Agent based integer programming framework for solving real-life curriculumbased university course timetabling

ABSTRACT

This research proposes an agent-based framework for solving real-life curriculum-based University Course Timetabling problems (CB-UCT) at the Universiti Malaysia Sabah, Labuan International Campus (UMSLIC). Similar to other timetabling problems, CB-UCT in UMSLIC has its own distinctive constraints and features. The proposed framework deal with the problem using a distributed Multi-Agent System (MAS) environment in which a central agent coordinates various IP agents that cooperate by sharing the best part of the solution and direct the IP agents towards more promising search space and hence improve a common global list of the solutions. All agents are incorporated with Integer programming (IP) search methodology, which is used to generate initial solution in this, regards as well. We discuss how sequential IP search methodology can be incorporated into the proposed multi-agent approach in order to conduct parallel search for CB-UCT. The agent-based IP is tested over two real-life datasets, semester 1 session 2016/2017 and semester 2 session 2016/2017. The experimental results show that the agent-based IP is able to improve the solution generated by the sequential counterpart for UMSLIC's problem instance used in the current study impressively by 12.73% and 17.89% when three and six IP agents are used respectively. Moreover, the experiment also shows that increasing the number of IP agents lead to the better results.