Evolutionary Algorithm for School Timetabling

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Abstract

In this paper we describe a method for generating high school timetables using an Evolutionary Algorithm (E.A.) with a new set of genetic operators inspired on the Infected Genes Evolutionary Algorithm (Tavares, 99). We show that widening region of infection considered in (Fernandes, 99) leads to a very significant increase in the performance of the E.A.. Comparative tests between the E.A. with and without the improved Bad-Gene operators were made using the data of a large Portuguese high school. These clearly show that the improved Bad-Gene operators result in a significant improvement in performance.

1 INTRODUCTION

Given c classes, t teachers and r classrooms it is required to build a set of c+t+r timetables satisfying the needs of the school and respecting the restrictions in the assignement of the lessons.

Simulated Annealing (Melicio, 1998), Tabu Search or Evolutionary Algorithms are some of the techniques used to solve the timetabling problem.

2 BAD GENE OPERATORS

In this algorithm bad genes are those that belong to a class, teacher or classroom in which a violation of a hard constraint occurs that cannot be repaired by the repair function. Genes are flagged as bad in order to focus the actions of the bad-gene operators.

The bad gene crossover chooses two parents randomly and exchanges the bad genes of the better of the two with the related genes of the other. The bad gene mutation randomly changes one bad gene of a selected chromosome.

3 RESULTS

In figure 1 we can see the improvement in the E.A. performance caused by the introduction of the bad genes operators.

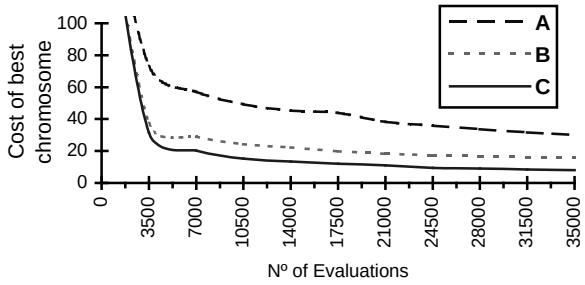

Figure 1 – Evolution of the algorithm with the following configurations: canonical E.A.(A), E.A. with previous version of bad gene mutation(Fernandes, 1999)(B), E.A. with new bad gene operators(C).

References

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