

**IVAN MALCEVIC**

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**EDUCATION**

**Ph.D. Computational mechanics, Carnegie Mellon University, Pittsburgh, PA, (expected: May 2001)**

Thesis: “Numerical Simulation and Optimization of Systems with Dynamic Boundaries with Application to Biomechanics of Cellular Systems”

Advisor: Associate Professor Omar Ghattas

GPA: 4.0 / 4.0

***Award:***

Graduate Student Conference Presentation Grant, Carnegie Mellon University, October 2000

**M.Sc. Civil Engineering (Computational Mechanics), Carnegie Mellon University, Pittsburgh, PA, 1997**

Thesis: “Large-Scale Unstructured-Mesh Shape Optimization on Parallel Computers”

Advisor: Associate Professor Omar Ghattas

GPA: 4.0 / 4.0

**B.Sc. Civil Engineering, University of Belgrade, Belgrade, Yugoslavia, 1992**

Major: Applied Mechanics and Theory of Structures

Thesis: “Second Order Matrix Analysis of Frame Structures”

Advisors: Professor Miodrag Sekulovic and Associate Professor Nikola Klem

GPA: 9.71 / 10.0

***Honors and awards:***

Ivan Maksimovic Best Diploma Thesis Award, Faculty of Civil Engineering, University of Belgrade, 1992

Jovan Korolija Best Student Award, Faculty of Civil Engineering, University of Belgrade, 1992

Best Student Award, University of Belgrade, 1992

State Foundation for Art and Research Development Fellowship, 1990-1992

University of Belgrade Fellowship, 1988-1989

## RESEARCH INTERESTS

### **Computational Methods:**

Structural engineering, Advanced finite elements methods, Computational fluid and solid mechanics  
Biomechanics of micro/cellular systems, Multiscale modeling

### **Numerical optimization:**

Algorithms for large-scale optimal design, optimization of time dependent problems

### **Computational Geometry:**

Grid/mesh generation and regeneration, adaptive refinement, dynamic unstructured meshes, mesh quality

### **High Performance Scientific Computing:**

Parallel algorithms for large-scale simulation and optimization

### **Scientific Data Visualization:**

Flow visualization for large and distributed data sets

## PROFESSIONAL APPOINTMENTS

### **Carnegie Mellon University, August 1995 - present**

Department: **Department of Civil and Environmental Engineering**

Position: Research and Teaching Assistant

Description: Research on

- computational methods for simulation of systems with dynamic interfaces
- dynamic unstructured finite element meshes for time-dependent problems
- parallel algorithms for large-scale simulation of dynamic systems
- algorithms for parallel shape optimization of mechanical systems

### **Argonne National Laboratory, May-August 1998**

Department: **Mathematics and Computer Science Division**

Position: Summer Student Practical Training Program

Description: Parallel Implementation of Large Scale Reduced SQP Method using PETSc library.

### **University of Belgrade, September 1992 – July 1995**

Department: **Faculty of Civil Engineering and Engineering Computing Center**

Position: Research and Teaching Assistant and Civil Engineering Associate

Description: Research in areas of nonlinear structural analysis, dynamic response, advanced finite elements methods and engineering software development

Various static and dynamic structural simulations, development of graphical interface tools

### **Delft University of Technology, Holland, June-August 1991**

Department: **Faculty of Civil Engineering, Concrete Division**

Position: Summer Student Internship Program

Description: Development and Evaluation of Educational Tools for Concrete Design

## TEACHING EXPERIENCE

### **Carnegie Mellon University, 1995 – present**

Teaching Assistant for Courses:

Statics (12-235) (Spring 1996, 1997, 2001)

Fluid Mechanics (12-355) (Spring 2000)

Solid Mechanics (13-331) (Spring 1998)

Duties included: grading assignments and exams, conducting recitations and occasional lecturing.  
Class size:20-40 students

### **University of Belgrade, 1992-1995**

Teaching Assistant for courses:

Structural Analysis 1 and 2, (1992-1995)

Dynamics and Stability of Structures (1993-1995)

Introduction to Personal Computers (1994-1995)

Introduction to Programming and Numerical Methods (1992-1995)

Duties included: Lecturing, on-board recitations, hands-on lab sessions, preparing and grading assignments and projects, and preparing and grading written and practical exams.

Class size: 30-50 students for structural analysis courses;  
200-400 students for computer oriented courses

Books, handbooks: Wrote several assignment handbooks.  
Wrote chapter in book: “Introduction to Personal Computers”, Chapter: AutoCAD 12,  
Authors: N. Klem, I. Malcevic, N. Perin, N. Prascevic, Faculty of Civil Engineering, 1996

### **Honors:**

Voted second in the category Teaching Assistant in Annual student evaluation of faculty and teaching assistants, Faculty of Civil Engineering, University of Belgrade, 1995 (from the body of 400 faculty and teaching assistants)

## PROJECTS and SUPPORT

### **TAOS**

**Terascal Algorithms for Optimization of Simulations**, (NSF grant NAG-1-2090 and NASA/Sandia ECS-9732301 contract).(\$750,000) September 1998-September 2001. PIs: O. Ghattas and L. T. Biegler, Carnegie Mellon University. Development and implementation of parallel scalable algorithms for large-scale optimal control and shape optimization. Results from my work on parallel shape optimization for large-scale problems were included in the proposal. Current activities include parallel optimal design of incompressible viscous flows with application to design of artificial heart device.

### **Sangria**

**Micro-structural Blood Flow Simulation**, NSF-ITR 2000 award No. 0086093. (\$3,100,000) Joint effort of Carnegie Mellon University, University of Pittsburgh Medical Center and University of Washington. PI: Omar Ghattas. Simulation of flows with dynamic interfaces on multi-teraflop computers. Motivating application: Micro-structural blood flow modeling in heart-assist devices. Multidisciplinary research program based on advances in computational mechanics, applied mathematics, computer science, biomechanics and hemodynamics. Computational section of the proposal was based on my Lagrangian dynamic-mesh CFD simulations. Current activities include investigating the micro-structural blood flow behavior, modeling the fluid-solid interaction, extension to 3D flows, and shape optimization.

## **PUBLICATIONS AND PRESENTATIONS**

### **Refereed journals, peer-reviewed conferences and book chapters**

J. F. Antaki, G. Blelloch, O. Ghattas, I. Malcevic, G. Miller, N. Walkington, "**A Parallel Dynamic Mesh Lagrangian Method for Simulation of Flows with Dynamic Interfaces**", In Proceedings of Supercomputing 2000, Dallas, TX, November 04-10, 2000

N. Klem, I. Malcevic, N. Perin, N. Prascevic, "**Introduction to Personal Computers**", Book, Faculty of Civil Engineering, University of Belgrade, 1996, Chapter: **AutoCAD 12**, pages: 135

M. Sekulovic, I. Malcevic, "**Second-Order Analysis of Frame Structures**", Theoretical and Applied Mechanics, Vol: 20, pp: 209-234, 1994

M. Sekulovic, I. Malcevic, "**Influence of the Bowing Effect in the Second-Order Analysis**", Facta Universitas, vol: 1, pp: 6-13, 1994

### **Other conference articles**

O. Ghattas, I. Malcevic, "**Parallel Dynamic Mesh Methods With Application to Lagrangian Flow Simulation With Moving Boundaries**", In Proceedings of 7<sup>th</sup> International Conference on Numerical Grid Generation in Computational Field Simulations, Whistler, Canada, September 25-28, 2000

M. Sekulovic, Z. Prascevic, I. Malcevic: "**Nonlinear Analysis of Reinforced-Concrete Frame Structures**", In Proceedings of XXI National Congress in Theoretical and Applied Mechanics, Nis, Yugoslavia, Jun 1995

### **Contributing conference presentations**

O. Ghattas, I. Malcevic, "**Performance and Scalability of Parallel Reduced SQP for Large Scale Optimal Design**", Contributed presentation, 6-th SIAM Conference on Optimization, Atlanta, April 9-12, 1999

G. Blelloch, O. Ghattas, I. Malcevic, G. Miller, N. Walkington, "**A Parallel Dynamic Mesh-Based Lagrangian Method for Viscous Incompressible Flows**", 5<sup>th</sup> United States National Congress of Computational Mechanics, Boulder, Aug. 04-06, 1999

### **Submitted publication**

O. Ghattas, I. Malcevic, "**Pressure Stabilized Variational Formulation for Lagrangian Simulation of Incompressible Viscous Flows**", Submitted to 15<sup>th</sup> AIAA Computational Fluid Dynamic Conference, Anahaim, 11-14 Jun, 2001

### **Publication in preparation**

O. Ghattas, I. Malcevic, "**Parallel Lagrangian Finite Element Method for Viscous Incompressible Flows with Deformable Boundaries**", In Preparation

## SOFTWARE

Ivan Malcevic, Miodrag Sekulovic, “**NAK-2 – Computer Program Package for Nonlinear Analysis of Frame Structures**”, University of Belgrade, 1993

Ivan Malcevic, “**Revision of take-off lane at Niznevartovsk airport, Siberia, Russia: Graphical postprocessor for multi-layer system behavior analysis**”, Faculty of Civil Engineering, University of Belgrade, 1993

## PROFESSIONAL ACTIVITIES

### Conferences

Symposium on Contemporary Problems in Nonlinear Analysis, Kopaonik, March 1993, Yugoslavia, Organizing Committee Member

### Membership in Professional Organizations

Association for Computing Machinery  
Society for Industrial and Applied Mathematics  
United States Association for Computational Mechanics  
International Society for Grid Generation

## COMPUTATIONAL EXPERIENCE

Computational Science and Engineering:

Finite elements, Optimization, Computational geometry, CFD, Parallel computing

High Performance Computing: Cray MPP platforms (T3E, T3D), C90, IBM-SP

Languages: c, c++, FORTRAN, Lisp

Software: Engineering (ABAQUS, ANSYS, Algor) CAD/Visual (AutoCAD, AVS, VTK), MATLAB, ...

## RELEVANT GRADUATE COURSEWORK

### Computer Science

Fundamental Structures in Computer Science 1  
Introduction to Geometry  
Algorithms for Scientific Computing  
Parallel Algorithms

### Mathematics

Introduction to Continuum Mechanics  
Introduction to Functional Analysis (U. of Belgrade)  
Numerical Methods (Univ. of Belgrade)

### Civil/Mechanical Engineering

Finite Elements in Mechanics 1, 2  
Optimization in Mechanics  
Introduction to Solid Mechanics 1  
Geometric Modeling  
Fluid Mechanics  
Computational Fluid Mechanics 1, 2  
Advances in Computational Mechanics  
Earthquake Engineering and Soil Mechanics  
Vibrations of Elastic Systems  
Computational Design Tools