

# Kai Wang

Department of Computer Science  
University of South Dakota  
734 Ratingen Strasse #317  
Vermillion, SD 57069

Phone: (605) 214-0797  
Email: [Kai.Wang@usd.edu](mailto:Kai.Wang@usd.edu)  
Homepage: <http://www.usd.edu/~Kai.Wang>

## Research Interests

High performance computing

Computational methods

## Professional Background

### Assistant Professor

Computer Science Department, University of South Dakota. 2006 - present.

### Research Associate

Parallel Programming Lab, University of Illinois at Urbana-Champaign. 2003 - 2005.

### Research Assistant

Computer Science Department, University of Kentucky. 2000 - 2003.

### Instructor

Computer Science Department, Qingdao University. 1997 - 1999.

## Educational Background

**Ph.D.** Computer Science, University of Kentucky. December, 2003.

Dissertation: High Performance Preconditioning Techniques

**M.S.** Computer Science, Shandong University, China, September, 1997.

Thesis: 3-D Fast Volume Rendering Algorithms.

**B.S.** Computational Mathematics, Shandong University, China, September, 1994.

## Courses Taught

High Performance Computing (Graduate), Machine Organization (Undergraduate), Advance Java Programming (Undergraduate), Data structure (Undergraduate), Discrete Mathematics (Undergraduate).

## Academic Service

2006 present: Serve on College Curriculum and Instruction Committee at the University of South Dakota.

## Software

**DemoBuilder.** Windows capturing, recording, and editing solution.

**MSP packages.** Parallel multistep successive sparse approximate inverse preconditioning for solving general sparse linear systems.

**MMSP packages.** Parallel multilevel sparse approximate inverse preconditioning for solving general sparse linear systems.

## Selected Papers

Xiuhua Ji, Caiming Zhang, and **Kai Wang**. *A Fast 2D 8\*8 Discrete Cosine Transform Algorithm*. Submitted.

**Kai Wang**. *The Parallel Performance of Sparse Approximate Inverse Preconditioning Based on Processor Virtualization*. Submitted.

**Kai Wang**, Rui Wang. *Nonsingularity Study of SAI Preconditioners for M-matrices*. **The 2009 International Conference on Scientific Computing, CSC'09**: July 13-16, 2009.

**Kai Wang**, Rui Wang, Yanyan Liu. *All Shortest Path 2-Interval Routine is NP Complete*. To appear in **Journal of Applied Mathematics and Computing**. 2009.

Xiuhua Ji, Caiming Zhang, and **Kai Wang**. *A Fast Two-Dimension 4\*4 Inverse Inverse Integer Transform Algorithm for Real-Time H.264 Decoder*. **International Journal of Innovative Computing, Information and Control**, Vol 5(3), pp. 689-696, 2009.

**Kai Wang**, and Asai Asaithambi. *A Parallel Multigrid Solver Based on Processor Virtualization*. **International Conference on Parallel and Distributed Processing. Techniques and Applications, PDPTA' 07**, Las Vegas. 2007.

**Kai Wang**, and Laxmikant Kale. *Parallelization of levelset methods for dendritic growth*. **Journal of Parallel and Distributed Computing**, Vol. 66, 1379-1386. 2006.

**Kai Wang**, Jun Zhang, and Chi Shen. *A Class of Parallel Multilevel Sparse Approximate Inverse Preconditioners for Sparse Linear Systems*. **Scalable Computing: Practice and Experience**, Vol 7(2), pp. 93-106. 2006.

Chi Shen, Jun Zhang, and **Kai Wang**. *Distributed Block Independent Set Algorithm and Parallel Multilevel ILU Preconditioners*. **Journal of Parallel and Distributed Computing**, Vol. 65, pp. 331-346. 2005.

**Kai Wang.** *Sparse Approximate Inverse Preconditioning Based on Processor Virtualization.* **Charm++ Workshop 2004**, Champaign, IL, Aug, 2004.

**Kai Wang**, and Jun Zhang. *MSP: A Class of Parallel Multistep Successive Sparse Approximate Inverse Strategies.* **SIAM Journal on Scientific Computing**, 24(4):1141–1156, 2003.

**Kai Wang**, S. B. Kim, J. Zhang, K. Nakajima, and H. Okuda. *Global and localized parallel preconditioning techniques for large scale solid Earth simulations.* **Future Generation Computer Systems**, 19(4):443–456, 2003.

**Kai Wang**, Sangbae Kim, and Jun Zhang. *A Comparative Study on Dynamic and Static Sparsity Patterns in Parallel Sparse Approximate Inverse Preconditioning.* **Journal of Mathematical Modeling and Algorithms**, 2(3): 203–215, 2003.

**Kai Wang**, and Jun Zhang. *Multigrid treatment and robustness enhancement for factored sparse approximate inverse.* **Applied Numerical Mathematics**, 43(4): 483–500, 2002.

**Kai Wang.** *Parallel Multilevel Sparse Approximate Inverse Preconditioners in Large Sparse Matrix Computations.* In **Proceedings of the 2003 ACM/IEEE conference on Supercomputing**, pp 1-17, 2003.

**Kai Wang**, Jun Zhang, and S. Kim. *Global and Localized Parallel Preconditioning Techniques.* In **proceedings of IEEE 17th International Parallel and Distributed Processing Symposium**, April 22 - 26, 2003, Nice, France.

C.Shen, J.Zhang, and **Kai Wang** *Parallel Multilevel Block ILU Preconditioning Techniques for Large Sparse Linear Systems.* In **proceedings of IEEE 17th International Parallel and Distributed Processing Symposium**, April 22 - 26, 2003, Nice, France.

**Kai Wang**, and Jun Zhang. *Robust parallel preconditioning techniques for solving general sparse linear systems.* In **Proceedings of the 2002 International Symposium on Distributed Computing and Applications to Business, Engineering and Science**, pp. 109-113, 2002.

**Kai Wang**, and Jun Zhang. *Robust parallel matrix preconditioning through successive sparse approximate inverse.* In Abstracts of the 2nd International Workshop on Parallel Matrix Algorithms and Applications, Neuchâtel, Switzerland, November 7 - 10, 2002, pp. 59.

**Kai Wang**, and Jun Zhang. *A class of new parallel preconditioning strategies for solving large sparse Linear Systems.* In **Proceedings of The International Conference on Parallel and Distributed Processing Techniques and Applications**. pp. 199-205, Las Vegas, Nevada. June 24-27, 2002.

**Kai Wang**, and Jun Zhang. *Parallel multilevel sparse approximate inverse preconditioners for solving large sparse linear systems.* In Abstracts of SIAM 50th Anniversary and 2002 Annual meeting, pp134, Philadelphia, PA. July 8-12, 2002.

**Kai Wang**, and Jun Zhang. *Multistep sparse approximate inverse preconditioning strategies*. In Proceedings of 2002 Copper Mountain Conference on Iterative Methods. March 24-29, 2002.

**Kai Wang**, and Jun Zhang. *Parallel multistep sparse approximate inverse Preconditioning Strategies for General Sparse Matrices*. Bay Area Scientific Computing Day, March 2, 2002.

Jun Zhang, **Kai Wang**, and Chi Shen. *Parallel preconditioning techniques for solid earth simulation*. In Abstracts of Workshop on Scalable Solver Software 2002: Multiscale Computing and Computational Earth Science”, pp. 23 – 24, December 3 - 5, 2001, Tokyo, Japan.

**Kai Wang**, and C. M. Zhang. *The Improvements of neural network methods to reconstruct the freeform surface*. In **Proceedings of International Conference on Manufacturing Automaton 1997**. HongKong, 672-679. April 28, 1997.

**Kai Wang**, and C. M. Zhang. *Neural network methods to reconstruct the freeform surface*. Chinese **Journal of Computer Aided Design and Computer Graphics**, 10(3): 193-199, 1998.

**Kai Wang**, and D. M. Zhu. *A research on the complete stability of DCNN*. Chinese **Pattern Recognition and Artificial Intelligence**, Vol. 10, No. 4, 310-316, 1997.

## Invited Talks

**Kai Wang**. *High Performance Computing Research Review*. Shandong University, Shandong, China, July 12, 2006.

**Kai Wang**. *Processor Virtualization for High Performance Computing*. Intel Corporation, San Jose, May 18, 2005.

**Kai Wang**. *High Performance Computing in Biomolecular Simulation*. National Institute of Health, DC, July 12, 2005.

## Book

Rui Wang, and **Kai Wang**. *C and C++ Techniques*. People’s Post and Telecom Press. July, 1999.

## Funding Experience

*Getting American Indians to Information Technology*. CO-PI: Kai Wang. Funding source: U.S. NSF. Budget:\$500000. 2008.

NASA Travel Funding Award. \$2000. 2008.

*Enhance the Performance of ACTS by Processor Virtualization.* PI: Kai Wang. Funding source: Governor 2010 Research Grant Award. Budget: \$54166. 2007.

*Building a High Performance Bioinformatics Cluster.* PI: Kai Wang. Funding source: NIH SD Brin. Budget: \$25000. 2007.

*Performance Improvements of ACTS with Processor Virtualization.* Development Project of NSF TeraGrid. ASC070018T, 20000SUS. 2007.

*Theoretical Study of High Performance Preconditioning Methods.* PI: Kai Wang Contract No: 60673151 Funding Source: China National Science Foundation. Budget: \$47,500. 2006.

*High Performance Computing Techniques for Rendering Medical Images.* PI: Kai Wang Contract No: 60403036 Funding Source: China National Science Foundation. Budget: \$41,500. 2004.