How is GoldSim Different from Other Simulation Software?

This document provides a brief overview of how GoldSim differs from three general types of simulation software: discrete simulators, system dynamics programs, and probabilistic spreadsheet programs.

Discrete Simulators
Discrete simulators (such as ProModel, Arena, and Witness) generally rely on a transaction-flow approach to modeling systems. Models consist of *entities* (units of traffic), *resources* (elements that service entities), and *control elements* (elements that determine the states of the entities and resources). Discrete simulators are generally designed for simulating detailed processes such as call centers, factory operations, and shipping facilities.

GoldSim differs from most discrete simulators in the following manner:

- GoldSim can simulate both discrete and continuous processes simultaneously. This is a distinct advantage when the system includes continuous flows or dynamics.
- GoldSim was designed to build "top-down" models of complex systems that focus on "big picture" issues. As such, GoldSim is much better at simulating systems that have many diverse components that must be coupled together in a consistent manner in order to understand the behavior of the entire system (e.g., strategic business models, supply chains, portfolios of assets and/or projects, complex programs).
- GoldSim is much better at simulating complex systems whose behavior is difficult to predict and/or poorly understood such that they have a high degree of uncertainty. Such systems include both natural systems (such as hydrological systems and ecosystems) and man-made systems (such as markets, businesses, and complex programs or development projects).
- GoldSim is less effective at tracking detailed, carefully engineered systems whose interactions are precisely defined and controlled (such as assembly lines and call centers). If your system can best be described using a transaction-flow approach using only discrete events, a pure discrete event simulator would generally be a more appropriate tool than GoldSim.
- GoldSim is dimensionally aware and allows you to use any type of units without having to perform conversions or worry about unit errors.
- GoldSim was designed to accommodate the addition of specialized extension modules, such as such as the Financial Module (for simulating financial instruments and processes), the Contaminant Transport Module (for simulating the fate and transport of chemical and radioactive constituents in the environment) and the Reliability Module (for simulating the reliability of complex engineered systems).

System Dynamics
System dynamics software (such as Stella, Vensim, and Powersim) are all based on the standard stock and flow approach developed by Professor Jay W. Forrester at MIT in the early 1960s. Models based on system dynamics are built using three principal elements (stocks, flows, and converters), and put emphasis on understanding the feedback structure of systems. System dynamics software packages are typically used for simulating business and organizational systems and simple engineering and scientific systems.

Although GoldSim is similar to system dynamics programs in many ways (and can simulate any system that these tools can), GoldSim moves beyond the system dynamics software packages by offering the following features:

- GoldSim provides powerful capabilities for superimposing the occurrence and consequences of discrete events (e.g., financial transactions, accidents, labor strikes, lawsuits) onto continuous systems.
- GoldSim includes a much broader range of model objects (elements) that make the model logic and structure more transparent.

- GoldSim was specifically designed to quantitatively represent uncertain parameters and stochastic processes and events in the system. Because nearly all real-world systems are strongly influenced by such parameters, processes and events, predictive simulations must include a realistic representation of such system features.
- GoldSim's hierarchical submodel approach and other specialized programming features (e.g., local variables, looping/iterative submodels) allow you to build and efficiently maintain highly complex models (consisting of thousands of objects) without losing the ability to explain the models to a non-technical audience.
- GoldSim is dimensionally aware and allows you to use any kind of units in your model. GoldSim checks for dimensional consistency and carries out the conversions for you automatically during model construction.
- GoldSim was designed to accommodate the addition of specialized extension modules to realistically address systems that can not adequately be represented using the stock and flow paradigm. This includes the Financial Module (for simulating financial instruments and associated stochastic processes), the Contaminant Transport Module (for simulating the coupled fate and transport of chemical and radioactive constituents in the environment) and the Reliability Module (for simulating the reliability of complex engineered systems).

Probabilistic Spreadsheet Programs

Probabilistic spreadsheet programs (such as @Risk and Crystal Ball) are add-on programs for Microsoft Excel that allow users to define probabilistic distributions for input parameters. Any type of system that can be represented in a spreadsheet can be simulated using probabilistic spreadsheet programs. One advantage of these programs compared with all other classes of simulation software is that most users are already familiar with spreadsheet programs and the application of probabilistic methods is relatively simple.

GoldSim differs from probabilistic spreadsheet software in the following manner:

- GoldSim is much better at simulating dynamic systems that evolve with time.
- GoldSim's graphical user interface makes it much easier to understand, demonstrate, and document the model logic and structure.
- Although GoldSim's object-oriented graphical interface is better for showing model logic, spreadsheets are well suited for rapidly assembling large amounts of data and calculations in a single view.
- GoldSim's hierarchical submodel approach allows simulation of highly complex systems without losing the ability to understand and explain the model. In other words, any spreadsheet model that involves multiple workbook sheets is probably easier to understand and explain using GoldSim.
- GoldSim supports seamless integration with existing spreadsheet models via a specialized element that allows the user to pass data to and from a spreadsheet.
- GoldSim is dimensionally aware and allows you to use any type of units without having to perform conversions or worry about unit errors.
- GoldSim allows the user to build player files that can be viewed by anyone using GoldSim Player, a free download.
- GoldSim was designed to accommodate the addition of specialized extension modules, such as such as the Financial Module (for simulating financial instruments and processes), the Contaminant Transport Module (for simulating the fate and transport of chemical and radioactive constituents in the environment) and the Reliability Module (for simulating the reliability of complex engineered systems).

If you would like more details regarding how GoldSim compares with a specific software package, please feel free to contact us:

GoldSim Technology Group
300 NE Gilman Blvd Suite 100 • Issaquah, WA USA 98027-2941
Telephone 1.425.295.6985 • fax 1.425.642.8073
Email software@goldsim.com • Web: http://www.goldsim.com

GoldSim is a registered trademark of the GoldSim Technology Group LLC