Introduction to Process Simulator

by

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Merriam-Webster's Dictionary:

"something that is made to look, feel, or behave like something else especially so that it can be studied or used to train people"

Simulation of vehicle behavior

Definition

“Simulation is the process of designing a model of a real system and conducting experiments with this model for the purpose of either understanding the behavior of the system and/or evaluating various strategies for the operation of the system.”

- Introduction to Simulation Using SIMAN

  (2nd Edition)

What can be simulated?

almost anything can

and

almost everything has...

Why simulation?

Can be used to study existing systems without disrupting the ongoing operations

Simulation testing is cheaper and faster than performing the multiple tests of the real systems (most of the time!)

Simulation's greatest strength is its ability to answer "what if" questions...

"What if we don't change at all ...
and something magical just happens?"

Drawbacks

Simulation is an art as well as a science. The quality of the analysis depends on the quality of the model

Small errors in a simulation model have the potential to give you very wrong results…

"We've done a computer simulation of your projected performance in five years. You are fired."

Steps in a simulation study

1. Problem formulation: Clearly state the problem

Setting of objectives and overall project plan: How we should approach the problem

Model conceptualization: Establish a reasonable model

Data collection: Collect the data necessary to run the simulation (such as arrival rate, arrival process, service discipline, service rate etc.)

2. Model building: Convert the model into a programming language

Verification: Verify the model by checking if the program works properly. Use common sense!

Validation: Check if the system accurately represent the real system

Experimental design: How many runs? For how long? What kind of input variations?

Production runs and analysis: Actual running the simulation, collect and analyze the output

3. Document and report: Document and report the results

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Model building

Transform the model to a computer-recognizable form

Terminology

Entities: “Players” that move around and change status

Attributes: Characteristic of an entity

Resources: What entities compete for

Activity: Corresponds to a separate process in a system

Arrivals

deterministic vs. stochastic

Activity

Capacity

Processing time (two different solutions)

Resource

Using a resource

Keeping a resource through two or more activities

Using alternative resources (priority)

Routing

Percentage

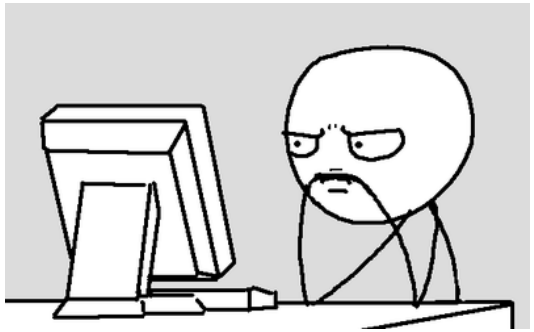
Conditional

Verification

Is the simulation model correct?

How do I know?!

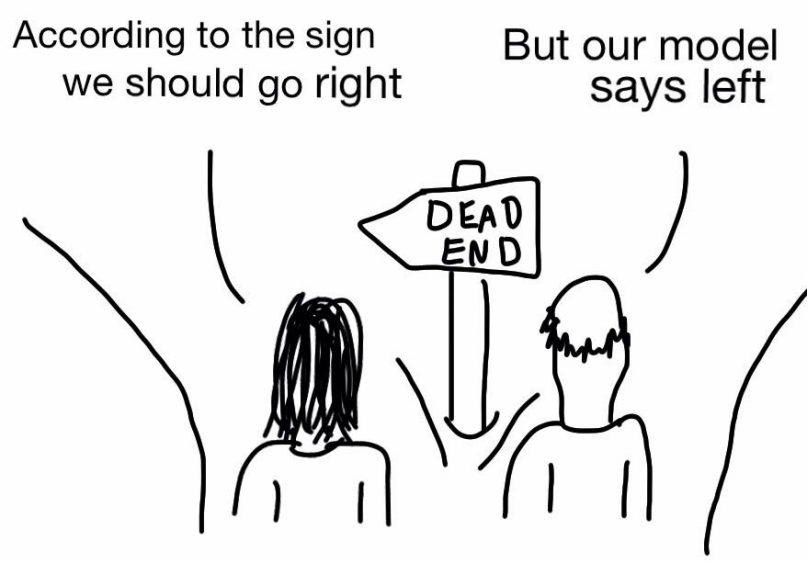
- Watch the model's animation
- Make the model as self-documenting as possible
- Debug, debug, debug…
- Ensure that the outputs are reasonable



Validation

Is the simulation model an accurate representation of the real system?

Compare the simulation model's output to that of the real system



Takeaways

What the necessary steps are to build a good simulation model

Process Simulator Quickstart

Have fun mixing and matching! ☺