Abstract

The computing resources used in safety-critical systems have stringent timing requirements due to mission critical nature of their tasks. A fault in these systems could lead to mission failure and catastrophic consequences. To avoid this various redundancy schemes are built in to mission critical applications to ensure the overall success of the system. The usual industrial practice is to employ fault tolerance using hardware redundancy where costs are highly exorbitant depending on the mission. In this paper, a prototype tool has been designed and developed for testing and evaluation of a framework for adaptive fault tolerance on an existing dual hardware redundancy with resource augmentation. This proposed model gives enhanced resource management and improved system performance under normal runtime and provides minimal safe functionality under permanent fault condition. It has been implemented with a
practical case study of Cruise Control System using NXP LPC2148 processors. The results demonstrate the better performance and process speedup (execution time of process) vis-à-vis over a traditional dual redundant processor system and the high performance that can accrue by applying this model to an m-processor redundancy model.

References

- N. Audsley, A. Burns, "Real time system scheduling", Department of Computer Science, University of York, UK, Predicatably Dependable Computer Systems, Volume 2, Chapter 2, Part II.

Index Terms

Computer Science
Circuits And Systems

Keywords
Fault tolerance  Resource management  Cruise control system  Process speedup
Prototype tool