

Examination Timetable Scheduling based on Quadratic Assignment Problem

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Timetable scheduling is crucial for the efficient functioning of any institute. The type of timetable varies according to institutional requirements, with many factors to consider for creating an effective schedule. In particular, the examination timetable plays a pivotal role in the smooth operation of an academic institution. Consequently, the examination-timetabling problem is an active research area with various methods in literature, and new approaches continually emerging to meet diverse institutional needs. In this study, scheduling the examination timetable is formulated as a quadratic assignment problem. By considering both hard and soft constraints and assigning weights to courses based on student enrolment, an algorithm is proposed using the branch and bound technique—an effective method for such problems. Given that the number of exams may exceed the available time slots, the objective function prioritizes satisfying hard constraints to minimize conflicts. As a real-world application, the proposed algorithm was implemented to prepare the end-of-semester examination timetable for the Faculty of Applied Sciences at Wayamba University, Sri Lanka, using data from the university's 2010/2011 academic year handbook. The implementation involved 309 students and 39 courses. The generated timetable successfully met all hard constraints and most soft constraints. During the process, two key matrices were introduced: a course conflict matrix to prevent conflicts among courses with shared students, and a time slot matrix to minimize simultaneous exams for each student and ensure sufficient intervals between exams. These matrices, being Boolean, facilitate efficient implementation for larger numbers of courses with minimal computational cost.

Keywords: Examination Timetable, Quadratic Assignment Problem, Branch and Bound Algorithm, Constraints