

Arman Pazouki

Curriculum Vitae

<http://armanpazouki.github.io/>
<https://sbel.wisc.edu>

E: pazouki@wisc.edu
4150 Mechanical Engineering Building
1513 University Ave, Madison, WI 53706

FORMAL EDUCATION

PhD 2014 Mechanical Engineering, University of Wisconsin-Madison
M.S. 2013 Engineering Mechanics, University of Wisconsin-Madison
M.S. 2008 Mechanical Engineering, Sharif University of Technology, Iran
B.S. 2005 Mechanical Engineering, University of Tehran, Iran

POSITIONS HELD

UNIVERSITY OF WISCONSIN-MADISON

2009 – PRESENT

Assistant Scientist (since 2015)
Research Associate (2014-2015)
Research Assistant (2009-2014)
Teaching Assistant (2010-2014)

MSC SOFTWARE CO., ANN ARBOR, MI

2012

Research Intern

By developing modules in Mathematica and Maple, I analytically formulated and validated the ADAMS software's solver using problems with up to 10 degrees of freedom. I also implemented a new contact detection in ADAMS software relying on a high performance computing approach.

CATERPILLAR INC., PEORIA, IL

2011

Research Intern

By leveraging a high performance computing approach and implementing a penalty based contact detection in Chrono, I simulated a soil excavation process using a Caterpillar excavator prototype. As a part of this project, I analyzed the performance and accuracy of two different frictional contact models, namely Penalty and Differential Variational Inequality, in a real soil excavation process.

PROFESSIONAL MEMBERSHIPS

American Society of Mechanical Engineers
American Physical Society
Society of Industrial and Applied Mathematics

RESEARCH EXPERIENCE

Fluid-Solid Interaction (FSI): modeling, simulation, and analysis
Multibody Dynamics (MBD); Computational MBD; flexible body dynamics, friction, and contact
High performance computing
Granular material: modeling, simulation, and analysis
Computational Fluid Dynamics (CFD): mesh-based and mesh-free
Lattice Boltzmann Method (LBM); Smoothed Particle Hydrodynamics (SPH)

TEACHING EXPERIENCE

Instructor: Dynamics (2011-2014)
Teaching Assistant: Dynamics (2010-2011), High Performance Computing (2011), Dynamic Systems (2010)

SELECTED COURSES

Computational Fluid Dynamics, Advanced Multibody Dynamics, Modeling and Simulation of Two-phase Flows, Advanced Structural Dynamics, Advanced Vibration, Nonlinear Dynamics and Chaos, Data Structures, Linear Programming.

HONORS AND AWARDS

Eckrose Innovation Award, 2015
Fellow of the Teaching Academy, University of Wisconsin-Madison, 2014
Conference travel awards for attending ASME and ICMMES conferences, 2014
Best MS thesis, Mechanical Eng. Dept., Sharif University of Tech., Tehran, Iran, 2008
1st Rank and gold medal in the 10th National Mechanical Engineering Olympiad, Iran, 2005
3rd Rank in Mechanical Engineering M.Sc. Entrance Exam amongst 8000 graduate students, Iran, 2005

PUBLIC PROJECTS

PROJECT CHRONO (<http://chronoengine.info/chronoengine/>)

Chrono is a suite of open-source softwares for the investigation of MBD problems. I have been one of the main developers of Chrono and the lead developer of Chrono::FSI, an open-source software for the simulation of the fluid-solid interaction problems involving larger domain deformation and free surface flow. Chrono has been used in projects offered by US Army TARDEC, Oshkosh Truck, NASA, Caterpillar, MSC Software, and Statoil.

GPUSPH-CHRONO (<https://github.com/gpusph/gpusph>)

GPUSPH is an open-source CUDA implementation of the weakly-compressible Smoothed Particle Hydrodynamics (SPH), which is developed by several contributors from US and Europe. Relying on my background on SPH and Chrono, I helped adding Chrono functionality for multibody dynamics into GPUSPH to provide a framework for the simulation of fluid-solid interaction problems. The changes will appear in the next release of the code.

SKILLS

Programming: C/C++, Java, MATLAB, CUDA (library, gdb, memcheck), NVIDIA Visual Profiler, MPI, OpenMP, Cusp, Armadillo, MKL, Pardiso. JavaScript

Software: Ansys, SolidWorks, AutoCAD/Mechanical Desktop, Mathematica, Maple, ADAMS, Paraview.

Tools: cmake, version control with git, mercurial, and svn

SELECTED INVITED TALKS

1. “High-Powered Computer Simulation Speeds Truck Design,” University of Wisconsin-Madison “Wednesday Nite @ the Lab” series and Wisconsin Public Television, October 14, 2015 (available online: http://www.biotech.wisc.edu/webcams/?lecture=20151014_1900)
2. “Chrono Fluid-Solid Interaction,” Machine-Ground Interaction Consortium, Madison, WI, May 2015.
3. “Chrono: An open-source multibody dynamics simulation framework,” Intuitive Machines, Houston, TX, October 2014.
4. “Chrono Fluid-Solid Interaction,” Caterpillar Inc., Peoria, IL, July 2014.
5. “Improving ADAMS contact detection algorithm,” MSC Software Co., Ann Arbor, MI, August 2013.
6. “Comparing penalty and complementarity approaches for the simulation of a soil excavation,” Caterpillar Inc., Peoria, IL, September 2012.

TECHNICAL REVIEWER FOR PROFESSIONAL PUBLICATIONS

Mathematics and Computers in Simulation
Journal of Mechanical Science and Technology
International Journal of Vehicle Performance
Several ASME conferences

PUBLICATIONS

BOOK CHAPTERS

1. A. Tasora, R. Serban, H. Mazhar, A. Pazouki, D. Melanz, J. Fleischmann, M. Taylor, H. Sugiyama, and D. Negrut, Chrono: An open source multi-physics dynamics engine, Springer, 2015 (submitted).
2. A. Pazouki, R. Serban, and D. Negrut, A Lagrangian-Lagrangian framework for the simulation of rigid and deformable bodies in fluid, Multibody Dynamics: Computational Methods and Applications, ISBN: 9783319072593, Springer, 2014.
3. H. Mazhar, T. Heyn, D. Melanz, A. Pazouki, A. Bartholomew, D. Negrut, Paramsothy Jayakumar, and Alessandro Tasora, Accelerating multibody simulation and visualization GPU computing, Advances in Computers and Information in Engineering Research, ASME, 2014.
4. D. Negrut, A. Tasora, M. Anitescu, H. Mazhar, T. Heyn, and A. Pazouki, Solving large multibody dynamics problems on the GPU, GPU Gems 2. ISBN: 9780123859631, Morgan Kaufmann Publishers, 2011.

JOURNAL PAPERS

1. B. Song, A. Pazouki, T. Pöschel, Instability of SPH applied to Poiseuille flow, New Journal of Physics, 2015. (submitted).
2. H. Mazhar, M. Aanjaneya, A. Pazouki, P. Jayakumar, E. Sifakis, and D. Negrut, A comparison of four approaches for characterizing fording operations, Computers and Fluids, 2015. (submitted).
3. A. Pazouki, D. Negrut, Numerical investigation of microfluidic sorting of microtissues, Computers and Mathematics with Applications, 2015.
4. A. Pazouki and D. Negrut, A numerical study of the effect of particle properties on the radial distribution of suspension in pipe flow, Computers and Fluids, 2015.

5. A. Pazouki R. Serban, and D. Negrut, A high performance computing approach to the simulation of fully resolved coupled fluid-multibody dynamics systems with free surfaces, *Archive of Mechanical Engineering*, 2014.
6. H. Mazhar, T. Heyn, A. Pazouki, D. Melanz, A. Seidl, A. Bartholomew, A. Tasora, and D. Negrut, Chrono: A parallel multi-physics library for rigid-body, flexible-body, and fluid dynamics, *Mechanical Sciences*, 2013.
7. A. Pazouki, H. Mazhar, and D. Negrut, Parallel collision detection of ellipsoids with applications in large scale multibody dynamics, *Mathematics and Computers in Simulation*, 2012.

CONFERENCE PAPERS AND PRESENTATIONS

1. W. Savoie, A. Pazouki, D. Negrut, and D. Goldman, Smarticles: design and construction of smart particles to aid discovery of principles of smart, active granular matter, *Proceedings of the International Symposium on Swarm Behavior and Bio-Inspired Robotics*, 2015, Kyoto, Japan..
2. A. Pazouki and D. Negrut, A fluid-multibody dynamics framework for the investigation of the subsea problems, *ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE)*, 2015, Boston, Massachusetts.
3. A. Pazouki, H. Mazhar, M. Aanjaneya, P. Jayakumar, E. Sifakis, and D. Negrut, A comparative study of four fluid-solid coupling methods for applications in ground vehicle mobility, *European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS)*, 2015, Barcelona, Spain.
4. A. Pazouki, Multiphysics simulation using GPU, *GPU Technology Conference*, 2015, San Jose, California.
5. A. Pazouki, R. Serban, and D. Negrut, A fluid-solid interaction approach for the simulation of rigid and deformable bodies in Newtonian fluid, *Proceedings of the ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE)*, 2014, Buffalo, New York.
6. A. Pazouki, D. Negrut, Numerical investigation of flow cytometry using a microfluidic technique, *11th International Conference on Mesoscopic Methods in Engineering and Science (ICMMES)*, 2014, New York City, New York.
7. H. Mazhar, R. Serban, D. Melanz, A. Pazouki, D. Kaczmarek, P. Jayakumar, A. Tasora, and D. Negrut, Chrono: An Open Source Parallel Simulation Framework for Many-Body Dynamics Applications, *17th U.S. National Congress on Theoretical and Applied Mechanics (USNCTAM)*, 2014, East Lansing, Michigan.
8. A. Pazouki, R. Serban, and D. Negrut, A fluid-solid interaction approach for the simulation of polymer motion in Newtonian fluid, *3rd Joint International Conference on Multibody System Dynamics (IMSD)*, 2014, Busan, Korea.
9. A. Pazouki and D. Negrut, An investigation of particles suspension using smoothed particle hydrodynamics, *66th DFD Annual Meeting, American Physical Society 2013*, Pittsburgh, Pennsylvania.
10. A. Pazouki and D. Negrut, A Lagrangian-Lagrangian framework for the simulation of fluid/rigid-body interaction, *European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS)*, 2013, Zagreb, Croatia.
11. T. Heyn, H. Mazhar, A. Pazouki, D. Melanz, A. Seidl, A. Bartholomew, L. Fang, A. Tasora, E. Sifakis, and D. Negrut, Chrono: A parallel multi-physics library for rigid-body, flexible-body, and fluid dynamics, *European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS)*, 2013, Zagreb, Croatia.
12. A. Pazouki and D. Negrut, On the simulation of the moving rigid bodies in fluid media, *International Symposium on Stability, Vibration and Control of Systems (SVCS)*, 2013, Albena, Bulgaria.
13. A. Pazouki and D. Negrut, Direct simulation of lateral migration of buoyant particles in channel flow using GPU computing, *Proceedings of the 32nd Computers and Information in Engineering Conference, ASME-IDETC*, 2012, Chicago, Illinois.
14. A. Pazouki and D. Negrut, A high-performance computing approach to the simulation of dense particulate flow using smoothed particle hydrodynamics and discrete element method, *The 6th Asian Conference on Multibody Dynamics*, 2012, Shanghai, China.
15. A. Pazouki, H. Mazhar, P. Hahn, and D. Negrut, A parallel algorithm for the coupling of the fluid flow and rigid-body dynamics with contact and friction, *ASME International Mechanical Engineering Congress and Exposition*, 2011, Denver, Colorado.
16. A. Pazouki, Million body simulations of granular dynamics on the GPU, *SIAM Conference on Computational Science and Engineering (Mini Symposium Presentation)*, March 1, 2011, Reno, Nevada.
17. D. Negrut, L. Jay, A. Tasora, M. Anitescu, H. Mazhar, T. Heyn, and A. Pazouki, Simulation of multibody dynamics leveraging new numerical methods and multiprocessor capabilities, *Proceedings of 2011 NSF Engineering Research and Innovation Conference*, Atlanta, Georgia.
18. A. Pazouki, H. Mazhar, and D. Negrut, Parallel ellipsoid collision detection with application in contact dynamics, *Proceedings of 30th Computers and Information in Engineering Conference (CIE), ASME-IDETC*, 2010, Montreal, Canada.
19. H. Mazhar, D. Negrut, A. Pazouki, and A. Tasora, A scalable parallel method for large scale collision detection problems, *The 5th Asian Conference on Multibody Dynamics (ACMD2010)*, August 23-27, 2010, Kyoto, Japan.

20. A. Pazouki, Massively parallel collision detection on the GPU, SIAM Conference on Parallel Processing for Scientific Computing (Mini Symposium Presentation), February 25, 2010, Seattle, Washington.
21. F. Javid, A. Pazouki, and A. Alasti, Application of fuzzy logic in solving PDEs with finite difference method, 15th Annual International Conference of Mechanical Engineering, ISME 2007, Tehran, Iran.