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Ring Star Problems Solver

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The Ring Star Problem consists in minimizing the cost of a spanning network made of a cycle called the ring to link a subset of nodes called hubs (to be determined), and to connect each terminal, i.e., non-hub, to a single hub at minimum cost. The package RingStarProblems.jl solves a resilient variant of the Ring Star Problem named 1-R-RSP in which the failure of a node in a given subset of so-called uncertain nodes triggers two corrective operations to repair a Ring Star network. The first operation repairs the ring and the second operation reconnects the non-hubs that were originally connected to the failing hub. For a given real positive input parameter F which represents the total duration of breakdowns during the considered time horizon, the objective is to minimize the Ring Star Problem cost plus the costs incurred by the corrective operations when a hub fails in the worst case during F unit of time. We model this problem as an Integer Linear Program (ILP), that is also addressed with a Branch-and-Benders-cut decomposition. Several enhancements to both the ILP and the Branch-and-Benders-cut (B&BC) algorithm are also implemented. The registered package RingStarProblems.jl is coded in the Julia Mathematical Programming Language, it solves 1-R-RSP to optimality using either ILP or B&BC. The package uses callbacks through Julia Mathematical Programming (JuMP) and is solver-agnostic, which means it can be used with Gurobi, GLPK, CPLEX or any JuMP solver that can support Lazy Constraints Callbacks. The package RingStarProblems.jl is highly parametrized, can plot the obtained solutions to PDF files, and other features will be added in the future.

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