

Computer Modeling and Simulation of Dynamical Systems

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Guidelines abstract



Innovative teaching and learning strategies
in open modelling and simulation environment
for student-centered engineering education

Новые стратегии обучения инженеров
с использованием сред визуального моделирования
и открытых учебных платформ»



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КОМПЬЮТЕРНОЕ МОДЕЛИРОВАНИЕ ДИНАМИЧЕСКИХ СИСТЕМ

МЕТОДИЧЕСКИЕ УКАЗАНИЯ
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Systems characterized by both continuous and discrete behavior arise in different engineering and science domains: power and mechanical engineering, biological and social systems, etc. Being able to model and simulate systems of this kind and to analyze the obtained simulation results is a crucial skill for a modern engineer. This publication gives a brief introduction to modeling and simulation in the ISMA environment and guidelines on the virtual laboratory benches employed in the Simulation Fundamentals undergraduate course offered by NSTU. A virtual laboratory bench allows one to model, simulate, and visualize the behavior of a particular system in a browser window, which proved to be an interesting and convenient way of studying of modeling and simulation.

Its target audience is students in the “09.03.01 Computer Science and Computer Engineering (Network Information Technologies)” educational program and those who are interested in

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modeling and simulation of complex dynamic systems. The prerequisites are physics, modeling, and simulation.

The first chapter introduces a fragment of the grammar of the modeling language LISMA, which is a general-purpose modeling language employed by the ISMA modeling and simulation environment. The students learn the constructs for specifying continuous behavior in a form of explicit differential-algebraic systems of equations, partial differential equations of the particular type, discrete behavior through defining the modes or employing event control.

The second chapter is devoted to the use of the ISMA environment. It offers a brief manual for this software suit, describes typical user cases.

The third chapter is more practice-oriented. It contains examples of modeling and simulation in ISMA and guidelines on the virtual laboratory benches.

These guidelines have been written by Yu. V. Shornikov and D. N. Dostovalov (NSTU).