

Lecture Schedule on Accounting Computer Department of Indonesia Computer University Using Genetic Algorithm

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Abstract—The aim of this research is to obtain the best combination of scheduling of courses and lecturers but does not violate the constraints of the Accounting Computer Department of Indonesia Computer University. Hence, the need considered various aspects that affect scheduling of courses. From the aspect of lecturers, we need to consider to the possibility of the lecturer in question cannot be taught because the other academic activities, lecturer teaching more than one subject on the same day and same hour and lecturers already has a schedule of teaching in the Department of another. These problems included in the NP-Hard Problem (Nondeterministic Polynomial time), namely the entire alternative combinations should be tested. This research uses genetic algorithms approach specifically computational approach is to solve a problem that is modeled with the biological processes of evolution. Genetic algorithm will represent the solutions using genetic operations such as crossover and mutation. The result of this genetic algorithm shows the best fitness value one, which means there is no breach of a hard constraint. The best combination with making no use of high-frequency space and no lecturer teaching the high frequency.

Keywords— *lecture schedule, Accounting, genetic algorithm.*

I. INTRODUCTION

Scheduling of lectures is the process of drafting the schedule execution that inform a number of lectures given, lecturer who teach, study, time and place of the students who take the lecture.

Scheduling of lectures belong in the type of timetabling. Problem timetabling can be classified as NP-Hard Problem (nondeterministic polynomial time). NP-Hard Problem is the problem when all alternative combinations should be tested, then the time it takes to find a feasible solution of the problem will increase sharply [1]. Therefore, the resolution of the problem of optimization will be hard to do using conventional optimization methods [2]. Scheduling of lectures must meet the constraints that had already been determined. Constraint can be classified into two categories, hard constraint and soft constraint.

In the case of scheduling courses, needed a better algorithm i.e. algorithms that can solve the problem of multi-criteria and objectives. One of the algorithms that can be used is the genetic algorithm [3]. The latest studies suggest that genetic algorithm is an effective method in tackling the problem of scheduling [4]. The genetic

algorithm is one way to solve a problem that is quite large with a good solution though the problem requires a long execution time if done manually [5].

Genetic algorithm is a computational approach to resolve the problem that is modeled in the process of biological evolution. Expected with use of genetic algorithm scheduling lecture, which will happen the best combination for a couple lecture and lecturer teachers overall and there is nothing a conflicting schedule.

II. METHOD

John Holland first discovered genetic algorithm in 1975 through a study from the University of Michigan that was then developed by his student David Goldberg in 1989 [2].

Procedure steps this algorithm begins by determining a set of potential solutions and making changes with some looping (iterations) with a genetic algorithm to produce the best solution. The set of potential solutions was set early and called chromosomes. This chromosome formed random binary numbers the form of the binary numbers in order generate and selected. The entire set of chromosomes may represent a population [2]. Chromosomes-chromosomes evolved several times called iteration stages with generations. New generation (off springs) degenerate with crossover technique and mutations.

This process is performed repeatedly until it finds a chromosome that has the best fitness to foundation of the as the best solution of a problem [6].

III. RESULTS AND DISCUSSION

A. Genetic Algorithm

This Genetic Algorithm configuration to process data even semester. These are the input and result of chromosome of the even semester:

- a) *Chromosome generated* = 10
- b) *Maximum generation* = 500
- c) *Best Fitness* = 1
- d) *3rd generation* = 2
- e) *Chromosome to* = 7

The best fitness chromosomes to 2 (two) in the generation of mutations to the 7 (seven), with tables and charts are as follows:

TABLE I. CHROMOSOME RESULTS

Chromosome	Fitness Generation 2	Fitness Selection 2	Fitness Crossover 2
0	0.035714286	0.027777778	0.05
1	0.023809524	0.027777778	0.027777778
2	0.1	0.333333333	0.333333333
3	0.027777778	0.333333333	0.037037037
4	0.035714286	0.027777778	0.028571429
5	0.028571429	0.028571429	0.055555556
6	0.028571429	0.333333333	0.1
7	0.027777778	0.333333333	1
8	0.333333333	0.333333333	0.333333333
9	0.028571429	0.333333333	0.027027027

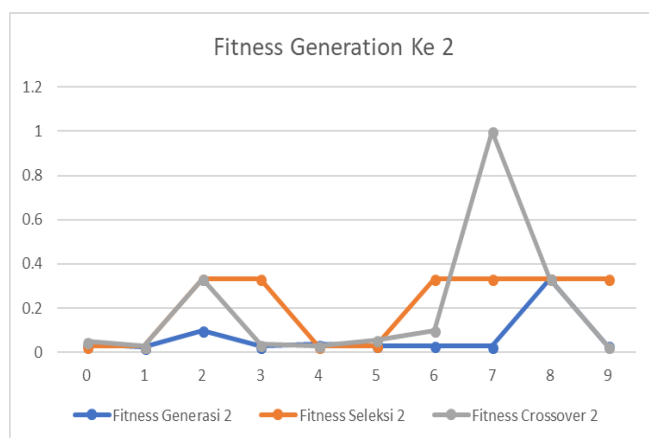


Fig. 1. Lectures Result

B. Design of Data Analysis

Scheduling of lectures is affected by multiple components consisting of: lecturer, classroom, and time with a specific constraint, where the constraint to be met or cannot be violated. the constraint is the measurement of the quality scheduling of lectures, so that one of the best lecture's schedules can be formed.

C. Design of genetic Algorithm

The genetic algorithm is one of the methods for determining the optimization based on the theory of Darwin. Procedure steps this algorithm begins by determining a set of potential solutions and making changes with some looping (iterations) with a genetic algorithm to produce the best solution. The set of potential solutions was set early and called chromosomes. This chromosome formed random binary numbers order form that you generate and selected. The entire set of chromosomes may represent a population [7].

a) Representation of Chromosome and Population

The making of a representation of a chromosome to scheduling the lecture aimed to obtain the result of

a merger between credits, lectures, semester and year. The table class and table lectures first paired, of the table will be raised early with a population table room and table time.

b) Function Evolution

Each constraint that affects the value of fitness gives a different influence towards fitness, the influence of so-called level with weights. The higher the price weights are a constraint will reduce the value of the fitness of the solution [8].

a. Hard Constraint

- Lecturers can only teach one lecture at a time.
- Room can only be used one lecture at a time.
- Class can only follow one lecture at one time.
- Lectures should not be scheduled to pass through Friday prayers.

b. Soft Constraint

- Lectures with special room.
- Lecturers are given three days to teach in a week.
- Lecturers can only teach three classes in a day.
- Classes can only follow three lectures in a day.

TABLE II. WEIGHTING

Hard Constraint	Code weighting	Weighting Value
Lecturer teaching one lecture in one time	B1	9
The room is used one lecture in one time	B2	9
Classes follow the one lecture at a time	B3	7
Lectures should not be scheduled to pass through Friday prayers	B4	9
Soft Constraint		
Lectures with special room	B5	3
Lecturers are given three days to teach in a week	B6	1
Lecturers can only teach three classes in a day	B7	1
Classes can only follow three lectures in a day	B8	1

The fitness formula used is as follows:

$$Fitness\ Kromosom1 = \frac{1}{1 + (\sum B_1 + \sum B_2 + \sum B_3 + \sum B_4 + \sum B_5 + \sum B_6 + \sum B_7 + \sum B_8)}$$

Description: B1 to B8 is a code with weighting.

c) Selection

To get the best solution, should be done selection solutions that have low fitness value that belongs to will be eliminated. The selection using the method best fitness. The

solution is left on the results of this selection are known with the name of the parent population [8].

TABLE III. WEIGHTING

Popu latio n	Before	1	4	3	2	3	2	1	4
	After	1	2	3	2	3	4	1	4

d) *Crossover*

A crossover operation that combines two parent chromosomes and then create new chromosomes called child chromosome. In other words, the crossover is a process of exchange value at the position of gen in the same gen from both parents (parent) [8]. The following is an example of crossover:

TABLE IV. THE NEW CHROMOSOME IN CROSSOVER GEN

Popu latio n	Anak1	1	4	3	2	3	2	1	4
	Anak2	4	1	2	1	2	3	4	3

e) *Mutation*

This process acts to replace the missing genes from the population due to the selection process, which allows the reappearance of a gene that does not appear in the initial populations [8].

f) *Finished Condition*

If after several generations a row retrieved the highest population of fitness value then the process will be stopped, while algorithm if at consecutive grades generations fitness have yet to achieve such conditions, it will be restarted the process/steps of iteration the evaluation of fitness against the new population.

IV. CONCLUSION

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