An ontology about ontologies and models: a conceptual discussion

Diana M. Sánchez, José María Cavero, Esperanza Marcos

Departamento de Informática, Estadística y Telemática.
Rey Juan Carlos University.
Calle Tulipán s/n. Móstoles, Madrid. Spain
{dm.sanchez@alumnos, josemaria.cavero@, esperanza.marcos@}urjc.es

Abstract. The goal of this position paper is to analyze the conceptual differences between some of most popular concepts in Computer Science, like model and ontology. An ontology about these concepts is proposed as starting point of discussion.

The rapid evolution of topics related to Computer Sciences provokes that some common terms are used with slightly different sense in different branches of this discipline. This lack of a profound discussion may lead to misunderstandings or even inadequate uses of some terms. Concepts like schema, model, meta-model or ontology belong to this group of usual concepts whose meaning is diffuses and unclear in many cases.

Modeling is one of the most important task in current development of Information Systems. Proposals like the Model-Driven Architecture (MDA) from the Object Management Group (OMG) [5], or several works about that topic (for example, [2]) strengthen the importance of models in the development of Information Systems.

The goal of this position paper is to analyze the differences between some of these concepts, mainly the concepts of model and ontology. The result of this analysis will allow us clearly state how and in which part of Computer Science to use each concept.

The concept of *model* is mainly used with the following meanings: 1. *"Something which a copy can be based on because it is an extremely good example of its type"* 2. *"A representation of something, either as a physical object which is usually smaller than the real object, or as a simple description of the object which might be used in calculations"* [1]. In Mathematics there exist two different terms to distinguish those different meanings [4]: the representation of something is named *theory* and the mathematical object which is taken as an example is called *model*. Marcos & Marcos [3], based on these different meanings, establish a distinction between *'model as original'* where *"the model is understood as reality itself"* and *'model as copy'* where *"the model is understood as a simplified reproduction of reality"*. We have used their distinction as starting point for elaborating the ontology represented in figure 1.

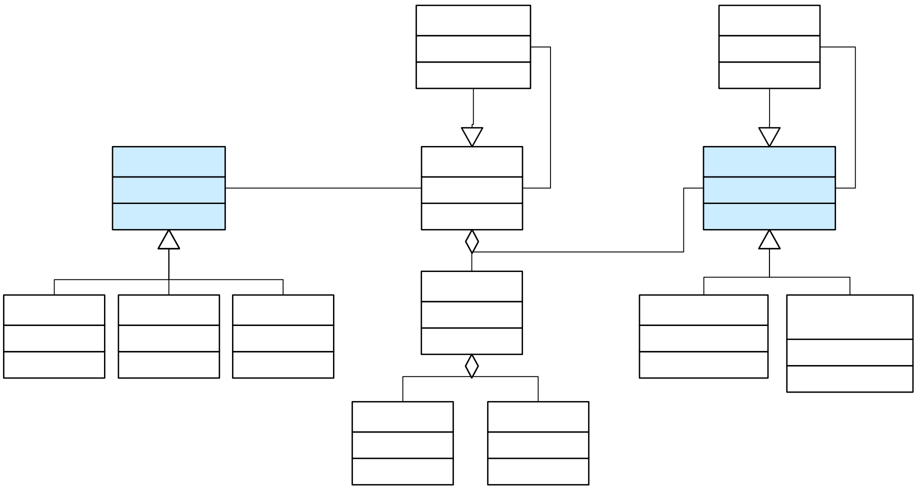

Fig. 1. Ontology about model and ontology concept.

Previous ontology synthesizes our proposal for clarifying the use of concept of model in Computer Science and uses the definitions of "Model as copy" and "Model as original" proposed by Marcos & Marcos. The distinction done by Marcos & Marcos can be compared with the classification of models according to their functions done by Ludewig [2]. In that classification, models can have a *descriptive* function if they describe a real world or a *prescriptive* function if they are represented by objects in the real world.

Next, we briefly explain the ontology represented in figure 1.

Models as original represent things that exist in the real world, or in a part of it, from a particular point of view. For example, the *Relational Model* allows organizing and storing that information in a computer. Object-oriented model organizes the world in objects, which might have properties and methods.

Models as original may be represented or not. The result of representing a model as original is a model as copy. However, a method or process to create that representation must be established. Several times this process is standardized in a methodology that guides the user through steps for obtaining a concrete representation. That representation is expressed in a common language –for example, a data language.

Languages have two basic elements: Grammar and Semantics. Grammar studies language elements and its combinations and are made up of Syntax and Morphology. Semantics study linguistic signs and its meanings. A data language is an example of language which is used to represent data in a Computer environment. Such a Language defines a Grammar, that is, a set of elements (keywords, symbols, diagrams, etc.) used to represent concepts like objects, sets of objects, functions, etc. However, the Semantics to build the model as copy obtained from the model as original. For example, the semantics of what a relation, or a primary key is, is contained in the Relational Model itself, which is a model as original. Therefore, a Language is composed of a Grammar and a Model as Original (Semantics), as can be seen on figure 1.

A model as copy is a reproduction of a specific domain expressed using some [data] language. Examples of Models as copy are ontologies, schemas (data models), patterns, etc.

A Meta-model is a model for describing models, and a meta-language is a language for describing languages. The goal of meta-models is to describe a way to model the world, so it is a meta-model of a model as original.

Acknowledgements

This work is being carried out in the framework of the MIFISIS (*Research Methods and Philosophical Foundations in Software Engineering and Information Systems*) (TIC2002-12378-E) and DAWIS (TIC 2002-04050-C02) projects supported by the Spanish Ministery of Science and Technology. We wish to thank Ascensión Lovillo for her useful comments.

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