Local search for multicriteria single machine scheduling with setups

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In this paper we consider a single-machine scheduling problem with setup times. We are given a set J of n jobs. Each job j consists of a number j_k of operations. Each operation correspond to manufacture of products of certain type. Each operation $o_i \in j$ has processing time p_i, weight v_i and a setup time s_{ik} which is incurred when operation o_k immediately follows operation o_i. A due date d_j is specified for each job j. The machine is continuously available through the planning period and can process at most one operation at a time. Once an operation is started it must be completed without interruption.

We denote the completion time of operation o_i by C_i. The tardiness L_j of job j is defined as $L_j = \max\{0, \max_{o_i \in j}(C_i - d_j)\}$, that is, the positive time difference between the due date of job j and the completion time of the last operation of job j. The earliness e_i of operation o_i of job j is defined as $e_i = \max\{0, (d_j + L_j - C_i)v_i\}$. The value e_i determines the storage costs of products of type i.

We want to find a schedule in which operations are to be completed as close to their due dates as possible and at the same time to minimize the makespan. Thus, in our problem , it is required to find a sequence of operations which delivers the minimum value to the function

$$F(\pi) = \sum_{j=1}^{n}(\alpha_j L_j(\pi) + \sum_{o_i \in j} \beta_i e_i) + \gamma C_{max}.$$

We present a local search algorithm to solve this problem. Computational results and some open questions are discussed.

Acknowledgements