Editorial 10/2006

The aim of this special issue is to continue presenting the research activity of the Cybernetics and Decision Support Laboratory at the University of Maribor, the Faculty of Organizational Sciences in the field of the modelling and simulation of complex systems. The special issue includes papers dealing with the development of simulation methodology, modelling tools and practice for decision assessment in parallel processing, service systems, control and optimization, social dynamics research and living laboratory development.

The first paper, entitled "Simulation System Design", addressed the use of computer simulation as a tool for designing complex stochastic systems and some technical problems regarding computing time. This paper proposes a "stochastic approximation" algorithm to estimate the necessary controllable input parameters within a desired accuracy given a target value for the performance function. The solution algorithm is based on Newton's methods, using a single-run simulation approach to estimate the needed derivative. The approach proposed may be viewed as an optimization scheme, where the loss function must be minimized. The solution algorithm properties and the validity of the estimates are examined by applying it to some reliability and queuing systems with known analytical solutions.

The paper entitled "Modelling Parallel Service Systems in GPSS" deals with parallel service system modelling in the GPSS simulation language. The problem can be solved using a variety of theoretical approaches. In this article, the simulation method carried out by a digital computer is being used. The transactions entering the systems select between numerous different servers and we can mostly detect two rules in the selection of the appropriate server. The first rule always gives the first few (regarding its position in the system) entities (either servers or queues) precedence over the others, while the second rule always treats all the equal entities evenly and selects among them quite randomly. Since GPSS normally operates by the first rule, we frequently come up against difficulties when modelling systems that serve by another rule. The present article offers a methodology how to solve this problem within GPSS.

The paper entitled "Discrete Event Passenger Flow Simulation Model for an Airport Terminal Capacity Analysis" describes an analysis of passenger flow in an airport departure terminal, from the passenger entrance to boarding, involving the development of a simulation model. Data was collected and used to define the inputs to the simulation model and that was followed by a statistical analysis of the collected data. A discrete-event simulation model was constructed using the General Purpose Simulation System (GPSS) simulation programming language. The performance of the system in the present and the expected future was studied. The simulation model helped us to evaluate the passenger flow, identify system bottlenecks as well as the system capacities. Critical aspects in the passenger flow through the airport terminal have also been explored and studied.

The paper entitled "A Simulation Approach to Warehouse Cost Minimization in a Stochastic Environment" describes the simulation method used to solve replenishment strategy problems in a medium-sized company in order to improve its warehousing processes. The simulation approach is used to minimize total warehousing cost while ensuring no stock-outs occur and that the warehouse capacity is not exceeded. A case study of optimization to the replenishment process is presented on several representative materials of an automotive company using two replenishment algorithms: fixed review period and full capacity ordering. The simulation results presented indicate a considerable cost reduction without violating the constraints mentioned.

The paper entitled "The Periodicity of Discrete Demand-Supply Model Solutions using the Anticipative Principle" presents analysis of the periodicity solutions of the discrete cobweb model. Dubois' anticipative principle was applied in the modification of Kaldor's cobweb model. By the application of simulation, characteristic solutions are gained that determine the cyclical behaviour of demand and supply. Z-transform was applied when the solutions were determined. The interconnection between the anticipative definition of the cobweb model and the Hicks model is addressed.

The last paper of this issue, "A Model of the E-Documentation of Community Nursing", presents the development of electronic documentation for community nursing using a system approach. Documentation is viewed as an information model for the organization and management of processes. The community nurse plans the nursing process after gathering and evaluating information on the patient's health and his/her family status. The article describes a prototype software model for e-documentation in community nursing together with its evaluation in practice.

Guest editor
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