Resume of Man-Tak Shing, 1992

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Research Areas

Software engineering, specifically the development of computer-aided prototyping tools, software architectures, and efficient scheduling algorithms for real-time embedded systems.

Research Description

The major objective of Professor Shing's research is to develop efficient algorithms and tools to support the computer-aided rapid prototyping of real-time embedded systems. The process of design and development of real-time embedded systems is often plagued with uncertainty, ambiguity and inconsistency. The timing requirements are difficult for the user to provide and for the analysts to determine. It is also very difficult to determine whether a delivered system meets its requirements. Rapid prototyping provides a means to alleviate the risks and difficulties in real-time embedded systems. The Computer Aided Prototyping System (CAPS), currently being developed at the Naval Postgraduate School, provides a set of tools to help the developers and their customers visualize the proposed system and assess its properties using rapidly constructed prototypes.

Specific topics currently being investigating include efficient heuristic scheduling algorithms for real-time systems, and incremental attribute-evaluation and software architectures for distributed real-time embedded systems.

Relevance to DoN/DoD

Real-time embedded systems, such as missile guidance systems, space shuttle avionics, and military C3I systems, are of significant importance to DoN and DoD. The substantial investment in these systems in DoN/DoD points out the tremendous need for improved acquisition methods and supporting tools that can be used to test the design of a system before implementation. CAPS enables DoD/DoN to make better decisions in designing and acquiring real-time embedded systems.

Recent Publications

Luqi and M. Shing, Real-Time Scheduling For Software Prototyping. *Journal of Systems Integration, 6*, No. 1-2, 1996.

M. Shing and Luqi, Functional Specification and Prototyping for a Generic C3I Workstation. Proceedings of the First International Symposium on Command and Control Research and Technology, Washington, D.C., pp. 119-131, 1995.

D. Dampier, V. Berzins, Luqi, M. Shing, D. Dolk and C. Rasmussen, A Slicing Method for Semantic-Based Change-Merge of Software Prototypes. Proceedings of the Computer in Engineering Symposium, Houston, Texas, Jan 29-Feb 1, 1995.

Luqi and M. Shing, Teaching Hard Real-Time Software Development via Prototyping. Proceedings of the ACM/IEEE International Workshop on Software Engineering Education, Sorrento, Italy, pp. 199-211, 1994.

T. Gonzalez, M. Razzazi, M. Shing and S. Zheng, On Optimal Guillotine Partitions Approximating Hyperrectangular Partitions. *Computational Geometry: Theory and Applications, 4*, pp. 1-11, 1994.

Luqi, M. Shing, P. Barnes and G. Hughes, Prototyping Hard Real-Time Ada Systems in a Classroom Environment. Proceedings of the 7th Annual Ada Software Engineering Education and Training (ASEET) Symposium, Monterey, CA, 12-14 January 1993, pp. 103-117.

M.T. Shing and G.B. Parker, Genetic Algorithms for the Development of Real-Time Multi-Heuristic Search Strategies. Proceedings of the 5th International Conference on Genetic Algorithms, Urbana-Champaign, Il, 17-21 July 1993, pp. 565-572.

Luqi and M. Shing, CAPS - a Tool for Real-Time System Development and Acquisition. *Naval Research Reviews*, Vol. XLIV, 1992, pp. 12-16.

(See pages 10-11 for illustrations of the CAPS project.)