

Slovenian Festival of Knowledge
UM-FL Celje, 2009 september 16-19.

Abstract for workshop

„Simulations of discrete events based on GPSS”

Simulations are mostly employed to optimize complex systems when a mathematical model is not available (when mathematical formula is too complex) and we ask ourselves "What if...?" Computer aided simulation as reality is merely an electronic fantasy that enables us to recreate the behavior of complex systems; currently, it is the most powerful tool at our disposal.

When talking about computer simulation, we are mostly referring to dynamic discrete stochastic simulation. The term "dynamic" refers to the possibility to monitor processes through time; "discrete" means that the time line (or time axis) is divided into a large number of (freely definable) small time intervals that allow studying the state of processes which does not change within such interval, i.e. the process state is static within a single time interval; stochasticity introduces uncertainty into system behavior, thus allowing us to deal with risks. Such simulations often require conducting a number of iterations in order to attain an adequate level of confidence in particular results arrived at through simulations.

The use of simulations tends to increase through the years as confidence in simulation results is improving both with model quality and with number of simulation iterations. The number of iterations has increased by several thousand times in the recent few decades – in accordance with the Moore's law which states that computer capacity is doubled every 18 months. Simulations have thus become available in virtually any environment and they are now used in cases that were unimaginable a few decades ago due to technological and financial restraints.

General Purpose Simulation System (GPSS) is a discrete time simulation language, where a simulation clock advances in discrete steps. A system is modeled as transactions enter the system and are passed from one service (represented by blocs) to another. This is particularly well suited for problems such as Logistics.

Logistics simulation usually follows (in general and using GPSS also) the following four steps:

1. Modeling the system as a dynamic stochastic (i.e. random) process
2. Generation of the realizations of this stochastic process
3. Measurement of Simulation data
4. Analysis of output data

Participants of the workshop will be introduced to build the models and to simulate them for explanation a large number of capabilities addressing each of the above four steps. There is no need to have any programmer skills to use GPSS and to participate the workshop.

One of the strongest features of GPSS has always been its Standard Reports. With essentially no effort from the model developer, a simulation run automatically reports on all the GPSS Entities

defined in the model. Thereby, the participants should be concentrated to the problem itself (i.e. how to describe the model and how to interpret the reports) and much less to the technology (i.e. GPSS).

The umbrella of examples will consist a number of "barber example" deviations by simulating input and output of the barber shop, queues waiting for released barber and time for shaving. Another set of examples are based on the production queue. The another example represents queues in supermarket.