

Hyper-Heuristics for Examination Timetabling with Fairness

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Examination timetabling is a well-known and challenging optimisation problem. In addition to achieving feasibility, the quality of an exam timetable is measured by the extent of the soft constraint violations. A standard and often cited example of a soft constraint is where the exams should be spread out as evenly as possible throughout the overall time period in order to give students as much time as possible for revision. However, to the best of our knowledge, existing state-of-the-art examination timetabling solvers neglect the concept of fairness among the entire students body taking examinations. Since the examination timetable contributes to the students' academic achievement, we believe that it is reasonable that overall student satisfaction could be improved by increasing the fairness of treatment towards and between individual students. Thus, making balance between quality of the overall timetable and fairness to individual students becomes an important issue and that is likely to be exacerbated universities continue to offer interdisciplinary degree programs.

Work will be presented in relation to providing solutions to the examination timetabling problem that takes fairness into account. Hyper-heuristics, a well-known effective approach for solving many combinatorial optimisation problems, are implemented within the HyFlex framework. After an initial feasible solution is constructed, an extended great deluge algorithm is applied as a strategy to select predefined low-level heuristics in order to minimise an objective function that includes the standard soft constraints, but also includes fairness measured by Jain Fairness Index. Two significantly different data sets from public examination problem domains, the Toronto and International Timetabling Competition 2007 (ITC 2007) are used in the experiment. It is hoped that this work will contribute to an improved student-oriented decision making methodology in the process of generating high quality examination timetables for Universities.

Keywords: Examination Timetabling, Fairness, Hyper-heuristic, Optimisation

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