Overview of Genetic Algorithms in Educational Timetabling

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ABSTRACT

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1 INTRODUCTION

Educational timetabling involves creating schedules for educational institutions such as schools, colleges, and universities. The problem domain can be divided into the following three main problems [2, 3]: High-School Timetabling (HTT), University Course Timetabling (CTT) and University Examination Timetabling (ETT). Although a clear distinction between these three problems is not always possible, they generally differ significantly from one another [1]. However, each of these problems essentially is a resource allocation problem with the goal of assigning classrooms, instructors, and students to specific time slots for various courses or activities, ensuring that all constraints and requirements are met. This includes avoiding conflicts (e.g., a student being scheduled for two classes at the same time), adhering to institutional policies, and maximizing the efficient use of resources.

The difficulty in finding a valid and effective solution to such a problem lies in meeting the diverse requirements of different stakeholders (e.g. students, teachers, administration), multiple constraints and resolving resource conflicts in a combinatorial complex solution space caused by the numerous constraints. Timetabling problems like these are therefore known to be NP-complete in their general form, meaning that the difficulty of finding a solution increases exponentially with the problem size, which in turn makes it impossible to find a deterministic algorithm providing an acceptable solution in polynomial time [1]. Therefore, optimization algorithms trying to find (near) optimal solutions have been used as alternative methods of solving educational timetabling problems. Examples for such methods are local search and simulated annealing techniques as well as computational intelligence algorithms like genetic algorithms (GAs), Tabu Search, Ant Systems and other metaheuristic approaches [1].

2 METHODS

To do.

3 BASIC CONCEPTS

To do.

4 ADVANCED TECHNIQUES

To do.

5 DISCUSSION

To do.

6 CONCLUSION

To do.

7 FUTURE WORK

To do.

REFERENCES

[1] G. N. Beligiannis, C. Moschopoulos, and S. D. Likothanassis. 2009. A genetic algorithm approach to school timetabling. *Journal of the Operational Research Society* 60, 23–42. Issue 1. https://doi.org/10.1057/palgrave.jors.2602525

[2] Jeffrey H Kingston. 2013. Educational timetabling. In *Automated Scheduling and Planning: From Theory to Practice.* Springer, 91–108.

[3] Andrea Schaerf. 1999. A survey of automated timetabling. *Artificial intelligence review* 13 (1999), 87–127.