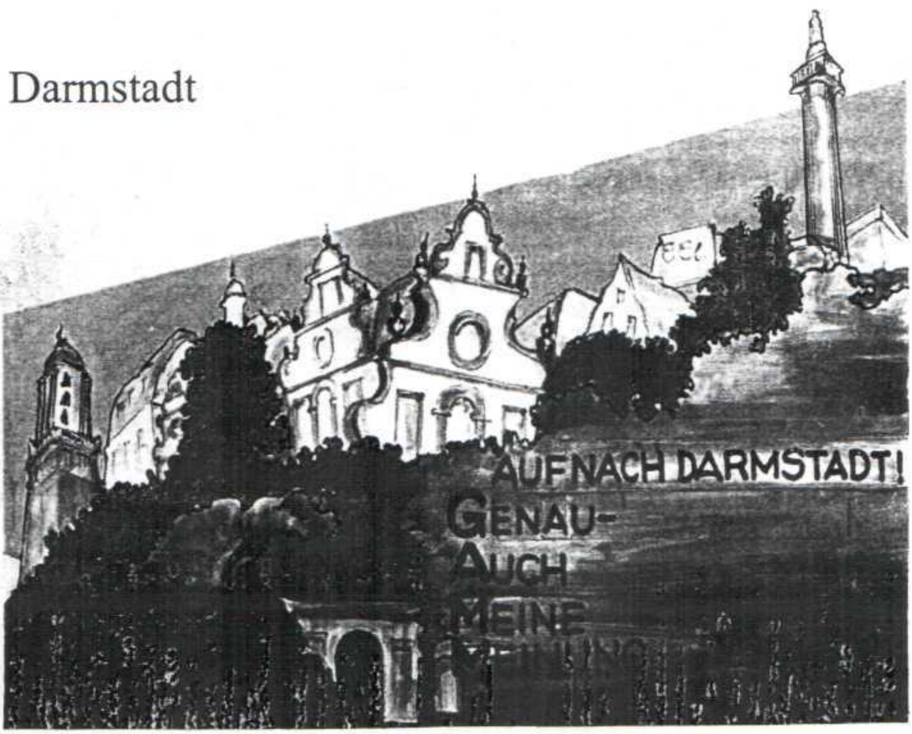
Gesellschaft für
Angewandte Mathematik und Mechanik

Book of Abstracts

83rd Annual Meeting
March 26 – 30, 2012

Darmstadt



83rd Annual Scientific Conference of the International Association of Applied Mathematics and Mechanics

Book of Abstracts

Technische Universität Darmstadt

March 26 – 30, 2012

Hans-Dieter Alber Cameron Tropea

Unter Mitwirkung von
Anke Böttcher, Dieter Bothe, Petra Fuhrmann, Peter Hagedorn, Christiane Herdler, Carsten Juretzka, Natalia Kraynyukova, Richard Markert, Anke Meier-Dörnberg, Birgit Neuthe, Martin Oberlack, Stefan Ulbrich, Nicole Wagner

to the evolution strategy with covariance matrix adaption (CMA-ES) [4]. For a population size of 80 and for the total number of evaluation calls limited to less than 10^4 the own algorithm yields acceptable results with much higher probability.

[1] K.S. Suslick, D.J. Flannigan, Inside a Collapsing Bubble: Sonoluminescence and the Conditions During Cavitation, *Annu. Rev. Phys. Chem.* **59** (2008), 659 – 683.

[2] R.P. Taleyarkhan, C.D. West, J.S. Cho, R.T. Lahey Jr., R.I. Nigmatulin, R.C. Block, Evidence for Nuclear Emissions During Acoustic Cavitation, *Science* **295** (2002), 1868.

[3] R.P. Taleyarkhan, J.S. Cho, C.D. West, R.T. Lahey Jr., R.I. Nigmatulin, R.C. Block, Additional evidence of nuclear emissions during acoustic cavitation, *Phys. Rev. E* **69** (2004), 036109.

[4] N. Hansen, A. Ostermeier, Completely Derandomized Self-Adaptation in Evolution Strategies, *Evolutionary Computation* **9** (2001), 159 – 195.

Fuzzy-stochastic models for solving CVRPFD

Yuriy P. Kondratenko, Leonid P. Klymenko, Galyna V. Kondratenko (Petro Mohyla Black Sea State University, Mykolaiv, Ukraine), Igor P. Atamanyuk (Mykolaiv State Agrarian University, Mykolaiv, Ukraine)

In many cases the Vehicle Routing Problem (VRP) can be solved using corresponding mathematical models, exect optimisation algorithms, operations research methods and mathematical programming. Problem statement, size of set of nodes, existing restricitions and assumptions are main factors which have significant impact to a choise of solving heuristic.

The CVRP (Capacitated Vehicle Routing Problem) is considered with focus to VRP for tanker-refuellers which should provide bunkering operations (BO) for various ships. These ordered ships may be located in different ports or in different sea points. The efficiency of BO is evaluated by possibility to serve all ordered ships with minimum total length of tankers routes and with maximum possible quantity of unloaded fuel.

Comparing modelling results for CVRP with crisp demands based on different heuristic (genetic algorithm, ant colony models, saving algorithm, sweeping algorithm and other) are under discussion.

Marine practice shows that very often the information about fuel demands is uncertain. The fuzzy logic algorithms (FLA) are designed by authors for solving CVRP with fuzzy demands (CVRPFD) and for special sets of input data. For testing and verification of proposed models authors use fuzzy-stochastic approach.

Among finding of this research are: classification of conflict situations in CVRPFD, stochastic simulation models of prognoses and real demands for modeling and optimization in uncertainty; methods for increasing efficiency of CVRPFD solving by adjusting critical value of satisfaction level for node-applicant in conflict situations.

Average value of critical parameter (desired satisfaction level or preference level) is determined as 0.5 based on the 10000 fuzzy-stochastic models of uncertain demands in one program for each port (CVRPFD with 32 ports and 8 marine bunkering programs).

Modelling results confirm the efficiency of suggested intelligent models and fuzzy-stochastic approach for solving CVRPFD in marine environment.

The main contribution of this research deals with development of intelligent models and algorithms for solving CVRPFD and design of fuzzy decision support system (DSS) which