Flow Formulations for Curriculum-based Course Timetabling

In this paper, we present two mixed-integer programming formulations for the curriculum-based course timetabling problem (CTT). We show that the formulations contain underlying network structures by dividing the CTT into two separate models and then connect the two models using flow formulation techniques. The first mixed-integer programming formulation is based on an underlying minimum cost flow problem, which decreases the number of integer variables significantly and improves the performance compared to an intuitive mixed-integer programming formulation. The second formulation is based on a multi-commodity flow problem which in general is NP-hard, however, we prove that it suffices to solve the linear programming relaxation of the model. The formulations show competitiveness with other approaches based on mixed-integer programming from the literature and improve the currently best known lower bound on one data instance in the benchmark data set from the second international timetabling competition. Regarding upper bounds, the formulation based on the minimum cost flow problem performs better on average than other mixed integer programming approaches for the CTT.

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