

Abstracts of PH. D. Theses

Title: Algorithms for solving some optimization problems on graphs and their applications

Author: Rodica Boliac

Promotor: Prof. Dr. Dumitru Lozovanu

Date of defence: February 13, 1998

Institution: State University of Moldova,
Faculty of Mathematics and Informatics

Abstract

The dissertation is devoted to investigations of some optimization problems on graphs, connected with transportation problems.

Among the problems considered in the dissertation there are transportation problems with concave cost functions on the edges' flux are considered. An algorithm which reduces the capacitated transportation problem to a non-capacitated one is presented. The applications of transportation problem with concave cost functions in solving the Steiner problem, the problem of synthesis of networks with one source are studied.

The problems of finding optimal paths in network games with elements of indetermination also are particular cases of the transportation problem. The problem of finding the min-max path tree in network games is considered and a polynomial time algorithm for its solving is proposed in the case of positive cost function on network's edges. Also, the problem of finding optimal strategies of players in network games with p players is studied and solved by using polynomial time algorithms in the case of positive edge costs.

Another problem considered in the dissertation is the construction of graphs containing a given graph as median is considered. Three algorithms for its solving are proposed. Also, an algorithm, which constructs a graph containing the given one as center and median, is proposed.

Title: Design and development of an applied system for the biological activity investigation in chemistry, biology and medicine

Author: Natalia Shvets

Promotor: Vladimir Red'ko

Date of defence: December 4, 1998

Institution: Technical University, Moldova

Abstract

The thesis is devoted to the design, development and implementation of an applied system dealing with problems of structure–biological activity relationships investigation arisen in medicine, chemistry and biology far enough. The system is based on the idea of an original electron-topological method (*ETM*) that has no analogs among the methods proposed for solving the same problems till now. On the base of the methods' analysis the place and role of the *ETM* are revealed.

The overall scheme of the applied system is developed, analysed and discussed to the extent of the level of its separate parts' implementation. Data and control flows are investigated, influencing the components interaction in the system. The I/O processes are separated and described as an hierarchy of classes under object-oriented approach. The user interface is developed and described in details.

On the base of the most important queries analysis the structure of a local data base is proposed that takes into account a sequence of steps determined by the user interface and is capable of satisfying the queries.

The core algorithms development is mathematically justified by means of a number of formal definition of objects (molecules) they are dealing with and relations between their elements introduction. Some statistical estimations are given both to the algorithms and parameters controlling the features of activity (molecular substructures) selection. The results of the system application to a number of tasks are given. Some of them are compared with the results issued by other systems developed for solving the same problems of different biological activities investigation.

Title: Development of methods and software tool for design of problem-oriented simulation systems

Author: Lyudmila Burtseva

Promotor: Dr. Galina Magariu

Date of defence: January 13, 1999

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Abstract

The thesis is devoted to the development of methods and software tool for design of problem-oriented simulation systems (POSS). The modern problem-oriented simulation systems were investigated. On the basis of this investigation the general architecture of POSS is developed, in which the components depended on the language of model

description, specific model and the user preferences and components independent from these parameters are marked. The technique for automatic creation of POSS is developed. This technique allows to receive as result POSS that has the architecture which is proposed by the author and realizing all necessary stages of simulation; is the integrated simulation environment; provides the dialogue with the user in problem-oriented language; automatically builds in POSS the techniques used by general-purpose simulation systems. The software is implemented that applies the technique developed by the author for automatic creation of POSS, creates POSS being full-function independent software, automatically embeddes in target POSS the techniques of general-purpose simulation systems. The technique developed in the thesis allows essentially reduce the time and work expenditures on creation of POSS. The practical importance of the results is defined by wide application domain of simulation systems, being the most effective contribution of simulation in intellectualization of computer techniques. The software created by this technique fast and qualitatively generates POSS for any problem domain with the purpose of solution of the practical task. Besides, it is used in the educational process with the purposes of clarification to students practical application of simulation.

Title: Design of high-level description language for plans of task solving and the technique of its implementation in the training devices on programming

Author: Phan Phuong Dat

Promotor: Dr. Valentin Ryingach

Date of defence: January 13, 1999

Institution: Institute of Mathematics and Computer Science,
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Abstract

The dissertation is devoted to the design of high-level description language for plans of task solving and the technique of its implementation in the structure of training devices on programming (TDP). The idea of the language is based on the concept of educational programming task introduced in the dissertation. A programming task is defined as the interconnected high-level plan and program, which is low-level in relation to the plan. The operators, transforming plan's objects, are given by algorithmic models. These models describe sub-tasks, arising in the task solving process. Algorithmic models are put into execution by actions. The basic sets of algorithmic models and actions form the core of the description language, which is used as the entry language of TDP.

The problem of formalisation of the syntax, semantics and algorithmic semantics of the language is considered. The formalised description of the language is directed to the designers of the compiler within the structure of TDP. The logic structures of TDP and of its main component – compiler, are shown. The compiler generates the algorithm and the database of task's objects, on the basis of which the flowchart and the program of task solving are constructed.

The validity of theses given in the dissertation is confirmed by experimental implementation of the compiler and by factual data of efficiency evaluation of the language.