

# Erhan Turan

Resumé

## Education

- 2005–2010 **PhD**, *Boğaziçi University*, Istanbul.  
Department of Mechanical Engineering
- 2004–2005 **MS**, *Boğaziçi University*, Istanbul.  
Department of Mechanical Engineering
- 1998–2004 **BS**, *Boğaziçi University*, Istanbul.  
Department of Mechanical Engineering

## PhD thesis

- title *A Framework for the Analysis of Coupled-Physics Models using Adaptive Multi-Level Techniques*
- supervisors Assoc. Prof. Ali Eçder
- description Development of a computational framework to deal with multiphysics problems encountered in fluid mechanics. The framework has the flexibility to select and combine various numerical techniques.

## Experience

### Vocational

- 2014– **Advanced Lead CFD Engineer**, *GE Aviation*, Gebze, Turkey.  
Engineering activities to design and analyse thermal systems of GE Aircraft Engines.
- 2013–2014 **Lead CFD Engineer**, *GE Aviation*, Gebze, Turkey.  
Engineering activities to design and analyse thermal systems of GE Aircraft Engines.
- 2010–2012 **Postdoctoral Researcher**, *ETHZ*, Zurich, Switzerland.  
Research on large scale finite element analysis of 3D poroelasticity.
- 2004–2010 **Research & Teaching Assistant**, *Boğaziçi University*, Istanbul, Turkey.  
Energy Science and Mechanics courses both in Undergraduate and Graduate levels.  
Guidance of M.S. and Ph.D. students both in theory and numerical methodologies.

### Academic Visits

- 2011– **Visiting Researcher**, *Institute of Geonics*, Ostrava, Czech Republic.  
Collaboration on preconditioning methods for indefinite linear elastic and poroelastic problems arisen from geomechanics.  
Optimization of parallel solvers with the use of Trilinos Framework.

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2008–2009 **Visiting Researcher**, *Düsseldorf University of Applied Sciences*, Germany.  
Multiphase Flows research by Prof. Ali Cemal Benim  
Opensource CFD computations using OpenFOAM, Code Saturne, Salome and Paraview.

### Training

2003 **Intern**, *Robert BOSCH GmbH*, Stuttgart, Germany.  
Automation of Preventative Measures of Production Stations of VP 44 Diesel Injectors.  
Optimization of Screwing Processes of Assembly Stations.

## Academic Research Projects

- PorFE** PorFE is an extension on ParFE to include poroelastic effects of bone structures. Mixed finite element method is used to discretize the governing equations based on Biot's Consolidation. Both flux and pressure values are treated as primitive variables on top of displacements. The resulting indefinite problem is solved using FGMRES with a special type block preconditioner based on Multilevel. PorFE is programmed with C++ using Trilinos framework for parallel computations. The source is public and available at <https://bitbucket.org/erhanturan/porfe>
- ParFE** ParFE is a large scale multilevel micro finite element solver developed for linear elastic problems arose from human bone mechanics. The geometry is taken from medical imaging hence a voxel-based implementation is favored to improve the performance of the solver. The code is programmed in C++ using Trilinos framework. The project is in progress since 2006 and matured in 2011. I'm involved with the project since 2011. <http://parfe.sourceforge.net/>
- DEMONA** Decomposition Enhanced Mechanics Optimized Numerical Analysis - Demona in short, is a computational framework to couple different physical problem while keeping the flexibility of applying advanced numerical methods, for instance Newton-Krylov Techniques. The solver is developed in Fortran during my doctoral studies. Source code is available at <http://www.mechran.com/demona>

## Languages

English Advanced  
German Advanced  
Turkish Native

## Computer skills

Programming	Fortran, C++, Python	Opensource	OpenFOAM, Salome, ParaView
OS	Windows, Linux	Scientific	Trilinos, Petsc, MPI
Software	CFX, Fluent, ICEM, Matlab	Miscellaneous	Mercurial (HG), Tecplot, L <sup>A</sup> T <sub>E</sub> X

## Interests

Research Multiphysics, Porous Media, Energy Science, Biomechanics, Scientific Computing, Computational Fluid Dynamics, Turbulent Flows, Multiphase

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## Membership

Professional Associations AMS, EuroMECH, SIAM

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## Publications

- [1] P. Arbenz and **E. Turan**. Preconditioning for large scale poroelasticity. In *Applied Parallel and Scientific Computing*, volume 7782 of *Lecture Notes in Computer Science*, pages 361–374. Springer, 2013. [dx.doi.org/10.1007/978-3-642-36803-5\\_26](https://doi.org/10.1007/978-3-642-36803-5_26).
- [2] A. Assmann, A.C. Benim, A. Nahavandi, **E. Turan**, D. Schubert, E. Gams, and P. Feindt. Aortic blood flow characteristics of different extracorporeal circulation techniques during cardiac surgery - a computational fluid dynamics approach. In *IFMBE Proceedings*, volume 25, pages 1604–1607, 2009. [dx.doi.org/10.1007/978-3-642-03882-2\\_425](https://doi.org/10.1007/978-3-642-03882-2_425).
- [3] R. Blaheta, O. Jakl, J. Stary, and **E. Turan**. Parallel solvers for numerical upscaling. In *Applied Parallel and Scientific Computing*, volume 7782 of *Lecture Notes in Computer Science*, pages 375–386. Springer, 2013. [dx.doi.org/10.1007/978-3-642-36803-5\\_27](https://doi.org/10.1007/978-3-642-36803-5_27).
- [4] E. Turan and A. Eceder. Set reduction in nonlinear equations. arXiv Preprint, available online <http://arxiv.org/abs/1203.3059>, 2012.
- [5] M. Ilıcak, **E. Turan**, and A. Eceder. Splitting techniques for the numerical analysis of natural convection heat transfer. *International Journal of Computer Mathematics*, 84(6):783–793, 2007. [dx.doi.org/10.1080/00207160701458278](https://doi.org/10.1080/00207160701458278).
- [6] **E. Turan** and P. Arbenz. Large scale micro finite element analysis of 3d bone poroelasticity. *Parallel Computing*, 2013. In Press <http://dx.doi.org/10.1016/j.parco.2013.09.002>.
- [7] **E. Turan** and P. Arbez. Preconditioning aspects of large scale micro finite element analysis of 3d bone poroelasticity. Technical Report 774, Institute of Theoretical Computer Science, ETH Zurich, November 2012. <ftp://ftp.inf.ethz.ch/pub/publications/tech-reports/7xx/774.pdf>.
- [8] **E. Turan** and A. Eceder. Analysis of a bimetallic slab in non-isothermal flow. *Journal of Mechanical Engineering Science*, 225(3):658–672, 2011. [dx.doi.org/10.1243/09544062JMES2135](https://doi.org/10.1243/09544062JMES2135).
- [9] **E. Turan**, H. Saygin, A. Basol, and A. Eceder. Resolving non-symmetry in flows via subdomain shifts. *Mathematical Modelling and Analysis*, 15(3):349–370, 2010. [dx.doi.org/10.3846/1392-6292.2010.15.349-370](https://doi.org/10.3846/1392-6292.2010.15.349-370).
- [10] U. Turk, **E. Turan**, M. Orhan, and A. Eceder. An adaptive time-stepping strategy for the implicit solution of steady transonic flow. *Progress in Computational Fluid Dynamics*, 2013. Accepted for publication.

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## Conferences & Workshops

- Nov. 2012 **E. Turan**, "Large scale micro finite element analysis of 3D bone poroelasticity" SPOMECE Workshop 2012, Czech Republic
- Sep. 2012 41<sup>th</sup> SpeedUp Workshop, Switzerland
- Jun. 2012 **E. Turan**, P. Arbenz, "Preconditioning for large scale micro finite element analysis of 3D poroelasticity" - PARA 2012, Finland
- Jun. 2012 **E. Turan**, P. Arbenz, "Preconditioning for large scale micro finite element analysis of 3D poroelasticity using Trilinos" - EuroTUG 2012, Switzerland
- Dec. 2011 Movement Biomechanics , Switzerland
- Aug. 2011 Biomedical Flows at Low Reynolds Numbers, Switzerland
- Jun. 2011 **E. Turan**, P. Arbenz, "Large Scale Micro Finite Element Analysis of 3D Poroelasticity" LSSC 2011, Bulgaria
- Sep. 2010 39<sup>th</sup> SpeedUp Workshop, Switzerland
- Aug. 2010 Transpore 2010, Switzerland
- Apr. 2010 **E. Turan**, A. Ecdar, "Set Reduction in Nonlinear Equations" 11<sup>th</sup> Copper Mountain Conference, United States
- Jun. 2008 **E. Turan**, A. Ecdar, "Analysis of a Bimetallic Strip in Non-isothermal Flow Using Adaptive Multilevel Techniques" European Seminar on Coupled Problems, Czech Republic
- Jul. 2006 H. Saygin, A. Ecdar, **E. Turan**, "Numerical Investigation of Boundary-Motion-Induced Flow"
- A. Basol, A. Ecdar, **E. Turan**, Y. Kaptan, "Aerodynamics Optimization of a Paraglider Wing using Domain Decomposition Analysis" 12<sup>th</sup> ICCAM, Belgium
- Sep. 2005 **E. Turan**, A. Ecdar, Z. Gunbegi, "Analysis of Premixed Combustion with Detailed Chemistry Using Adaptive Multigrid Method" 8<sup>th</sup> EMG Conference, The Netherlands

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## References

### Academy

- Prof. Peter Arbenz  
Postdoctoral Supervisor, ETH Zurich  
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- Assoc. Prof. Ecdar  
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- Prof. Ali Cemal Benim  
Research collaborator , FH Dusseldorf  
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### Industry

- Dr. Emre Aksan  
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