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A constraint programming-based branch-and-price-and-cut approach for operating room planning and scheduling

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Abstract : The goal of this seminar is to present an efficient algorithm capable of solving a wide range of integrated operating room planning and scheduling problems which combine the assignment of surgeries to operating rooms and their scheduling over a short-term planning horizon. We take into account maximum daily working hours of surgeons, prevention from overlapping of surgeries corresponding to the same surgeon, obligatory cleanings due to switching from infectious to non-infectious surgeries, and due dates of surgeries which must be respected. The problem is formulated as a mathematical programming model and a branch-and-price-and-cut algorithm is developed based on a constraint programming model to solve the subproblem. A novelty of the proposed formulation is that it reduces the number of subproblems significantly leading to high efficiency in solving real-world instances. Some dominance rules and a fast infeasibility checking criterion based on a multidimensional knapsack problem are also developed which effectively improve the efficiency of the constraint programming model. Extensive computational results demonstrate the superiority of the proposed method to a compact mathematical formulation in the literature.

Biography : Hossein Hashemi is a PhD candidate in operations research at Ecole Polytechnique de Montreal and is a researcher at the Interuniversity Research Centre on Enterprise Networks, Logistics and Transportation (CIRRELT). He received his B.Sc. and M.Sc. in Industrial Engineering from Amirkabir University in 2008 and 2010. His research interest is in the area of stochastic and integer programming with applications in healthcare, logistics, production planning and scheduling.