

CS405 Introduction to Empirical Modelling

By way of orientation....

Interactive Environments and Empirical Modelling

(text for admissions purposes to describe 'interesting research in CS')

Traditionally computing has been primarily to do with automation and the symbolic representation of data. But with the current huge explosion in the use of computers for multimedia and communications the role of the user's direct experience with computing devices (of music and images for example) is now much more prominent.

In the past computer programs have enabled the automation of many everyday tasks ranging from making good toast and encrypting credit card details through to the control of complex manufacturing processes. However, there are other tasks -- like writing a poem or designing a good website -- where automating all the processes needed is either impossible or undesirable. But in such cases the computer could still be very useful, for example, in offering possible rhyming words for the next line of our poem, or suggesting complementary colours for parts of our webpage. It is in these areas of 'semi-automation' that it has proved very difficult to use conventional methods to program computers in a sufficiently open and human-friendly fashion. This is a general problem for the construction of truly interactive environments. On the one hand this has stimulated research at Warwick into how we can get computing processes to be integrated much more closely with human processes - what we call 'human computing'. On the other hand, tools and principles for achieving this integration have been the focus of Empirical Modelling.

The Empirical Modelling Group is doing ground-breaking research on developing interactive environments that are unusually open and experiential. The approach involves writing sets of 'definitions' that are rather like formulas for a kind of generalised spreadsheet. As the name suggests, the idea is to do modelling with an emphasis on observation and experiment. The main focus is on using the computer to construct artefacts that reflect, through interaction, patterns of observables similar to those in the personal world of the modeller. In our modelling we seek to identify reliable dependencies between the observables and express these in so-called 'definitions'. Special principles and tools have been developed exclusively at Warwick in recent years with which to construct the models. The modeller works rather like an artist with a painting or an author with a novel -- she can directly experience and modify the model throughout the construction according to her vision for the model and her viewpoint and purposes. In contrast to traditional programming the models have an unusual quality of openness and continuous connection with personal experience. Empirical Modelling is not only a different approach to software development but also a kind of 'alternative computing' having significant and complementary contributions to make to many areas such as artificial intelligence, computer graphics, concurrent systems and educational technology.

Although this is primarily a research area (there is no textbook about it yet), undergraduate students can be involved with the work through taking the module *Introduction to Empirical Modelling* and through 3rd year projects. Our tools, and sometimes new application areas for the approach, have developed in important ways as a result of ambitious student projects. Some recent projects have been: car-parking simulation, ant navigation using landmarks, animation for basketball coaching, restaurant management, crowd movement, 5-a-side football and modelling planimeters.

See the website <http://www.dcs.warwick.ac.uk/modelling/> to download the tools and access over a hundred archived models. Your comments, questions and ideas about anything on the website are very welcome.

Steve Russ 2005

