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## Exploring capabilities of an auction-based multiagent system in real-time reactive scheduling

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In this paper a distributed auction system intended to provide efficient real-time reactive scheduling for flat steel industry is introduced. We focus on the context of parallel finishing lines where several equipment units can be used to process the materials. When a severe disruption takes place, it is necessary to provide a feasible reschedule in a timely manner.

Regarding the scheduling algorithm, both materials to be processed and processing equipment units are conceptualized as agents that participate in auctions. Equipment units offer their availability, and each material bids to be assigned and sequenced to one of the corresponding allowed equipment. This approach enables implementing not only customer order-based material rules but also rules guiding the behavior of the material processing equipment units. Thus, through a series of bidding rounds the set of materials waiting to be processed are rescheduled with a multi-objective perspective.

From the information technology viewpoint, the critical timing efficiency requirement is handled by setting a distributed environment and using Apache Kafka messaging. The latter technology shows its efficiency in handling the information exchange required for the creation of auctions alongside the interaction of all the agents participating in each auction until the scheduling process is completed.

Finally, different configurations of the system are explored through a series of data settings. The estimation of the system performance when facing actual industrial setting cases is shown. Besides, the analyses of the solutions yield the identification of needs for additional rules as well as further functionalities.

Keywords: agent-based scheduling, rescheduling, flat steel parallel lines

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