CS 6420: DISTRIBUTED SIMULATION

Semester Hours: 3.0  
Contact Hours: 3

Coordinator: Hassan Rajaei
Text: Various
Author(s): VARIOUS
Year: Various

SPECIFIC COURSE INFORMATION

Catalog Description:

Principles of distributed simulation and applications using multiprocessor systems. Synchronization and time management for distributed environments. High-level architecture for distributed simulation. Prerequisite: CS 3270 or Full Admission to MS in CS Program.

Course type: ELECTIVE

SPECIFIC COURSE GOALS

• I can explain why distributed simulation is needed.
• I understand the main differences between two synchronization methods.
• I can describe how the conservative method works.
• I can describe how the optimistic method works.
• I can name hybrid approaches for distributed simulation.
• I can describe the HLA standard overview for simulation.

LIST OF TOPICS COVERED

• Introduction
  o Why simulation
  o Why parallel and distributed simulation
  o Analytic simulation vs virtual environment
  o Typical applications
• Discrete Event Simulation Fundamentals
  o Basic concepts: system attribute, state variables, event list, simulation time
  o Basic mechanisms: time advance, event scheduling, inherent parallelism
- Modeling issues and logical processes
- Data model, probability distributions, statistics collection

- Parallel Processing Overview
  - Brief intro to parallel processing
  - Overview of cluster computing with MPI
  - Underlying technologies
  - Concurrent simulation processes

- Conservative Synchronization Algorithms
  - Synchronization problem
  - Deadlock avoidance using null messages
  - Lookahead and the simulation model
  - Deadlock detection and recovery
  - Synchronous execution
  - Barriers Synchronization, Transient Messages, Time Distance between Logical Processes
  - Performance Issues
  - Pros and cons of conservative mechanism

- Optimistic Synchronization Method
  - Time Warp
  - Rolling Back and Error Correction, Global Virtual Time, Memory Management Issues
  - Performance Issues
  - Optimization Techniques
  - Comparing optimistic and conservative synchronization

- Hybrid Protocols
  - Moving time windows
  - Space time simulation
  - Breathing time buckets
  - Local time warp

- Distributed Simulation Standards
  - Distributed virtual environment
  - High level architecture, HLA
  - Overview, Rules, Object Model, Run-Time Infrastructure, Communication Issues