
The GENESIS Simulator-Based Neuronal Database

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As the complexity and amount of neurobiological data continue to increase, neuroscientists are at risk of being inundated with huge amounts of data of unknown accuracy or relevance for the task of understanding the brain's workings. This chapter presents a new approach to overcoming inherent limitations in conventional databases, including: (a) accuracy and relevance of the data entered, (b) problem of conflicting data, (c) data compression, (d) promoting participation in development and use of the database, and (e) connection between the data and their functional significance.

With support from the Human Brain Project, this chapter explores the construction of a brain database based on an existing neural simula-

tion system—GENESIS. GENESIS (the GEneral NEural Simulation System) was developed as a research tool to provide a standard and flexible means to construct realistic simulations of biological neural systems (Bower & Hale, 1991). It currently serves as the basis for both instruction and research in a growing number of institutions around the world. The GENESIS object-oriented database project involves a novel approach to neural database construction, organization, and interaction. The intention of the project is to develop software tools to make the wealth of information already accumulated within GENESIS about the structural organization of the nervous system more easily accessible and more generally available to both modelers and other neurobiologists.

A useful neuroscience database should address certain educational needs as well. Students, as well as experienced researchers who are interested in extending their research into new areas, face a formidable challenge when seeking to acquire a state-of-the-art understanding of a particular system. Such a database should be useful for both unsophisticated users interested in understanding more about a particular structure or area and for more sophisticated modelers and experimentalists interested in exchanging information. Thus, this design focuses on methods of providing users at all levels of experience with a convenient means to achieve a basic understanding of what is known in a particular area and the opportunity to connect to centralized, coordinated information at any level of depth. This also serves the purpose of educating neurobiologists in the use of new tools, including modeling.