Logic-Based Benders Decomposition for Multiagent Scheduling with Sequence-dependent Costs

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Logic-based Benders decomposition (LBBD) has a natural application to multi-agent scheduling problems in which the master problem assigns agents to jobs, and the subproblem schedules the jobs. The success of LBBD depends, however, on the identification of strong Benders cuts and subproblem relaxations for inclusion in the master problem. Sequence- dependent costs in the subproblem pose a particular challenge to both. Such costs occur, for example, when there are sequence-dependent setup times between jobs, or when agents are routed from one customer to another. We investigate strategies for cut generation and relaxation in this context and apply them to the routing and scheduling of home hospice care personnel. The master problem is solved by mixed integer programming and the subproblem by constraint programming. We find that with properly chosen cuts and relaxations, LBBD is superior to pure mixed integer programming and can scale up to instances of realistic size.