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异构分布式实时仿真系统的容错调度算法

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Abstract
Heterogeneous distributed real-time simulation system is a special kind of real-time system. This paper solves its fault-tolerant problem based on the CSP (checkpoint-based spare processor) model, which is an improvement of the traditional SP (spare processor) model with checkpoint mechanism. Firstly, two propositions are put forward based on the characters of simulation system. Secondly, the Worst Case Response Time of the simulation tasks are analyzed based on Markov chains and the schedulability analysis rules for simulation task are presented. In the end of the paper, a fault-tolerant scheduling algorithm CSP-RTFT is proposed and simulated. The results show that the algorithm can achieve better stability, higher task accept ratio than SP-RTFT which is based on SP model, whereas the resource utilization ratio is lower than those based on PB model.

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摘要
异构分布式实时仿真系统是一类特殊的实时系统,基于改进的SP(spare processor)容错模型(checkpoint-based spare processor,简称CSP)对其容错问题进行了研究.首先,根据仿真系统的特点提出了两个命题,这是后续工作的基础;而后,基于Markov链对仿真任务的最坏反应时间进行了分析,并提出了仿真任务的可调度性分析规则;最后,基于CSP容错模型和上述可调度分析规则提出了异构分布式实时仿真系统的容错调度算法CSP-RTFT.算法的仿真结果表明:该算法较之基于SP模型的算法SP-RTFT可获得更好的稳定性、更高的任务接收率;缺点是资源利用率比PB模型下的算法要低.

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