

Title: Finding Lookahead in Wargaming, A Requirement for Scaleable Parallel Simulation

Outline:

- Overview
- Parallel Discrete Event Simulation
- Conservative vs Optimistic Protocols
- Role of Lookahead
- Traditional Contract (ala HLA)
- Relaxed Lookahead Requirement
- Domain Knowledge Informs Lookahead
- Local Fight vs. Global Battle
- The Impact of Fast Movers
- When Events Cannot be Parallelized
- Conclusion

Abstract:

Military simulations generally fall into two main categories: time-stepped and discrete-event simulation (DES). Where it can be used, DES provides performance advantages and can reduce temporal distortions imposed upon time-stepped simulations. In fact, some time-stepped simulations, such as the OneSAF Testbed (OTB), use some discrete-event techniques to mitigate these problems. The main difficulty with DES is that it is difficult to scale beyond a single processor. Parallel processing of discrete events requires that causality be retained, even while events are processed out of strict time ordering. The two approaches to this are optimistic and conservative. Optimistic simulation allows processors to simulate events, assuming that they are temporally correct. When it is discovered that there is a temporal discrepancy, the simulation is “rolled back” to the time of the discrepancy and then proceeds again. Conservative simulation never allows discrepancies – event processing is only allowed when it can be guaranteed that the event will not be altered. Conservative parallel discrete event simulation (PDES) depends upon a temporal separation between cause and effect, i.e. lookahead. PDES has been successful in simulations where lookahead can easily be calculated as a function of physical properties and fixed relationships between entities – typically in computer processor scheduling and in communications network simulation. In the naïve approach to wargaming it would appear the separation between cause and effect can be arbitrarily small. Using domain knowledge and a more relaxed view of lookahead, the battle can be partitioned into local interest sets. This paper examines this relaxed concept of lookahead in wargaming and what can be done when a non-zero lookahead cannot be guaranteed.

Biography:

EMMET BEEKER is Chief Engineer in the Technical Support Group of GRC International, an AT&T Company, Vienna, VA. He received a B.A. in Mathematics (1973) and an M.S. in Computer Science (1974) from Indiana University in Bloomington, Indiana. He has been active in the application of Operations Research methods to simulation components. He has imbedded constructive geometry algorithms in the Joint Warfare System (JWARS). He participated in the High Level Architecture Specification Committee and contributed to AMG Time-Management research. He is currently researching distributed simulation architecture for use in large military simulations.

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