

**A MICRO-GENETIC ALGORITHM APPROACH FOR SOFT
CONSTRAINT SATISFACTION PROBLEM IN UNIVERSITY
COURSE SCHEDULING**

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SCHEDULING**

**This dissertation is submitted to the Centre for Graduate Studies to fulfill the
requirement of Master of Science (Information Technology By Research)
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Abstrak

Masalah penjadualan kursus universiti adalah kombinasi masalah pengoptimuman. Masalah adalah lebih mencabar apabila satu set peristiwa perlu dijadualkan dalam slot masa, akan ditempatkan ke bilik yang sesuai, yang tertakluk kepada beberapa set kekangan keras dan lembut. Kesemua kekangan yang wujud sebagai peraturan-peraturan dalam setiap sumber untuk peristiwa tersebut perlu dipenuhi untuk mencapai tugas yang optimum. Di samping itu, reka bentuk jadual kursus untuk universiti adalah tugas yang sangat sukar kerana ia merupakan satu permasalahan “non-deterministic polynomial”, (NP) keras. Masalah ini boleh dikurangkan dengan menggunakan pendekatan Algoritma Mikro Genetik. Pendekatan ini, mengekod perwakilan kromosom sebagai salah satu elemen penting untuk memastikan hanya sedikit bilangan kromosom individu yang tidak fisibel dihasilkan. Oleh itu, kajian ini mencadangkan pengekodan perwakilan kromosom menggunakan tatasusunan satu dimensi bagi menambahbaik pendekatan algoritma genetik mikro kepada masalah kekangan lembut dalam jadual kursus universiti. Sumbangan bagi kajian ini adalah dalam membangunkan perisian penjadualan yang efektif dan fisibel dengan menggunakan Algoritma Mikro Genetik yang mampu untuk mengurangkan pengeluaran kromosom individu yang tidak fisibel berbanding algoritma pengoptimuman sedia ada bagi jadual waktu kursus universiti, dimana data sampelnya ialah UNITAR International University. Algoritma Mikro Genetik yang dicadangkan telah diuji dalam ujian perbandingan dengan algoritma genetik biasa dan carian berpanduan kepada algoritma genetik sebagai penanda aras. Keputusan menunjukkan bahawa algoritma yang dicadangkan mampu untuk menjana bilangan minimum kromosom individu yang tidak fisibel. Keputusan eksperimen juga menunjukkan bahawa Algoritma Mikro Genetik mampu untuk menghasilkan jadual kursus terbaik untuk UNITAR International University.

Kata kunci: Mikro Genetik, Kekangan lembut, Pengoptimuman, Penjadualan

Abstract

A university course timetabling problem is a combination of optimization problems. The problems are more challenging when a set of events need to be scheduled in the time slot, to be located to the suitable rooms, which is subjected to several sets of hard and soft constraints. All these constraints that exist as regulations within each resource for the event need to be fulfilled in order to achieve the optimum tasks. In addition, the design of course timetables for universities is a very difficult task because it is a non-deterministic polynomial, (NP) hard problem. This problem can be minimized by using a Micro Genetic Algorithm approach. This approach, encodes a chromosome representation as one of the key elements to ensure the infeasible individual chromosome produced is minimized. Thus, this study proposes an encoding chromosome representation using one-dimensional arrays to improve the Micro Genetic algorithm approach to soft constraint problems in the university course schedule. The research contribution of this study is in developing effective and feasible timetabling software using Micro Genetic Algorithm approach in order to minimize the production of an infeasible individual chromosome compared to the existing optimization algorithm for university course timetabling where UNITAR International University have been used as a data sample. The Micro Genetic Algorithm proposed has been tested in a test comparison with the Standard Genetic algorithm and the Guided Search Genetic algorithm as a benchmark. The results showed that the proposed algorithm is able to generate a minimum number of an infeasible individual chromosome. The result from the experiment also demonstrated that the Micro Genetic Algorithm is capable to produce the best course schedule to the UNITAR International University.

Keyword : Micro Genetic, Soft constraint, Optimization, Timetabling

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Table of Contents

Permission to Use	ii
Abstrak	iii
Abstract	iv
Acknowledgements	v
Table of Contents	xi
List of Tables	ix
List of Figures	xi
CHAPTER 1 INTRODUCTION	1
1.1 Motivation	3
1.2 Background	4
1.3 Problem Statement	5
1.4 Research Objectives	6
1.5 Research Scope	7
1.6 Significance of This Study	7
1.7 Research Contribution	8
1.8 Thesis Organization	9
CHAPTER 2 LITERATURE REVIEW	11
2.1 Introduction	11
2.2 Approaches To Solve Timetabling Problems	17
2.3 The GA Generic Model	22
2.4 Genetic Operators	27
2.5 Application of GA in Timetabling Problem	30
2.6 Micro-GA	32
2.7 Conclusion	37

CHAPTER 3 RESEARCH METHODOLOGY.....	38
3.1 Introduction	38
3.2 Design of Study.....	39
3.2.1 Document Analysis Stage.....	39
3.2.2 Development Stage.....	40
a. Conceptual Model of MGAT system.....	40
b. Develop MGAT framework.....	41
c. Develop Chromosome modeling representation.....	42
i. <i>Chromosome Representation for MGAT system</i>	42
ii. <i>Fitness Function for MGAT system</i>	43
iii. <i>Soft constraint Value</i>	44
iv. <i>Calculation of Fitness Function</i>	46
v. <i>Generation of Initial Population</i>	47
vi. <i>Calculation of penalties of lecturer clashes</i>	48
vii. <i>Constructed Micro-GA</i>	50
3.2.3 Evaluation Stage.....	55
a. <i>System Environment Identification</i>	56
i. <i>Types of University Courses</i>	56
ii. <i>Availability of resources</i>	57
iii. <i>Rules for time tabling in the university</i>	58
iv. <i>University Timetabling Resources</i>	59
v. <i>Requirement of GA, GSGA and Micro-GA Performances</i>	62
b. <i>Structure of Testing Performance</i>	63
3.3 Conclusion	65

CHAPTER 4 ANALYSIS AND RESULT	66
4.1 Introduction	66
4.2 Comparative Testing.....	67
4.3 The Effectiveness of MGAT System.....	71
a. Soft Constraint Performance of Micro-GA.....	71
b. Testing of Fitness Performance for Micro-GA.....	77
c. Testing of End-User Usability	81
4.4 Conclusion	85
CHAPTER 5 CONCLUSION AND RECOMMENDATIONS	86
5.1 Introduction	86
5.2 Contribution	89
5.3 Future works	89
REFERENCES	91
Appendix.....	99
Appendix I: University Timetable System Interface.....	100
Appendix II: Output for UNITAR Timetable System.....	104
Appendix III: Sample Code.....	109
Appendix IV: Sample Questionnaire.....	113

List of Tables

Table 3.1: Setting of Soft Constraints Value	45
Table 3.2: University Timetabling Resources	60
Table 3.3: Hard Constraints of the time tabling specification	61
Table 3.4: Soft Constraints of the time tabling specification.....	61
Table 3.5: The genetic algorithm parameters.....	62
Table 3.6 : Group of Problem Instances	63
Table 3.7: Data set used	64
Table 3.8: Parameters Setting	65
Table 4.1 : Phase of Testing.....	67
Table 4.2: Result of Objective Values of Micro-GA and GSGA with Different Crossover Rates	69
Table 4.3: Result of soft constraints performance over time taken	71
Table 4.4: Result of different crossover rate to objective value	74
Table 4.5: Result of different size of population time taken to generate with corresponding objective function	77

Table 4.6: Result of different iteration over the fitness of standard GA and fitness of Micro-GA	79
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Table 5.1: Summary of the research	87
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List of Figures

Figure 2.1: Basic Structure of GA	25
Figure 2.2: Crossover Operation.....	28
Figure 2.3: Mutation Operation	30
Figure 3.1: Research Framework	38
Figure 3.2: A Conceptual Model of MGAT System.....	40
Figure 3.3: MGAT Framework.....	41
Figure 3.4: One-dimensional array for chromosome representation	42
Figure 3.5: Process to produce Initial Population.....	48
Figure 3.6: Calculation of Penalties.....	49
Figure 3.7: The Techniques of Soft Constraint Evaluation	50
Figure 3.8: The Process Flow of Using Micro-GA.....	53
Figure 3.9: The pseudo-code of Micro-GA.....	55
Figure 4.1: Objective Value Over Generation For Different Crossover Rate	70
Figure 4.2: Objective Function Over Generation For Different Varying Crossover Rate.....	75

Figure 4.3: Fitness comparison between GA and Micro-GA 80

Figure 4.4: System Aspect (Perceived Usefulness) 83

Figure 4.5: System Aspect (Perceived Ease of Use)..... 84

Figure 4.6: Overall Satisfaction (Usability) 84

CHAPTER 1

INTRODUCTION

In general, a university course timetabling problem usually refers to finding the exact allocated time within a limited time period for example a week, for a number of events (courses-lectures) and assignment of events to a number of resources (lecturers-rooms) in such a way that a number of constraints are satisfied.

Yang and Petrovic (2004) has defined the timetabling as the allocation of a set of subject into a classroom over a limited number of time periods to avoid the occurrence of conflicts of interests between two subjects or lecturers. A good scheduling technique that can lead to optimization is important to ensure it is able to produce all timetable for students and lecturers.

The main problem in the university timetable generation is to provide lecturers and lecture activities by matching all lectures involving the consumption a lot of time as well as the person responsible. The information required for the course schedule including room availability, time slots and several specific policy options. For example, information on room availability can be specified to the room capacity for certain events. In the domain of university timetable, it is often used to refer to the construction of schedule (with time slots) through the system by considering several numbers of constraints.

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