling using Genetic Algorithm , Universiti Utara Malaysia


Mushi , 2004 A. R. tabu search heuristic for university course timetabling problem Department of Mathematics, University of Dar es salaam, Box 35062, Tanzania


Sheibani, 2002. An evolutionary approach for the examination timetabling problems . University of Victoria Victoria, BC, Canada


