

Supervisor Controller-Based Colored Petri Nets for Deadlock Control and Machine Failures in Automated Manufacturing Systems

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Abstract : This paper develops a robust deadlock control technique for shared and unreliable resources in automated manufacturing systems (AMSs) based on structural analysis and colored Petri nets, which consists of three steps. The first step involves using strict minimal siphon control to create a live (deadlock-free) system that does not consider resource failure. The second step uses an approach based on colored Petri net, in which all monitors designed in the first step are merged into a single monitor. The third step addresses the deadlock control problems caused by resource failures. For all resource failures in the Petri net model a common recovery subnet based on colored petri net is proposed. The common recovery subnet is added to the obtained system at the second step to make the system reliable. The proposed approach is evaluated using an AMS from the literature. The results show that the proposed approach can be applied to an unreliable complex Petri net model, has a simpler structure and less computational complexity, and can obtain one common recovery subnet to model all resource failures.

Keywords : automated manufacturing system, colored Petri net, deadlocks, siphon

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