

Friday Interactive Workshop:

Using Simile to handle disaggregation and individual-based modelling

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Many SD models require the ability to handle multiple similar objects. This is sometimes referred to as disaggregation when you divide some component into parts - for example, a hospital into wards - or as multiplicity, or individual-based modelling, when you extend a model of one object to have many such objects - such as a regional healthcare model with several hospitals. In reality, these are just two sides of the same coin. Conventional System Dynamics software uses Fortran-style arrays for handling the variables associated with these objects, but this has long been an outdated approach, and one which hides the object-based nature of the problem.

In the area of software engineering and databases, object-orientation has been around for decades, and provides a more natural and elegant way of handling problems like this. You have one type of object (say "Ward" or "Hospital"), with several properties, then simply specify that there are a number of these. This is a lot easier and more intuitive than having to declare that each variable is an array.

Simile (<http://www.simulistics.com>), has been in use for some 15+ years, and was developed specifically to combine SD with the ability to express disaggregation/multiplicity in an object-based manner. The key addition to conventional SD software is the "multiple-instance submodel". You define how one object works in SD terms, wrap it up to make a submodel, then simply set the number-of-instances property to (say) 10000. Simile can now simulate the behaviour of 10000 separate instances. So, one could for example have a multiple-instance "Ward" submodel, nested inside a multiple-instance "Hospital" sub-model. Associations between objects are possible: for example, one could add into this healthcare model a district-based zonal model of the city each hospital is in, and model the proximity of a hospital to the districts it serves. Combined with a highly-efficient simulation engine (it generates and compiles models as C++ code for running simulations), this allows Simile to handle problems with very complex patterns of disaggregation.

Robert Muetzelfeldt was until 2002 a lecturer in ecological modelling in the Institute of Ecology and Resource Management at the University of Edinburgh, with a particular interest in the methodology of ecological modelling and the development of software tools to improve the practice of building and using models. This included links for many years with the AI department in Edinburgh, exploring the possibility of developing expert systems to help people build models. During this time he led the project to develop Simile, the SD- and object-based modelling software used in a number of international projects. [Disclosure: Robert is a director and shareholder in Simulistics Ltd, which markets Simile.] He took early retirement in 2002 in order to pursue this interest as an "independent academic", and now concentrates on the development of web-based modelling tools.