

Dynamic Simulations

Levente Sára

The subject of our research is to develop models, which consist of several parallel processes. In these models there exist great number of effects and counter-effects. Changing of some values in the system indicates unpredictable side-effects and feedbacks. These effects can not be managed by classical mathematical tools and methods, because they are highly non-linear. Dynamics of such systems can easily be followed with simulations.

We have developed a program to create and develop dynamics models quickly and easily by using visualization tools. During the process of a simulation certain values can be selected to see how they have changed. The program uses various visualization tools to realize the trends or principles which control the actions and "behavior" of the whole model. We use hyperbolic like screen view, which represents the model of a graph. The main advantage is that we are not forced to use a specific simulation description language to build the model, and so the developing of a new model is extremely fast. Data (the nodes of the graph) and the relations between the nodes can be created. We can define our own functions to describe the nodes. Multi-valued logical operators are extremely efficient. The program automatically creates and manages the most often used functions, such as average, weighted average, sum, product etc. Weight and speed of the effects are represented by the relation with assigned functions.

The program helps to analyze the simulation results by visualization tools. In this way, you can see the speed and orientation of processes in diagrams, graphs and colors instead of endless columns of numbers.

Dynamic simulation models can be applied in almost every field of life: from the inside processes of an enterprise or modeling of the market grow, through demographic and social changes affecting a whole country until studying the cycle of atmosphere or researching the interactions of ecological situations. E.g. in 1993 the periodical "System Dynamics Review" published an article about the agricultural investments and their effects in South Sudan. The author introduced a dynamic model of the rural life of Sudan. There are other studies on the inferences of the CO-concentration in the air and the tropical forest-fires using possible dynamic models. We implemented these examples to improve our program.