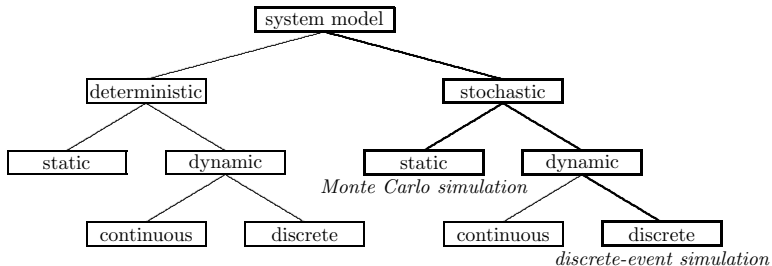


- What is discrete-event simulation?
 - Modeling, simulation, and analyzing systems
 - Computation and mathematical techniques
- **Model:** conceptual framework describing a system
- **Simulate:** perform experiments using computer implementation of the model
- **Analyze:** draw conclusions from output

Characterizing a Model



Characterizing a Model

- Deterministic or Stochastic
 - Does the model contain stochastic components?
 - Randomness is easy to add to a DES
- Static or Dynamic
 - Is time a significant variable?
- Continuous or Discrete
 - How does the system state evolve?
 - Continuous: classical mechanics
 - Discrete: queuing, inventory, machine shop models

- Discrete-Event Simulation Model
 - Stochastic
 - Dynamic
 - Discrete-Event
- Monte Carlo Simulation
 - Stochastic
 - Static

Algorithm 1.1.1 – How to develop a model:

- 1 Goals and objectives
- 2 Build a *conceptual* model
- 3 Convert into a *specification* model
- 4 Convert into a *computational* model
- 5 Verify
- 6 Validate

Typically an iterative process

Three Model Levels

- Conceptual
 - Very high level
 - How comprehensive should the model be?
 - What are the state variables?
- Specification
 - On paper
 - May involve equations, pseudocode, etc.
 - How will the model receive input?
- Computational
 - A computer program
 - General-purpose PL or simulation language?

Three Model Levels

Conceptual Model My understanding of the physical (or pseudo physical) system to simulate.

Specification Model How I can represent the *Conceptual Model* using data, data structures, algorithms, and mathematical equations.

Computational Model How I can implement my *Specification Model* in a particular machine using a particular set of languages.

Verification vs. Validation

- Verification
 - Computational model should be consistent with specification model
 - Did we build the model right?
- Validation
 - Computational model should be consistent with the system being analyzed
 - Did we build the right model?
 - Can an expert distinguish simulation output from system output?
- Interactive graphics can prove valuable

Now that we have some basic vocabulary under our belt, let's talk about those simulation articles...