

Complex Systems

1/21/2011

Opening Discussion

- What did we talk about last class?
- Minute essay comments
 - Looking at stats in the code.
 - Is it common for an event to trigger a chain?
 - Entities in the simulation.

Steps in Simulation Study

- It isn't just about writing code and running that code.
 - Formulate problem
 - Collect data/define model
 - Check validity of assumptions
 - Write program and verify it
 - Do pilot runs
 - Check if simulated behavior is correct
 - Design experiments
 - Do production runs
 - Analyze data
 - Document/present results

Other Types of Simulation

- Continuous simulation
 - Typically differential equations.
- Combined discrete-continuous simulation
 - You have a continuous system where certain thresholds can trigger events in a discrete manner.
- Monte Carlo Simulation
 - Lots of random events.
 - Static simulation.
- Spreadsheet Simulation

Drawbacks of Simulation

- Stochastic simulations give estimates in a single run.
- Can be expensive to develop.
- It is easy to put too much faith in a simulation.

Pitfalls of Simulation

- Poorly defined objectives
- Inappropriate level of detail
- Failures in communication/understanding
- Acting like it is just programming
- Lack of experienced team members
- Poorly collected system data
- Inappropriate software
- Misuse of animation

More Pitfalls

- Using arbitrary distributions
- Treating answers of a single run as the “true answers”
- Failure to move past transient behavior

Linked Storage

- These are basically linked lists.
- One variation that you might not be familiar with is “static linking” where you use ints instead of pointers.
- If you use static linking you can use a pool of element and keep a free list. This can be more efficient because memory allocation is often a fairly slow operation.

Linked Lists for Events?

- The author states that linked lists will often have advantages over arrays in simulations.
- He uses a sorted linked list for doing the event queue.
- What might be a better data structure?

Simlib

- The author has developed a small bit of C code in order to help with building simulations. This code really just focuses on playing with lists.
- While it is interesting to see what type of functionality he puts in, I think that we might benefit more from creating our own similar type of framework that is more object-oriented.

Minute Essay

- Do you have any questions about what we did today?
- How well do you think that the code we put together today will extend to other models?