Chapter 3
Technology of Computer Modeling

ABSTRACT

Technological aspects of computer modeling in its application to the investigation in computer field are discussed. A detailed classification of the applied computer models is presented, with two relatively independent groups - homogeneous and the heterogeneous models. For each of the models an introductory description of the main features is given, and corresponding relatively simple examples are presented. As a next step, a general procedure for the overall organization of a model research is defined, and the importance of the correct planning of each model experiment is indicated. A methodological scheme as a sequence of relatively independent phases is defined and each of them are discussed to present the mine goal and details, specific features, and requirements. The difference and features between the three successive types of models when conducting research are defined - conceptual model (formalized description), mathematical model (analytical description), and program model (concrete implementation in a suitable program environment).

1. CLASIFICATION AND FEATURES OF COMPUTER MODELS

Modeling is an approach used in various fields, and the choice of a specific method is made based on a preliminary analysis of the proposed application possibilities when solving a given task. One example is the critical review of different approaches for photo-voltaic arrays modeling presented in (Jena & Ramana, 2015). Basic approaches based on various analytical methods, classical optimization techniques and soft computing techniques are discussed. A classification of modeling techniques for both uniform and non-uniform conditions is presented. Another application of modeling research approaches is shown in (Taifa et al., 2000), analyzing the processes of allocating, sharing or dividing order quantities between cooperating business entities. A discrete event simulation software package for many-to-many processes was used for the study in order to optimize the monitoring and control of manufacturing relationships.

An analysis of the impact of computerization on modern science is made in (Varenne & Turnbull, 2018), explaining the crucial interaction between technology and science, discussing particularities of

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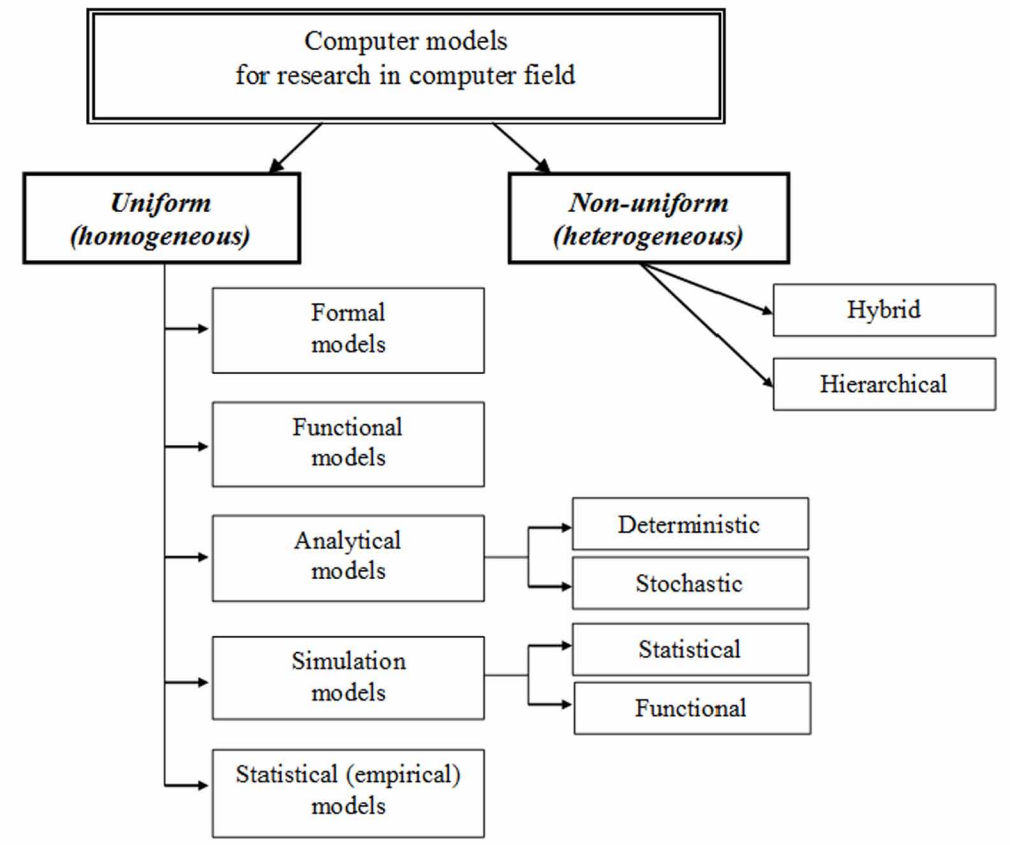
factors such as formalization, computation, data collection and visualization that led to the development of computer models and simulation in the time. The aim of the book is to explain the successive transition from mathematical models to computer simulations of the last decades.

A generalized classification of the main types of computer models used in the investigation in computer field is presented in Figure 1. Depending on the internal organization of the models, two main directions are defined – uniform and non-uniform models. In the case of the first, one of the basic modeling methods was applied and a homogeneous model of the original object was built. In the models of the second group, different approaches and/or means are used, which creates a heterogeneous structure of the developed model. A summary of special features of basic models with simple applications is presented below.

Figure 1. Generalized classification of computer models



Formal and Abstract Models

Formal models are built on the basis of strictly defined rules and hypotheses and can use various deterministic and stochastic means of abstract representation of the formalized object. Formalization allows converting the researched object (system resource and workload) into a form convenient for creating a computer model using one of the main modeling methods. In this reason, the formal model is the first step