UNIVERSITI TEKNOLOGI MARA

EVOLUTIONARY ALGORITHMS IN UNIVERSITY TIMETABLING OPTIMISATION

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SUPERVISOR APPROVAL

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This proposal was prepared under the supervision of the project supervisor, Dr. Yii Ming Leong. It was submitted to the Faculty of Computer and Mathematical Sciences and was accepted in partial fulfilment of the requirements for the degree of Bachelor of Computer Science (Hons.).

Approved by

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ABSTRACT

The university timetable problem is a complex scheduling problem of assigning courses, lecturers, student groups, classrooms, and time slots, and meeting various hard constraints and soft constraints. The process of manually creating a timetable is generally time-consuming, prone to human error and hard to do as the number of academic entities increases. The aim of this study is to propose a University Timetabling Optimisation System using Evolutionary Algorithm (EA) to optimise the timetable and make the timetabling process more efficient for Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA (UiTM) Sarawak Branch, Samarahan Campus 2. The aim of this study was to design an Evolutionary Algorithm that can produce optimized timetables, build a web-based timetable generation system to deal with multiple courses, multiple lecturers, multiple classroom, and multiple student groups, and to analyse the performance of the algorithm. The system was developed with the following methods: Prototyping Model, Implementation using Python, Flask, HTML, CSS and JavaScript. The Evolutionary Algorithm is a population-based method, which includes population initialization, fitness function evaluation, parent selection, cross-over and mutation, and termination to produce feasible timetable solutions satisfying the given scheduling constraints. An actual timetable data set of 68 teaching sessions, 28 lecturers, 5 student groups and 29 classrooms was used to test the proposed system. The Evolutionary Algorithm was used to generate a feasible timetable with no hard constraint violation after 359 iterations, and a final fitness value of −57 (in the context of minimizing soft constraint violations) was obtained. The developed system also offers optimisation statistics, graphical visualization of fitness, filtering of the timetable by student group, lecturer and classroom, automatic calculation of the credit hours for the lectures and export to CSV file. The results indicate that the Evolutionary Algorithm proposed in this study is an effective method to solve the University Timetabling Problem. The system developed has successfully generated useful and practical university timetables without any conflict and provides several administrative features which will enrich the timetable running process. The present system, however, is designed for the Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Sarawak Branch, Samarahan Campus 2 and the system can be further developed to support more than one faculty and be expanded to include other optimisation techniques.

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