Timetabling Problem

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***Abstract*—TODO: Abstract**

***Index Terms*—Artificial Intelligence, Scheduling Problems, Optimization Problems, Optimization algorithms, Hill climbing, Simulated annealing, Genetic Algorithms**

I. Introduction

TODO: Introduction

II. Problem Description

The *Timetabling Problem* that is subject of study in this project was designd by Ben Paechter, a professor in the Edinburgh University and consists in a reduction of a typical university course timetabling problem.

In this problem, a given set of events has to be scheduled into one hour timeslots, over the course of 5 days with 9 hours of active time each (totaling 45 timeslots). The events take place in a given set of rooms, each with its own size (number of sets), and require certain features (which may or not be available in a room). The students attend a given set of these events.

The goal is to assign the events to the available rooms, in a such a way that the given **Hard Constraints** are respected and that the given **Soft Constraints** are as respected as possible. A given proposed solution is assigned a certain penalty based on the constraints that are not being respected. The optimal solution (if existent for a given input) has a penalty of 0.

A. Hard Constraints

The hard constraints must be respected by any solution. If any of them are not respected, a penalty of value equal to infinity is assigned to the solution, being them the following:

- Only one event can take place in a room at any given timeslot
- A student can only attend one event at the same time
- The room must be big enough for all the student that are attending the event
- The room must satisfy all the features that are required for the event

B. Soft Constraints

The soft constraints are used to evaluate the quality of a valid solution (a solution that respects all the hard constraints), assigning a penalty based on that quality. The assigned penalty is equal to the sum of the penalties of each soft constraint constraint violation, being them the following:

- A student attends an event in the last timeslot of the day. For each student that only attends an event in a given day, a penalty of value 1 is assigned.
- A student attends more than two events consecutively. For each consecutively attended event (above 2), a penalty of value 1 is assigned (e.g. 3 consecutive events result in a penalty of 1, 4 consecutive events result in a penalty of 2, an so on).
- A student has a single class on a day. For each student that attends only one event in a given day, a penalty of 1 is assigned.

III. Problem Formulation

TODO: Problem Formulation

IV. Related Work

TODO: Related Work

V. Conclusions and Future Work

TODO: Conclusions and Future Work

References

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