Real-Time Computing

Parallel and Distributed Real-Time Computing

Welcome to this special issue on Parallel and Distributed Real-Time Computing! In this issue you will find articles on five distinct problems that represent some major themes in real-time computing: scheduling theory, robot control, real-time operating systems and programming languages, software engineering, and message-passing in multiprocessors.

A real-time computation is one in which the timeliness of a response to an event is as important as the correctness of the response. Real-time computers have typically been used in control systems for avionics, electrical power plants, military command and control, robotics, machining of parts, air traffic control, and so on. Now, the principles of real-time computing are also turning out to be useful for such emerging applications as multimedia, distributed simulation, and high-speed data collection and distribution.

Parallel and distributed computing is useful for real-time systems for three fundamentally different reasons. First, the processing and response requirements for some applications are so extreme that even the fastest uniprocessors are inadequate. It is natural to apply multiple processors or even multiple computers to such problems. Second, the fact that parallel and distributed systems use multiple copies of various components leads to natural "spatial redundancy" for fault tolerance, otherwise, failure could lead to disastrous accidents. Third, some real-time applications are by nature geographically distributed, such as real-time simulation involving databases and participants at sites scattered around an entire country, or even internationally. In all cases, the real-time application requires techniques for partitioning the problem, coordinating concurrent access, and communicating within tight delay bounds.

This issue of P&DT has benefited from the efforts of many people. In particular, we acknowledge the helpful comments received from the reviewers (listed below) under very tight time constraints. We also thank Vicki Fels for help with mailings. Our special thanks go to the authors. We hope you will find their articles useful and illuminating.


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Kang G. Shin is a professor and is director of the Real-Time Computing Laboratory at the Department of Electrical Engineering and Computer Science at the University of Michigan, Ann Arbor. He has written or cowritten more than 300 technical papers and numerous book chapters on distributed real-time computing and control, fault-tolerant computing, computer architecture, robotics and automation, and intelligent manufacturing. He is currently working with C.M. Krishna on Real-Time Systems, a textbook to be published by McGraw Hill in 1995.

Shin received a BS in electronics engineering from Seoul National University in 1970, and an MS and a PhD in electrical engineering from Cornell University in 1976 and 1978, respectively. He is an IEEE fellow, a distinguished visitor of the IEEE Computer Society, an editor of IEEE Transactions on Parallel and Distributed Systems, and an area editor of International Journal of Time-Critical Computing Systems. He was a program cochair for the 1992 International Conference on Parallel Processing, and chaired the IEEE Technical Committee on Real-Time Systems during 1991-93.