1064 The *monist-project* -- Educational Simulations For Brains

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To understand the functioning of brains we must bridge many levels of analysis from molecules, cells and synapses to perception and behavior. Although experimental analysis is a precondition for understanding information processing by nervous systems, it is in no way sufficient. Rather, computer simulations help to tackle problems resulting from dynamics and complexity of nervous systems. It has become common scientific practice in the neural and cognitive sciences to investigate brain function by both experiments as well as model simulations.

In the higher education of the neural and cognitive sciences, however, simulations are still only applied sporadically – even though educational materials (e.g. internet applets for well-known models such as Hodgkin-Huxley, Reichardt-detector, LTP etc.) and simulation tools (e.g. MatLab™) are readily available. Application suffers from various uncertainties of how to use simulations in higher education: *Do simulations effectively complement the well established methods of "chalk and talk", laboratory practicals or paper discussions? How long will it take to prepare application? Exactly which cases have a reasonable cost-gain ratio? Should I make demonstrations or let the students make it by their own in a practical course? How can I assess success or failure of use...* In sum, 'recipes' for applying simulations in education are widely missing.

The *monist-project* has committed itself to the task of developing such recipes for simulations in higher education. The basis of the *monist-project* is a software package (*monist-console*) designed for providing compact, ready to use educational simulations. Simulations become educational as they are complemented by topical texts, instructional design, concrete tasks and an editor for individual notes and solutions. Thus, the *monist-console* supports self-learning but particularly aids tutors to integrate simulations in their courses. Online file-management and communication tools (via *monist-server*) help to organize personalized courses.

The authoring mode provides means for designing or modifying educational material. Existing simulations (applets, programs etc.) can be embedded. An integrated simulation construction kit is under development. Authored educational simulations can be sub-

mitted to a central server for publication. An update routine can offer newly published simulations on the server for download to the local *monist-console*.

Beyond software and content development, the *monist-project* works on several practical fields for fostering the concrete application of simulations in higher education, e.g. evaluation for best practice scenarios, studies on learning and memory and organizational networking. The demonstration of the *monist-project* offers applicable tools and content (work in progress). It aims at teachers wishing to apply and evaluate the *monist-console*, authors seeking to contribute concepts or integrate their existing simulations and developers ready to participate. The *monist-project* is funded in nine groups at six universities from 2001-2003 by the German Federal Ministry of Education and Research *BMB+F*. One group carries out evaluation (Seel, Freiburg), the others correspond to topics, as follows (alphabetically, contributing groups in brackets):

Biophysics (Aertsen, Freiburg) Cognitive Neuroscience (Mallot, Tübingen) Learning and Behavior (Menzel, Berlin) Motor Systems (Cruse, Bielefeld) Neural Networks, Applied (Gross, Ilmenau) Neural Networks, Theory (Ritter, Bielefeld) Psychology (Dörner, Bamberg) Sensory Systems (Egelhaaf, Bielefeld)

Further information: http://www.monist.de