

# Biographical Sketch -- Zoran Popovic

## Education / Awards

- **Carnegie Mellon University**, Pittsburgh, PA.
  - **M.S.**, May 1993.
  - **Ph.D.**, Computer Science, April 1999.
  - Ph.D. Dissertation: "Motion Transformation by Dynamic Spacetime Optimization"
  - Thesis committee: Andrew Witkin (chair), David Baraff, Paul Heckbert, Matt Mason, Michael Cohen (Microsoft Research)
  - Schlumberger Research Fellowship, 1995-99
- **Brown University**, Providence, RI.
  - **B.S. with Honors**, Computer Science, June 1991.
  - Honors Thesis: "Distributed Ray Tracer -- Performance Issues for the Loosely-Coupled Networked Implementation."
  - Cumulative undergraduate GPA: 3.7 (4.00 within major)
  - Brown University Scholarship 1987-89
  - Baxter-Travenol Scholarship 1990-91 (merit-based full-tuition scholarship)
  - Elected to Sigma Xi, 1991

## Work Experience

### Assistant Professor

University of Washington, Department of CSE (October 1999-)

### Research Associate

University of Washington, Department of CSE (July - September 1999)

### Computer Graphics Researcher

Justsystem Pittsburgh Research Center (summer 1997)

### Research Associate

University of California at Berkeley, Department of Integrative Biology (summer 1996)

### Computer Graphics Software Engineer

Sun Microsystems - Advanced Technology Group (summers of 1990,1991,1992)

### Computer Graphics Research Assistant

Brown University Computer Graphics Group under Andries van Dam (1990-91)

## Research Projects / Systems Developed

- 1996-1999 **Motion Transformation through Spacetime Optimization**  
Developed an algorithm which transforms animation sequences while preserving dynamic properties of motion. The algorithm enables user to edit motion by changing high-level properties such as: foot positions, gravity, amount of floor impact or energy used. The motion can also be mapped onto drastically different characters. This method can also be used as a filter to make arbitrary motion look more realistic. Applications to computer animation and robotics. Ph.D. thesis work.
- 1996 **Optimality in Naturally Occurring Motion**  
Analyzed the optimality of the running gait of the South American cockroach ( *Blaberus discoidalis* ). Discovered that minimizing joint breaking forces dominates energy consumption for analyzed motion sequences. Work with Dr. Full at UC Berkeley.
- 1995-96 **2D Spacetime World**  
Developed a mass-spring simulation world which solves spacetime constraints problems at *realtime* speeds. The user can interact with the animated character, constraints and the objective and explore the optimal motion solutions. Work with Andy Witkin.
- 1994-95 **Motion Warping**

Developed an algorithm for editing captured motion sequences by defining key poses ( keyframes). Nearly all current commercial motion capture editing tools use this algorithm. Work with Andy Witkin.

1992-93 **Protein Bundling Simulation**

Implemented a simulation of actin filament growth from G-actin monomers. Upon getting close to each other monomers form chemical bonds. Eventually a distinct protein macro-structure emerges. The goal of the simulation is to understand the dependency of simulation parameters on the actin filament length.

1992-93 **Rapid simulation of Proximal-Interaction Particle Systems**

Designed a fast, general algorithm for simulating particle systems that are based on interactions between nearby particles. This method uses probabilistic distributions to extract spatio-temporal bounds on particles' motions without any a priori knowledge of their behavior. In addition to significantly speeding up the underlying spatial subdivision algorithms, statistical bounds provide a way to adjust the integration time step to reduce inaccuracy.

1992 **Edge of Intention**

An interactive animated art piece primarily designed as a demonstration of creating believable characters for simulated worlds. The characters have individual personalities, they display emotions, they engage in social behaviors, and they react to their dynamic environment. This piece was shown at the AAAI-92 Art Exhibit and SIGGRAPH-93, and is on permanent display at the Computer Museum in Boston, MA. Work with the Oz group lead by Joe Bates.

## Refereed and Invited Publications

- [1] Zoran Popovic "Changing Physics in Realistic Computer Animation." to appear in *Communications of ACM (CACM)* July 2000.
- [2] Zoran Popovic "Editing Dynamic Properties of Captured Human Motion." in *ICRA 2000*.
- [3] Zoran Popovic and Andy Witkin "Physically Based Motion Transformation." in *Computer Graphics (SIGGRAPH)* 1999.
- [4] Andy Witkin and Zoran Popovic "Motion Warping." in *Computer Graphics (SIGGRAPH)* 1995.
- [5] Zoran Popovic "Distributed Ray Tracer -- Performance Issues for the Loosely-Coupled Networked Implementation." in *SUG Conference Proceedings* 1990.

## Professional Activities / Teaching

- 2000 Computer Animation 2000. Program Committee.
- 2000 SIGGRAPH'00 Course Organizer, *Animating Humans by Combining Simulation and Motion Capture*  
Organized a full day advanced level course on combining dynamics and motion capture for character animation. Six experts in the field are invited to give lectures.
- 2000 SIGGRAPH'00 Course Speaker, *Motion Editing: Principles, Practice and Promise*  
Full day advanced level course on the current state of motion editing algorithms and how they are used in production.  
*Lectures on mathematical techniques for motion editing*
- 1999 SIGGRAPH'99 Course Speaker, *Motion Editing: Principles, Practice and Promise*  
Full day advanced level course on the current state of motion editing algorithms and how they are used in production.  
*Lecture on editing techniques that preserve dynamic integrity of motion*
- 1996- Paper Referee:
  - Graphics Interface (2000)
  - SIGGRAPH (1999, 1998, 1997, 1996)
  - IEEE Transactions on Visualization and Computer Graphics (1997)
  - Journal of Graphics Tools (1997)