

# CURRICULUM VITAE

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## Education:

1998-2004 Ph.D. in Computer Science, Stony Brook University (August)  
1995-1998 M.S. in Computer Science, Tsinghua University, China  
1991-1995 B.S. in Computer Science, Beijing University of Aeronautics and Astronautics, China

## Research Experiences:

2000-Present **Research Assistant** **Ph.D. thesis: Lattice Based Natural Phenomena Modeling**  
**Advisor: Professor Arie Kaufman**

Design and implement a new lattice based framework to simulate the dynamic behaviors of fluid flow, such as the cloud, wind, smoke and fire, etc., supported by ONR grant. The physically accurate modeling of fluid phenomena plays an important role both in virtual environment simulation and national security applications. Traditional methods based on the numerical solutions of the partial differential equations are computationally expensive and it is also difficult for users to interact with the fluid flow in a physically correct manner. This thesis proposes the use of Cellular Automata (CA) and Lattice Boltzmann Model (LBM) as the underlying physical models. The LBM satisfies the widely used incompressible Navier-Stokes equations globally, achieving physically accurate fluid behavior. It can also handle complex boundary obstacles and dynamic moving boundary objects easily, allowing users to interact with the flow. The linear and local computation of CA and LBM lends itself to acceleration on commodity graphics hardware, giving us a real-time simulation speed. For time critical applications, such as emergency response, which requires both physically accurate simulation and visually realistic result, we implement a two-tier framework based on a low-resolution computation grid and high-detailed texture splats. Based on the work in this thesis, substantially contributed to the NSF ITR proposal "Programmable Lattice: Visual Simulation and Scientific Computation on Graphics Hardware" and the ONR proposal "Visual Simulation of Gaseous Phenomena in Pervasive Environments".

1999-2000 **Research Assistant: Information Visualization**

Design and implement the *Particle Track Information Visualization System for Relativistic Heavy Ion Collider (RHIC) project at the Brookhaven National Lab (BNL)*, supported by the Center for Data

Intensive Computing at BNL. RHIC is the first instrument that scientists have built to use heavy ion collisions to understand how the Universe comes into being. In each heavy ion collision, thousands of new particles are generated, moving at various speed and curvature. Due to the complexity of the data set and the serious 3D overlapping problem, physicists need a fundamentally new tool to help them observe and understand the data better. Based on volume rendering and 3D fisheye view techniques, our system can modify the intensity value at different parts and magnify range of interests, assisting scientists to extract meaning information from this high-energy physical collision data. New feature representation model such as the spreadsheet, parallel coordinate and NURBS model can be incorporated into the system easily. The research in this work contributed to the NSF proposal “Consortium for Visualization and Perception from Reciprocal Space”.

**1996-1998 Master Thesis: The Design and Implementation of the 3-D Virtual Studio and the Research on Augmented Virtual Reality**

This thesis is part of the *Robot Virtual Reality System Project*, supported by the National “863” High-Tech Development Foundation, P. R. China. In charge of the dynamic display and kinematics simulation of more than 40 kinds of geometric robotic models, the stereo display, the navigation of the virtual environment and the collision detection between several moving objects. Users can use data gloves to arrange the location for various robot models, design the layout of the factory and observe the simulation interactively. The system is used by vehicle manufactures in China. It makes the new vehicle model design and testing simple and easy.

**1996-1997 Research Assistant: Augmented Reality**

Took part in the *Predictive and Perspective Display for National Key Project “Tele-robotic System with Large Time Delay”*, supported by the National “863” High-Tech Development Foundation, P. R. China. In this work, I implemented the camera calibration, the static and dynamic overlapping between camera images and 3D graphical models. Due to the enormous distance between the outer space and the earth, there will be a 4 seconds’ time delay before the image from the space station arrives at the control room on earth. This has a critical effect on controlling the movement of robots in space. The work predicts the behavior of robotic models; overcomes the distortion in camera image and modifies their locations based on real image information, helping scientists to solve the problem with large time delay.

**1994-1995 Research Assistant: Artificial Intelligence**

Took part in the design and implementation of *ADA Intelligent Simulation Package*. It is the first expert system with forward reasoning and backward reasoning based on ADA language in China. By setting certain rules, the system can deduct conclusions automatically and demonstrate the result with graphics animations. Also finished a simulation system for aircraft maintenance using this package.

**Teaching Experience and Oral Presentation:**

- 2003. 7      Presentation: Blowing in the Wind  
                  --ACM Symposium on Computer Animation 2003, San Diego, CA
- 2003. 5      Presentation: Melting and Flowing of Viscous Volumes

- 2002.10 --Computer Animation and Social Agents 2003, Rutgers University, NJ  
Presentation: Simulating Fire with Textured Splats  
--IEEE Visualization 2002, Boston, MA
- 2001.10 Presentation: Case Study-Visualization of Particle Track Data  
--IEEE Visualization 2001, San Diego
- 1999.3 Discrete Mathematics  
--Basic mathematics background Course for first year undergraduate student at the  
Computer Science Department, Stony Brook University
- 1998.10 Software Engineering  
--Course for the senior undergraduate student at the Computer Science Department,  
Stony Brook University

### Honors and Awards:

- Stony Brook University Graduate Student Scholarship, 1998-Present
- Second Prize of Technology Breakthrough Awards, National Education Bureau of China, 1997
- First Prize of the Motorola Scholarship of Tsinghua University, 1996
- First Prize of the President Awards, Beijing University of Aero. and Astro., 1991-1994
- Scholarship for Outstanding Student, Computer Science Department, Beijing University of Aeronautics and Astronautics, 1991-1994

### Publications:

#### A. Journal Papers:

1. **Xiaoming Wei**, Y. Zhao, F. Zhe, W. Li, F. Qiu, S. Y. Stover and A. Kaufman, "Lattice-based Flow Field Modeling", to appear in *IEEE Transactions on Visualization and Computer Graphics*, (TVCG)
2. **Xiaoming Wei**, W. Li, K. Mueller and A. Kaufman, "The Lattice Boltzmann Method for Gaseous Phenomena", *IEEE Transactions on Visualization and Computer Graphics*, (TVCG), vol. 10, no. 2, March/April 2004, pp. 164-176
3. W. Li, **Xiaoming Wei** and A. Kaufman, "Implementing Lattice Boltzmann Model with Graphics Hardware", *The Visual Computer*, vol. 19, no. 7-8, December 2003, pp. 444-456

#### B. Referred Conference Papers:

1. W. Li, Z. Fan, **Xiaoming Wei** and A. Kaufman, "GPU-Based Flow Simulation with Complex Boundaries", submitted for publication
2. **Xiaoming Wei**, F. Qiu, W. Li, S. Y. Stover and A. Kaufman, "Visual Simulation of Chemical Garden", submitted for publication
3. F. Qiu, Y. Zhao, Z. Fan, **Xiaoming Wei**, H. Lorenz, J. Wang, S. Yoakum-Stover, A. Kaufman and K. Mueller, "Accelerated Dispersion Simulation For Urban Security", to appear in *IEEE Visualization 2004*
4. Y. Zhao, Y. Han, Z. Fan, F. Qiu, **Xiaoming Wei**, S. Yoakum-Stover, A. Kaufman and K. Mueller, "Thermal Flow Modeling", submitted for publication

