Ramesh Yapalparvi

CONTACT INFORMATION

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SUMMARY

7 years of experience in the field of Computational & Theoretical Fluid Mechanics and Mathematical Modeling.

EDUCATION

University of Manchester, Manchester, UK

Ph.D., Applied Mathematics, July 2007

- Dissertation Topic: *Theoretical and numerical analysis of viscous inviscid interaction.*
- Relevant Courses: Asymptotic methods, Applied Mathematics, Computational Fluid Dynamics, Stochastic PDE's, Financial Mathematics.
- Research involved:
  - Study of wall jets and liquid layer flows encountering corners, humps and indents.
  - Study of unsteady boundary-layer separation in supersonic flow.
  - Study of control of shock wave boundary-layer interaction by means of grooves.

Bangalore University, Bangalore, India

Bachelor in Mechanical Engineering, September 2001

- Graduated with distinction.
- Relevant courses: Fluid Mechanics, Thermodynamics, Theory of Machines, Machine Design, Operations Research, Finite Element Methods.

PROFESSIONAL EXPERIENCE

Department of Mathematics and Statistics, McMaster University, Hamilton, Ontario, Canada

Postdoctoral Fellow **January 2009 – present**

- Studied inverse problems and PDE constrained optimization in applications to free boundaries and phase transition.
- Optimized industrial welding process in collaboration with General Motors Research & Development Center, USA and Commonwealth Scientific and Industrial Research Organization, Australia.
- Instructor for:
  - MATH 2MM3: PDEs and Vector Calculus, Winter 2009.
  - MATH 2Z03: ODEs, Laplace Transforms, Fall 2009, 2010.
  - MATH 4Q03/6Q03: Numerical Methods for Differential Equations, Winter 2010, 2011.

School of Mechanical and Aerospace Engineering, Nanyang Technological University, Singapore

Singapore–MIT Research Fellow **December 2007 – December 2008**

- Developed reduced order modeling techniques for unsteady flows and optimization of engineered systems.

- Extended the technique of Proper Orthogonal Decomposition (POD) and successfully applied the methods of POD with interpolation and Singular Value Decomposition (SVD) to predict the flow fields, trajectories of tumbling plates.
- Higher Order SVD and Bi-Orthogonal Proper Orthogonal Decomposition techniques for reduced order modeling in unsteady flows.
- Developed reduced order modeling techniques using the methods of POD extrapolation and marching POD extrapolation.
- Developed uncertainty quantification using Adjoint Sensitivity Analysis Procedure and Polynomial Chaos.

Department of Engineering, University of Liverpool, Liverpool, UK

Research Associate **November 2006 – October 2007**

- Studied unsteady effects of shock induced separation in collaboration with partners across European union.
- Generated multiblock structured grids using *ICEMCFD* and used in-house built parallel multiblock code to simulate the following test cases by means of RANS, URANS with various turbulence models and LES:
  - Transonic flow over a bump: base flow and control.
  - Transonic flow over an ONERA bump: base flow.
  - Transonic flow inside a flat, curved channel: base flow.

Department of Mathematics, University of Manchester, Manchester, UK

Teaching Assistant **October 2003 – October 2006**

- Instructor for:
  - MT2272: Fluid Mechanics, Winter 2005, 2006.
  - MT3251: Waves, Fall 2005.
  - MT3612: Linear PDEs and Special Functions, Winter 2004, 2005.
  - MT1Q1: Calculus, Fall 2003.

Analytical & Computational Research Inc, Bangalore, India

Trainee **May 2003 – August 2003**

- Testing and validation of standard benchmark problems in fluid mechanics using CFDStudio^{TM}.

CTFD division, National Aerospace Laboratories, Bangalore, India

Trainee **July 2002 – October 2002**

- Worked on vorticity dynamics which involved developing a simplified model for motion of 2D vortices of various types (point, uniform path or Gaussian) to simulate simple flows.

CFD Centre, Indian Institute of Science, Bangalore, India

Research Assistant **September 2001 – June 2002**

- Developed novel numerical algorithms for hyperbolic conservation laws.

Computer Skills

Applications:

- COMSOL, FLUENT, MATLAB, MATHEMATICA, MAPLE, OpenFOAM, LaTeX.

Languages:

- Fortran, C, C++, Python, MPI parallel processing library.

Operating Systems:

- Mac, Unix/Linux, Windows.

Publications

R. Yapalparvi, A. I. Ruban and J. S. B. Gajjar, *Numerical investigation of shock wave boundary layer interaction over moving walls in supersonic flow*, Proceedings of the 25$^{\text{th}}$ international symposium on shock waves, 17–22 July 2005, Bangalore, India.

J. C. Huang, E. Bernard, R. Yapalparvi and G. Barakos, *Combined CFD-tunnel test for transonic aerodynamic flows*, Proceedings of joint EWA and UFAST workshop on validation of numerical methods by experiments in Aerodynamics, 5–6 June 2007, VZLU, Prague.

G. Barakos, J. C. Huang, E. Bernard, R. Yapalparvi and S. Raghunathan, *Investigation of transonic flow over a bump: base flow and control*, AIAA 2008–357 46$^{\text{th}}$ AIAA Aerospace sciences meeting and exhibit, 7–10 January 2008, Reno, Nevada.

A. I. Ruban, D. Araki, R. Yapalparvi and J. S. B. Gajjar, *On unsteady boundary-layer separation in supersonic flow, Part 1: Upstream moving separation point*, (to appear in J. Fluid. Mech).

R. Yapalparvi, *Double deck structure revisited, Part 1: Wall jets encountering corners, humps and indents*, (submitted).

R. Yapalparvi, *Double deck structure revisited, Part 2: Liquid layers encountering corners, humps and indents*, (submitted).

R. Yapalparvi and B. Protas, *Effective Free-Surfaces*, (in preparation).

R. Yapalparvi, Dominic, D. J. Chandar and M. Damodaran, *Prediction of unsteady flow fields and trajectories of tumbling plates using reduced order modelling*, AIAA 2009–329 47$^{\text{th}}$ AIAA Aerospace sciences meeting and exhibit, 5–9 January 2009, Orlando, Florida.

O. Volkov, R. Yapalparvi, V. Bukshtynov and B. Protas, *Inverse methods in computational modelling of welding processes Report #2: Modelling and optimization of the system involving interaction with plasma column*, Report #2 for a collaborative research project with General Motors, Aug 2009.

A. Atena, R. Yapalparvi, V. Bukshtynov and B. Protas, *Inverse methods in computational modelling of welding processes Report # 3: Optimization and parameter estimation in MIG welding — towards multi-objective framework and modelling mass transfer with effective surfaces*, Report #3 for a collaborative research project with General Motors, Aug 2010.

R. Yapalparvi, *Boundary-layer separation control by means of grooves*, (unpublished report).

Talks

R. Yapalparvi and B. Protas, *Effective Free-Surfaces*, The 63$^{\text{rd}}$ Annual Meeting of the American Physical Society's Division of Fluid Dynamics, Long Beach, California, 21–23, Nov 2010.

B. Protas, R. Yapalparvi and O. Volkov, *An inverse formulation for solution of free-boundary problems in fluid mechanics*, Fifth European Conference on Computational Fluid Dynamics, Portugal,

14–17 June 2010.

Reduced order modeling techniques for unsteady flows, Fluids seminar, University of Illinois, Urbana Champaign, Oct 2009 (invited).

Tenth Workshop on the DOE Advanced CompuTational Software (ACTS) Collection Lawrence Berkely National Laboratory, 18–21, Aug 2009 (invited).

R. Yapalparvi and M. Damodaran, *Prediction of unsteady flow fields using higher order singular value decomposition and Bi-Orthogonal Proper Orthogonal Decomposition*, SIAM conference on Computational science and Engineering, Miami, Florida 2–6 Mar 2009.

Prediction of unsteady flowfields and trajectories of tumbling plates, Dept of Mathematics, McMaster University, Feb 2009.

Theoretical and numerical analysis of viscous inviscid interaction, JNCASR, Bangalore, India, Nov 2006 (invited).

Theoretical and numerical analysis of viscous inviscid interaction, CTFD division, National Aerospace Labs, Bangalore, India, Nov 2006 (invited).

Shock wave boundary-layer interaction over moving walls, British applied mathematics colloquium, University of Liverpool, Apr 2005.

Memberships & Honors

Society of Industrial and Applied Mathematics (SIAM)

American Institute of Aeronautics and Astronautics (AIAA)

Canadian Applied & Industrial Mathematics Society (CAIMS)

Honorary Fellow of the Australian Institute of High Energetic Materials.