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Time Table Scheduling using Genetic Algorithms

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ABSTRACT –

As a type of evolutionary optimization techniques, genetic algorithms have the advantage of being probabilistic and not requiring any auxiliary knowledge as compared to traditional search strategies like enumerative, random, and calculus-based approaches. This work describes a university timetable scheduling system based on genetic algorithms that satisfies restrictions to prevent conflicts with faculty, class times, etc. In contrast to the stagnant solution setup associated with the roulette selection scheme, the study makes use of the rank-based selection strategy to guarantee that the time table schedule generated is the feasible global optima. The suggested technique makes use of an application-specific encoding structure, rank-based time-table schedule selection, and single point crossover to investigate novel and more appropriate schedules. The proposed guided mutation operator helps in convergence as a result of the increased constraint satisfaction rates and hence better fitness values.

***Key Words*:** Constraints Satisfaction, Elitism, Evolutionary Algorithms, Genetic Variation, Guided Mutation, Rank Selection

I. INTRODUCTION :

The process of assigning, arranging, or distributing certain items in a time or space pattern while adhering to particular restrictions is known as scheduling [1]. Such an arrangement can have the goal of allocating resources as efficiently as possible to minimize time or expense. Alternatively, as all possible solutions in some scheduling problems have identical costs and are optimal, the goal of a scheduling problem may simply be to find a feasible solution based on the constraints. This is true for the timetabling issue that this work addresses.

Genetic algorithms form part of a larger category of algorithms called Evolutionary Algorithms (EA), which apply techniques inspired by natural evolution- such as mutation, selection, and crossover, and use them to generate solutions to optimization problems. Workers, cars, machines, and other items can all be objects in a scheduling problem. The rules that control the scheduling process are called constraints (e.g., time limits, resource availability). Some constraints are unbreakable for the task at hand, while others take the shape of principles that ought to be followed but aren't always necessary. Darwinian evolutionary theory serves as the foundation for a Genetic technique (GA), a parallel search technique [2]. It is employed to explore a broad solution space that might be nonlinear or discontinuous, as well as situations where expert knowledge is hard to come by or difficult to encode.

Fittest: by giving fitter chromosomes many copies in the ensuing generations and giving unfit chromosomes none or very few copies. As a result, the gene pool is generally more fitter. When two randomly selected partners engage in crossover, their genetic material is exchanged, leading to the production of one or more offspring that may differ genetically from their parents. Mutation is the process by which allele values randomly vary within a chromosome to produce genetic variation. Since the Time Table Scheduling Problem is NP-hard, it is particularly challenging to solve using standard techniques [3].

There are various uses for timetable difficulties, including transportation, educational institutions, and hospital nurse rosters. This essay examines a schedule for education, with a focus on universities. The primary task involved in this type of scheduling problem is assigning each lecture to a specific room during a designated time slot for a specific student group (i.e., students in the same department and year), while taking into account all time constraints, faculty availability, and other auxiliary resources. When it comes to a university timetable scheduling challenge, the following restrictions would not be broken:

II. RELATED WORK

The process of assigning, arranging, or distributing certain items in a time or space pattern while adhering to particular restrictions is known as scheduling [1]. Such an arrangement can have the goal of allocating resources as efficiently as possible to minimize time or expense. Alternatively, as all possible solutions in some scheduling problems have identical costs and are optimal, the goal of a scheduling problem may simply be to find a feasible solution based on the constraints. This is true for the timetabling issue that this work addresses. Since Timetable scheduling 978-1-4244-5967-

4/10/$26.00 ©2010 IEEE is an important problem that has been dealt with in the past, a large number of diverse methods have already been proposed in the literature for solving such problems, as well as several variations of the same.

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III. SIMULATION RESULTS

After running the simulations, it was discovered that a number of factors, such as the number of subjects each student group is considering and the number of hours each subject is taught each week, significantly influence how quickly the algorithm converges. As a result, four distinct cases—each with a variable number of subjects and/or contact hours per week for each subject—were used to evaluate the algorithm. For each of the four scenarios under discussion, the graphs in Figures 2–5 show how the suggested approach and the traditional mutation operator-based technique compare. In all graphs, the x-axis is a logarithmic (base 10) scale.

We simulate the algorithm over ten thousand generations. It is deduced from the simulation results and graphs that, for the first few generations, the fitness values for the algorithm using conventional mutation and the method utilizing guided mutation are not significantly different. In fact, chromosomes with somewhat superior fitness values may even be produced by the method employing traditional mutation. But eventually, new generations with constant fitness values similar to the preceding generation start to emerge from the process employing classical mutation. Fitness gains become rare when genetic variety diminishes. When the method uses directed mutation, though, this does not happen. Every generation's fitnevalues

VI. CONCLUSIONS

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REFERENCES :

[1] A. Wren, "Scheduling, timetabling and rostering– a special relationship?" in 1st International Conference on the Practice and Theory of Automated Timetabling, 1995, pp. 474–495.

[2] D. Goldberg, Genetic Algorithms in Search, Optimization,and Machine Learning. Addison Wesley, 1989.

[3] S. Abdullah and H. Turabieh, "Generating university course timetable using genetic algorithms and local search," in 3rd International Conference on Convergence and Hybrid Information Technology, 2008. [4] "International series of conferences on the practice and theory of automated time tabling (patat)," www.asap.cs.nott.ac.uk/patat/patat-index. shtml.

[5] "International timetabling competition," www.cs.qub.ac.uk/itc2007/ indexfiles/overview.htm.

[6] "The working group on automated timetabling," www.asap.cs.nott.ac. uk/watt.

[7] M. W. Carter, "A survey of practical applications of examination timetabling algorithms," Operations Research, vol. 34, pp. 193–202, 1986.

[8] S. C. Brailsford, C. N. Potts, and B. M. Smith, "Constraint satisfaction problems: Algorithms and applications," European Journal of Operational Research, vol. 119, pp. 557–581, 1999.

[9] D. Zhang, Y. Liu, R. MHallah, and S. Leung, "A simulated annealing with a new neighborhood structure based algorithm for high school timetabling problems," European Journal of Operational Research, vol. 203, no. 3, pp. 550–558, 1999.

[10] G. White, B. Xie, and S. Zonjic, "Using tabu search with longer-term memory and relaxation to create examination timetables," European Journal of Operational Research, vol. 153, no. 1, pp. 80–91, 2004.

[11] M. Mitchell, An Introduction to Genetic Algorithms. MIT Press, 1996. [12] D. A. Coley, An Introduction to Genetic Algorithms for Scientists and Engineers. World Scientific, 1999.