

## ABSTRACT

Master dissertation: 93 pp., 45 fig., 14 tab., 1 app., 40 sources.

**Topicality.** The power of computer technology grows every year, however, the possibilities of creating web applications are expanding. Web applications are increasingly pushing the application level of the operating system, since they require the user only the installed browser. It follows that web applications are automatically cross-platform because the browser is an integral part of any modern operating system. To date, there are many Petri simulators, but almost all of them are application-level operating systems, that is, they require a local installation on the computer, which causes some inconvenience compared to the use of web applications. The idea of creating an online Petri-simulator has significant advantages over offline Petri-simulators:

- no need to install additional software;
- all created models are stored on the remote server in the user account;
- ease of exchange of models between users;
- collective work is greatly simplified;

Petri-object simulation is a simulation technology based on Petri's stochastic networks and provides the ability to create models of complex systems from constructive elements. Unlike other well-known simulation techniques, Petri-object technology is based on a formalized description of the dynamics of the Petri network system, which allows for the most abstract and, at the same time, most detailed description of the functioning processes.

In this regard, the actual scientific task is to develop an effective Web service for the creation of Petri-object models.

**Relationship of work with scientific programs, plans, themes.** The work was carried out at the Department of Automated Systems for Information Processing and Management of the National Technical University of Ukraine "Kyiv Polytechnic Institute. Igor Sikorsky" within the framework of the topic «Development of tools for discrete-event system simulation» (No. 0117U000923).

**The aim of the research** is the creation of a web service with components for visual development of the dynamics of the Petri-object model, which increase the speed and convenience of designing the model.

To achieve this goal, the following tasks must be performed:

- carry out an overview of the known means of automated simulation of discrete-event systems;
- to familiarize with the Petri-object modeling technology in detail, to perform its comparative analysis with other technologies of the modeling of discrete-event systems;
- perform an overview of the existing modeling tools based on Petri's networks, including searching for such tools that allow the creation of Petri-object models in online mode for further use in simulation;
- Decide on the visual representation of elements of Petri and Petri-objects networks in the future system of visual programming of Petri Networks and Petri-object models (creation of Petri-objects and construction of links between them);
- To design this system using the simulation algorithm of Petri-object models and Petri stochastic networks;
- carry out the program realization of the designed system;
- carry out testing of the developed system on specific models;
- perform analysis of the correctness of the work and the speed of the developed software product.

**The object of research** is the process of building a web service for simulation of complex discrete-event systems using Petri-object technology.

**The subject of research** is the means and methods of constructing a web service for simulation of complex discrete-event systems based on the Petri-object formalism.

**Research methods** are the fundamental provisions of mathematical modeling, general scientific principles and methods of conducting research, in particular: methods of analysis and synthesis, methods of decision making in the design of the architecture of the

system, methods of systematization, abstraction, structuring for the evaluation of existing means of simulation.

**Scientific novelty of the obtained results.** For the first time, we propose a web service architecture that provides an effective development of simulation models based on the integration of the Petri-object model java library and Web-based graphic editor. The graphical representation of Petri-object models is improved, which provides the possibility of visual development of Petri-object models on two levels:

- development of stochastic Petri net and its use for creating Petri-objects
- development of dynamics of the model from the set of Petri-objects;

### **Publications**

The materials of research are published in theses of the 8th International Conference «Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS)» and published in Scopus Digital Library [29]; presented at the 7th International Conference «Internet Technologies and Applications (ITA 2017)» and published in Scopus Digital Library [40]; presented at the 18th International Conference on «System analysis and information technologies (SAIT 2016)».

SYSTEM SIMULATION, DISCRETE-EVENT SYSTEM, STOCHASTIC PETRI NET, PETRI-OBJECT MODEL.