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Novel Enumeration Algorithm for Weighted PNS Problem

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Abstract

One of the most important problem of design of production and manufacturing systems is to handle the numerous technologic alternatives. These alternatives can vary in lot of properties e.g., costs, number of operating units, byproducts, waste materials, etc. To find a best operating structure from a given point of view is an important design question which results in a combinatorial optimization problem, called Process Network Synthesis or (PNS).

Systems considered consist of materials (product materials, raw materials, intermediate materials) and operating units. The operating units convert materials of different properties into further materials and they constitute a network. In a design problem, we are to find a suitable network of operating units, called feasible process network, which produces the desired products from the given raw materials.

In the present work, such PNS problems are considered in which every operating unit has a positive weight. The sum of the weights of the operating units belonging to the process network is called the weight of the network. We are to find a feasible process network with minimal weight for the given PNS problem. It is known that this PNS problem is NP-complete [1]. Some methods are known for solving weighted PNS problem [2, 3]. We present here an important property of the optimal process networks of weighted PNS problem, which will be the basic idea of a new method for solving weighted PNS problem.

References

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