

**02-9 IUTAM Symposium on Evolutionary Methods in Mechanics,  
Cracow, Poland, 24-27 September, 2002**

**a) Scientific Committee**

T. Burczynski (Poland, Co-Chairman), A. Osyczka (Poland, Co-Chairman), K. Deb (India), J. Engelbrecht (Estonia, IUTAM repres.), D.E. Grierson (Canada), R. Haftka (USA), P. Hajela (USA), S. Kundu (Japan), I.C. Parmee (UK).

**b) Short summary of scientific progress achieved**

The objective of the Symposium was to provide an international forum for facilitating the exchange of information among researchers involved in computational intelligence methods based on evolutionary nature in mechanics.

Recently evolutionary methods have become the most effective tools for solving specific kinds of problems in mechanics, especially in structural and multidisciplinary optimization. The meeting was devoted to both theoretical and practical developments of computational mechanics methods drawing their inspiration from nature with particular emphasis on evolutionary models of computation such as genetic algorithms, evolutionary strategies, classifier systems, evolutionary and genetic programming and other evolutionary computation techniques in mechanics.

The symposium put special emphasis on evolutionary optimization in various fields of mechanics. The subject of evolutionary optimization has recently experienced a remarkable growth. New concepts, approaches and applications were proposed and exploited to provide efficient tools for solving a variety of optimization problems in mechanics.

The topics covered in the Symposium included:

- evolutionary methods in shape and topology optimization
- evolutionary methods in size and material optimization

- evolutionary methods in multicriteria optimization
- evolutionary methods in inverse problems of engineering mechanics
- evolutionary methods in biomechanics
- coupling of evolutionary methods and neural networks in mechanics
- methods of artificial intelligence in mechanics based on evolutionary computing
- other unconventional applications in mechanics

Thirty-six oral presentations were delivered during the four days of the Symposium. Judging by the response of the participants the Symposium achieved its aims admirably.

### **c) Countries represented and number of participants**

There have been 50 participants from 18 countries: Belgium, Brasilia, Canada, France, India, Israel, Italy, Japan, Korea, Mexico, Poland, Portugal, Singapore, Slovenia, Spain, Taiwan, UK, USA.

### **d) Publication of Proceedings of the Symposium**

The Proceedings will be published by Kluwer Academic Publishers in 2003 (editors: T. Burczynski and A. Osyczka).

### **e) Financial supports**

Financial support for the Symposium was generously provided by the following organizations:

- The International Union of Theoretical and Applied Mechanics
- Silesian University of Technology in Gliwice
- Cracow University of Technology

### **f) Scientific program**

#### **Opening Session**

G. Szefer (President of the Committee of Mechanics),

M. Chrzanowski (Rector of the Cracow University of Technology), W. Cholewa (Vice Rector of the Silesian University of Technology), T. Burczynski (Co-Chairman), A. Osyczka (Co-Chairman).

### **Session 1**

I.C. Parmee, *A review of the development and application of cluster oriented genetic algorithms.*

V.T. Johnson, S. Ananthramu, B.K B.K. Raghu Prasad, *Genetic algorithm for damage assessment.*

L. Grosset, R.Le Riche, R.T. Haftka, *Accounting for plies coupling in composite laminate statistical optimization via lamination parameters.*

### **Session 2**

A. Długosz , *Evolutionary computation in thermoelastic problems.*

S. Vigdergauz, *Hole shapes in a perforated elastic plate. Genetic algorithm optimization over range of in-plane loads.*

W. Cholewa, *Evolutionary improvement of belief networks for technical diagnostics.*

### **Session 3**

W. Kus, T. Burczynski, *Distributed evolutionary algorithms in optimization of nonlinear solids.*

C-Y. Lin, W-H. Wu, *Adaptive penalty strategies in genetic search for problems with inequality and equality constraints.*

A. Osyczka, S. Krenich, J. Krzystek, J. Habel, *Evolutionary optimization system (EOS) for design automation.*

### **Session 4**

D.E. Grierson, S. Khajepour, *Using evolutionary search to study structural safety.*

S. D'Angelo, M. Fantetti, E. Minisci, *Hang-glider wing design by genetic optimization.*

T. Burczynski, E. Majchrzak, *Evolutionary computation in inverse problems of mechanics and biomechanics.*

### **Session 5**

R.A. Bialecki, M. Król, *Minimum heat losses subjected to stiffness constraints: window frame optimization.*

N.M. Dourado, J.C. Xavier, J.L. Morais, *On the identification of linear elastic mechanical behavior of orthotropic materials using evolutionary algorithms.*

W. Beluch, *Evolutionary computation in crack problems.*

### **Session 6**

G. Dobrowolski, M. Kisiel-Dorohnicki, *Management of evolutionary MAS for multiobjective optimization.*

A. Hernandez-Aguirre, G. Lizarraga-Lizarraga, S. Botello-Rionda, *I-PAES: A multiobjective optimization method with efficient constraint handling in high dimensional space.*

J. Montusiewicz, *Ranking Pareto optimal solutions in genetic algorithm by using the undifferentiation interval method.*

### **Session 7**

A. Muc, W. Gurba, P. Kędziora, *The effectiveness of probabilistic algorithms in shape and topology discrete optimization of 2-D composite structures.*

F.I. de Bustos, J. Aguirrebeitia, V. Gomez-Garay, R. Aviles, *An error function for optimum dimensional synthesis of mechanisms using genetic algorithms.*

S. Krenich, A. Osyczka, *Optimal design of multiple clutch brakes using a multistage evolutionary method.*

### **Session 8**

G. Kokot, P. Orantek, *Topology optimization using evolutionary algorithms.*

R. Filomeno Coelho, P.H. Bouillard, H. Bersini, *PAMUC: A new method to handle with constraints and multiobjectivity in evolutionary algorithms.*

J. Zola, L. Lacinski, R. Wyrzykowski, *An objective oriented library for evolution programs with applications for partitioning of finite element meshes.*

### **Session 9**

A. Kęsy, Z. Kęsy, A. Kądziela, *Parameter estimation of hydrodynamic drive mathematical model with application of genetic algorithm.*

G. Papa, B. Korousic-Seljak, *Evolutionary method for a universal motor geometry optimization.*

R. Rohatynski T. Klekiel, K. Białas-Heltowski, *Investigation of evolutionary algorithm effectiveness in optimal synthesis of certain mechanism.*

### **Session 10**

S. Krenich, *Multicriteria design optimization of robot gripper mechanisms.*

D. Greiner, G. Winter, J.M. Emperador, B. Galvan, *A comparative analysis of „Controlled Elitism“ in the NSGA-II applied to optimization of frames.*

J. Kołodziej, W. Jakubiec, M. Starczak, R. Schaefer, *Hierarchical genetic strategy applied to the problem of identification of the coordinate measuring machine geometrical errors.*

### **Session 11**

A. Muc, P. Saj, *Genetic algorithms in optimization of resin hardening technological processes.*

M. Krawczuk, M. Palacz, W. Ostachowicz, *Genetic algorithm for fatigue crack detection in Timochenko beams.*

P. Orantek, *Hybrid evolutionary algorithms in optimization of structures under dynamical loads.*

### **Session 12**

Z. Hu, G.M. Genin M.J. Jakiela, *Material optimization of aligned fiber laminate composites in the presence of stress concentrations.*

Y.Y. Kim, D.H. Jung, *Multiscale genetic algorithm.*

L.A.C. Poltosi, N. Lemke, A.L. Cehin, *Genetic Algorithms applied to electric transformers design.*

**Report composed by Tadeusz Burczynski**