brain in order to manage a lot of nervous messages through condensed packets of informations. If these suggestions are correct, it is easy to understand that the model-based reasoning in science is not only and simply a very common way of thinking, but it probably constitutes the hard core of science itself, if we believe in the parallelism between metaphors and models mentioned above.

ENCODING DOMAIN KNOWLEDGE ON POPULATION DYNAMICS MODELING FOR EQUATION DISCOVERY

S. DZEROSKI AND L. TODOROVSKI

The paper is concerned with integrating knowledge-based modeling or modeling from first principles, with data-driven or automated modeling of dynamic systems. In the first approach, a domain expert uses his knowledge of the processes in the system to write down a model in the form of a set of differential equations. The structure of these equations is the crucial component of the model and reflects the processes in the system: constants in the equations can be calibrated using measured data.

In the second approach, measured data about the dynamic system is used to derive both the structure and the constants of the differential equations in an automated fashion. This approach includes methods for equation discovery: unlike mainstream system identification methods, which work under the assumption that the form of the equations is known, equation discovery systems explore a space of possible equation structures.

Here we propose an approach to representing knowledge about processes in population dynamics domains and a method to transform such knowledge into an operational form that could be used by equation discovery systems.

In this way, we would improve the ability of computer systems to exploit both knowledge and data in the process of automated modeling of dynamic systems.

NECESSITY AND LIMITATIONS OF COMBINING STRATEGY AND SUB-MODELS IN OBJECTIVE MODEL-BASED REASONING

E. FINKEISSEN

Modeling is necessary for any kind of planning and prognosis. A decision model is supposed to support an individual prognosis and therefore individual decisions on the basis of generalized statements. Therefore, the main problem of setting up and using a decision model is the demarcation between an individual decision and the referring generalized decision model. The author takes the stance, that the interaction between both points of view has not been described sufficiently, yet. So, before describing the interaction between the individual and the generalized decision-making, an analysis of the properties of or expectations to both levels of decision-making has to take place: 1. A generalized and scientific model should be represented objectively (disclosure) to provide a neutral basis for communication both in research and routine. In the last century well known scientists have articulated their demands on an objective formulation of these correlations. From these demands, the fundamental structure of an objective decision model can be derived. Like this a general model of objective decision models (meta-model) can found a theory of formal decision systems as a formal representation is in prospect. Herein, sub-models have to be integrated into the superposed strategy to result in one comprehensive model instead of multiple fragmented partial models. 2. In contrast individual decisions have to solve individual problems taking care of all aspects of reality. These decisions do not necessarily have to be objectified (disclosure) or justified as long as they do not affect other individuals. On the basis of these two levels of decision making, conclusions can be drawn about the interaction between the structure of an objective decision model and its individual application to reality.

MODEL-BASED REASONING IN AI: A NEW ACCOUNT OF REVISION

D. GABBAY, G. PIGOZZI, AND J. WOODS

One of the aims of any knowledge system is to represent the epistemic change occurring when a new information is added to a data set. The seminal paper in this area is by Alchourrón, Gärdenfors and Makinson (AGM) who proposed postulates for belief revision, formulating properties which every revision function must satisfy. AGM do not, however, give a specific revision algorithm. Moreover, no special attention is accorded to the process of iterated revision. In recent years, fuller accounts of belief revision have been developed intensively by AI researchers in a variety of application areas, in which it is common to have inconsistent theories which need revision. At the same time, non-classical logics are being used more and more in applications, with a consequent definition of non-classical theories as structured and labelled sets of formulas. What is now needed is a development of revision theory for the case in which the underlying logic is more sophisticated than classical logic, including non-monotonic logics.

Labelled Deductive Systems (LDS) theory is a good framework for this in which features for non-monotonic logics can be implemented, and an appropriate revision algorithm can be defined. Such an algorithm shall be called a controlled revision theory which will be introduced in this talk. Finally, we illustrate our account by working out some simple case-studies.