Petri Net Modeling and Analysis for Periodic Job Shops with Blocking

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Abstracts

We investigate the scheduling problem for periodic job shops with blocking. We develop Petri net models for periodic job shops with finite buffers. A buffer control method would allow the jobs to enter the input buffer of the next machine in the order for which they are completed. We discuss difficulties in using such a random order buffer control method and random access buffers. We thus propose an alternative buffer control policy that restricts the jobs to enter the input buffer of the next machine in a predetermined order. The buffer control method simplifies job flows and control systems. Further, it requires only a cost-effective simple sequential buffer. We show that the periodic scheduling model with finite buffers using the buffer control policy can be transformed into an equivalent periodic scheduling model with no buffer, which is modeled as a timed marked graph. We characterize the structural properties for deadlock detection. Finally, we develop a mixed integer programming model for the no buffer problem that finds a deadlock-free optimal sequence that minimizes the cycle time.

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