

Logic-Based Benders Decomposition: An Opportunity for Logic Programming Applications (Invited talk)

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Abstract

In 1962 J. F. Benders proposed a decomposition technique to solve large Mixed-Integer Linear Programming (MILP) problems; the idea was to split the whole MILP into a Master Problem (MP) and one (or more) independent sub-problems (SPs), that are solved independently, in an iterative fashion. Since the solution time is usually superlinear, splitting the problem provides a strong improvement. On the other hand, Benders' decomposition is tailored for MILP approaches, as it relies on the well-known duality theory of Linear Programming. More recently, J. Hooker proposed an extension of Benders' decomposition to a more general case, that does not rely necessarily on a duality theory: the so called Logic Based Benders Decomposition (LBBD). LBBD opened the way to the application of decomposition techniques to other constrained optimization approaches, notably to those based on constraint programming, and nowadays the applications are uncountable, including inventory management, scheduling, logic circuit verification, vehicle routing, facility location, space packing, supply chain management just no name a few.

In this talk, we argue that the use of Benders decomposition can provide a considerable speedup to logic programming solutions of real-life applications, without sacrificing completeness or optimality.

CILC'23: 38th Italian Conference on Computational Logic, June 21–23, 2023, Udine, Italy

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 CEUR Workshop Proceedings (CEUR-WS.org)