

Solving Timetable Scheduling Problems Using Genetic Algorithm

Deeba Kannan, Kuntal Bajpayee, Samriddho Roy

Abstract--- There are various methods to solve the timetable scheduling problem and preventing various slots from clashing like the ant colony optimization problem which by result is a very time consuming process and other approach includes heuristic approach where problem can be solved by using trial and error method or by using a multi dimensional matrix which again may or may not give the optimal solution .The most important factor which should be taken in consideration is that it's a NP hard problem which means there is not any best solution to this problem so ,by considering all the above factors it is found that Genetic Algorithm (GA) is the best approach to such problem where the main algorithm goal is to minimize the number of conflicts in the timetable and reduction to encoding of search space.

Keywords--- Scheduling, Genetic Algorithm, NP hard.

I. INTRODUCTION

The scheduling problems are essentially the problems that deal with effective distribution of resources over days and hours. During the scheduling process many factors have to be considered. Resources are usually limited and no two tasks should occupy one particular resource (collision problem) at the same time. For most of the scheduling problems it has been shown that they are NP-hard, and that they can not be solved in polynomial time using a deterministic algorithm.

The timetable should satisfy the following conditions:

- a) a particular can attend only one class at one time.
- b) one instructor can teach only one class at one time.
- c) In one room only one class can be taught at one time.
- d) All lectures should be kept exactly once.

GAs are used in optimized searching processes and scheduling process. This algorithm is generally applied to the problem of where optimization is the key goal.

A timetable problem is basically related to finding the exact time allocation within limited time period of number of events (courses-lectures) and assigning to them number of resources (teachers, students and Lecture Halls) while satisfying some constraints. The constraints are classified into two types namely Hard Constraints and Soft constraints. Hard constraints are those that must be strictly applied and worked on with, while soft Constraints can be violated if necessary.

Various combination factors are used in course scheduling, thereby increasing its complexity.

Genetic Algorithm

A genetic algorithm is a heuristic search optimization algorithm that forms the base of biological genetic and biological evolution. The algorithm establishes a model of biological evolution and implements the relevant calculation. The genetic algorithm can realize global optimization and parallel processing to optimize the configuration of various resources to make our task easier.

II. LITERATURE SURVEY

[1] Due to the insufficient number and limited sensing range of the mobile wireless sensors, the entire object moving trajectory cannot be covered by all deployed sensors. To tackle, the problem, sensors must move from one position on the trajectory to another in order to provide complete coverage. Because each sensor is powered only by battery for moving and sensing ability, large amount of movement will cause sensor node energy quickly exhausted

[2] The aim is to reduce the size of raw images and videos have been proposed in the paper. Digital image compression is considered to be a mature branch in image processing area, where several researches have already focused on developing algorithms that produce good compression rates with adequate image quality.

They have proposed a new compression idea that is based on reducing rational numbers into nominator-denominator form.

[3] This paper gives an idea of data mining (DM) solutions based on biological and evolutionary methods. The framework mainly focuses on the suitability of genetic algorithms and genetic programming in data mining context. This paper gives an outside idea of data mining (DM) solutions based on evolutionary methods. They have first describe the concepts and their closed links with machine learning (ML) and statistics. Two major data mining tasks are considered: the classification and associative analysis. While classification has been mostly studied in ML, association analysis is mainly related to data mining techniques; both may be achieved efficiently with genetic-based methods. A clear differentiation between these two data mining functionalities, which result in syntactically comparable patterns, is established. The genetic-based techniques used in DM context are presented. .

[4] The timetabling downside is usually a troublesome task that comes up each year in every educational institution. A lot of clashes occur particularly if it is to be done manually. Varied establishments of learning across the country area unit being combined with tons of difficulties

Revised Version Manuscript Received on 22 February, 2019

Deeba Kannan, SRM IST, Chennai, Tamil Nadu, India (e-mail: Deeba.k@ktr.srmuniv.ac.in)

Kuntal Bajpayee, SRM IST, Chennai, Tamil Nadu, India (e-mail: kuntalbajpayee_ne@srmuniv.edu.in)

Samriddho Roy, SRM IST, Chennai, Tamil Nadu, India (e-mail: samroy705@gmail.com)

making ready made examination timetable. So during this paper the matter has been tried to be put up and to resolve by incorporating genetic algorithm In varied institute, timetable programming could be a major problem The tool accustomed perform the experiment during this study is that the ECJ toolkit. It will take days and even weeks to arrange through manual approach.

III. PROPOSED MODEL

Genetic Algorithm

A population of individuals are maintained within search space for a GA, each representing a possible solution to a given problem. Each individual is represented as a finite length vector of components, or variables, in terms of some alphabet, usually the binary alphabet {0,1}. To continue the genetic analogy these individuals are analogical to chromosomes and the variables are analogous to genes. Thus a chromosome (solution) is composed of several genes (variables). A fitness score is assigned to each solution representing the abilities of an individual to compete. The individual with the best value or fitness score is sought. The GA aims to use various selective methods of the solutions to produce a child chromosome better than the parents by combining information from the parent chromosomes.



Fig. 1: Population

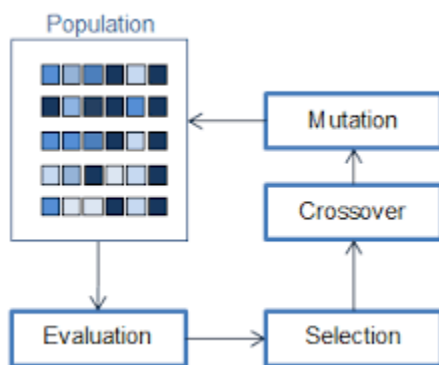


Fig. 2: Flow Chart

Pseudo Code:

START

Generate the initial population

Compute fitness

REPEAT

Selection

Crossover

Mutation

Compute fitness

UNTIL population has converged

STOP

1. Initial Population:- Population is set of chromosomes which are made up of group of genes which satisfies the given hard and soft constraints like number of periods required, timings, classrooms etc.

2. Fitness Function:- it's the function which determines the fitness value of each chromosome and the chromosomes with the highest fitness value is selected for crossover process.

3. Selection:- Roulette method is used for the selection process. The chromosomes having greater fitness function will have more chances of getting select for taking part in the crossover function.

4. Crossover:- The aim is to crossover genes of two actively participating chromosomes. There are various methods of crossover but we have chosen the single crossover. In single crossover, we select a random point in the chromosome and the right side of both the chromosomes swap and we get the resulting new offspring ready for the further process.

5. Mutation:- In the mutation, the best 2 chromosomes tries to combine with one another and create a random population again and then we further check it's optimization via evaluation function.

```
STG0 - 00000, STG1 - 00001, STG2 - 00010, STG3 - 00011,...
```

```
Data Mining - 0000, Machine Learning - 0001, Biology - 0010,...
```

```
<Data Mining, STG3, Monday, Hall D, 8.00AM>
```

```
Data Mining - 0000
```

```
STG3 - 00011
```

```
Monday - 000
```

```
Hall D - 1010
```

```
8.00AM - 1000
```

```
Chromosome - 00000001100010101000
```

Chromosome Structure

IV. CONCLUSION

Time table scheduling is a NP hard problem.

So, reduction in Time complexity and reducing the collision rate is the main problem which we have tried to solve using Genetic Algorithm

REFERENCES

1. C. Liang and Y. Lin, "A coverage optimization strategy for mobile wireless sensor networks based on genetic algorithm," 2018 IEEE International Conference on Applied System Invention (ICASI), Chiba, 2018, pp. 1272-1275.



2. M. Omari and S. Yaichi, "Image compression based on genetic algorithm optimization," *2015 2nd World Symposium on Web Applications and Networking (WSWAN)*, Sousse, 2015, pp. 1-5.
3. M. Collard and D. Francisci, "Evolutionary data mining: an overview of genetic-based algorithms," *ETFA 2001. 8th International Conference on Emerging Technologies and Factory Automation. Proceedings (Cat.No.01TH8597)*, Antibes-Juan les Pins, France, 2001, pp. 3-9 vol.1.
4. Ahmed H. Yousef, Cherif Salama, Mohammad Y. Jad, Tarek El-Gafy, Mona Matar, Suzanne S. Habashi, "A GPU based genetic algorithm solution for the timetabling problem", *Computer Engineering & Systems (ICCES) 2016 11th International Conference on*, pp. 103-109, 2016.