

## **GENESIS Social Simulation Modelling Progress**

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GENESIS[1] is a UK project funded by its Economic and Social Research Council through its National Centre for e-Social Science research node program. GENESIS aims to develop simulation models that represent individual humans and their organisations and how they change their location and influence over time. Part of this work is developing two core models that operate at two different temporal resolutions over different time scales. In time there might be linkage between these models and the hope is that they will become increasingly realistic. The simulation model development is primarily the work of the Centre for Computational Geography based at the University of Leeds. The visualisation of these models is primarily the work of the Centre for Advanced Spatial Analysis based at the University College London. This work is to be supported by a further project called NeISS[2] funded by the UK Joint Information Systems Committee. This aims to develop a National e-Infrastructure to support social simulation. This will make the models and computational infrastructure available to a wider community of users.

The two different models outlined are a model that operates over the time scale of a number of years with a daily time step, and a model that operates on the scale of days with a second time step. These can be considered respectively as Migration and Transport focused demographic models. The Migration model will model the housing and property market and the Transport model will focus on daily activity and initially commuting, but incorporating more and more activity modelling.

There are significant computational challenges in the simulation work. Running a model for the contemporary UK involves modelling and recording changes in the locations of virtual agent individuals representing approximately 60 million real people. A record is needed to detail the history for each individual agent's state over time.

The core models are to support lots of potential applications, but also work is to be considered linking the models in that an expensive commute to work will influence an individual's propensity to migrate or change jobs or working practice.

The paper will detail various technical aspects of the model and consider further scaling issues. A generic data storage solution will be described. This is for storing information about any agent from the model in its own file/directory. A simple branching directory structure is used such that the locations of agent files are implicit given a root directory and the unique numerical identifier of the agent/object. This allows serialised versions of any object to be looked up which is necessary if the object has been cleared from a model cache which might be done if available fast access memory is fully utilised. A similar file store is used to hold collections of agent/objects to load this en masse saving time in IO. Having a good storage solution allows more data about a model simulation/run to be stored and investigated and allows visualisation to be decoupled. Between now and the symposium it is hoped that good progress can be made and presented.

[1] <http://www.geog.leeds.ac.uk/people/a.turner/projects/GENESIS>

[2] <http://www.geog.leeds.ac.uk/people/a.turner/projects/e-ISS>