

On-Line Simulation Techniques for Real-Time Management of Systems

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Abstract

On-line simulation refers to the use of simulation tools to aid in the management of operational systems. For example, faster-than-real-time simulations of the air transportation network can be used to aid air traffic controllers in managing traffic flows to reduce congestion and improve safety. Live feeds from air traffic control centers are used to build a situation database indicating the current status of the transportation network. This database is used to initialize faster-than-real-time simulations that are used to explore the impact of decisions made by traffic controllers in order to determine appropriate courses of action. Other applications of on-line simulation include use in managing military engagements, communication networks, or supply chains. I will describe techniques that we have developed to realize efficient on-line simulations. Parallel execution is used to achieve fast execution of simulation models. Techniques to incrementally clone running parallel simulations enable rapid, concurrent evaluation of alternate courses of action in order to aid in decision making processes. Our experiences in applying these techniques to applications such as air traffic control will be described.

Dr. Richard Fujimoto is a professor in the College of Computing at the Georgia Institute of Technology. He received Ph.D. and M.S. degrees from the University of California (Berkeley) in 1980 and 1983 (Computer Science and Electrical Engineering) and B.S. degrees from the University of Illinois (Urbana) in 1977 and 1978 (Computer Science and Computer Engineering). He has been an active researcher in the parallel and distributed simulation community since 1985, and has published over 120 technical papers on this subject. His publications include a textbook and an award-winning article entitled "Parallel Discrete Event Simulation" (Communications of the ACM, 33 (1990) 30-53). He has led the development of parallel/distributed simulation software systems including the Georgia Tech Time Warp (GTW) simulation executive and the Federated Simulation Development Kit (FDK), both of which have been distributed worldwide. He has given several tutorials on parallel and distributed simulation at leading conferences. He led the definition of the time management services for the DoD High Level Architecture (HLA) effort that has been designated as the standard reference architecture for all modeling and simulation in the U.S. Department of Defense. Fujimoto is an area editor for ACM Transactions on Modeling and Computer Simulation. He served as chair of the steering committee for the Workshop on Parallel and Distributed Simulation (PADS) as well as the conference committee for the Simulation Interoperability workshop (1996-97).