

Abdusamad A. Salih

Education

- 2007 **Ph.D. (Computational Fluid Dynamics)**, *Department of Mechanical Engineering, Indian Institute of Technology Kharagpur, India.*
- 1989 **M.Tech. (Mechanical Engineering with specialization in Hydroturbomachines)**, *Indian Institute of Technology Madras, India.*
- 1986 **B.Tech. (Mechanical Engineering)**, *Regional Engineering College Calicut, India.*

Experience

Academic

- 2017 – Present **Professor**, *Department of Aerospace Engineering, Indian Institute of Space Science and Technology, Trivandrum, India.*
- 2011 – 2017 **Associate Professor**, *Department of Aerospace Engineering, Indian Institute of Space Science and Technology, Trivandrum, India.*
- 2008 – 2011 **Assistant Professor**, *Department of Aerospace Engineering, Indian Institute of Space Science and Technology, Trivandrum, India.*
- 1997 – 2008 **Senior Lecturer**, *National Institute of Technology Trichy, India.*
- 1991 – 1997 **Lecturer**, *National Institute of Technology Trichy, India.*

Administrative

- 2014 – 2017 **Head**, *Department of Aerospace Engineering, Indian Institute of Space Science and Technology, Trivandrum, India.*

Industry

- 1989 – 1991 **Design Engineer**, *Crompton Greaves Hydro-Division, Chandigarh, India.*

Research

Ph.D. Thesis

- Title *Numerical Simulation of Two-Fluid Flows with Sharp Interfaces Using Level Set Method*
- Supervisor Prof. S. Ghosh Moulic
- Description The thesis discusses a level set formulation for numerical simulation of multiphase fluid flow systems involving sharp interfaces. As the level set function does not follow any physical conservation law, it does not inherently conserve the mass of individual fluid phases. Numerical experiments show that for certain type of problems the conservation is a crucial issue with level

set method even when higher order discretization schemes are used for the solution of level set and reinitialization equations. In this work a new volume-reinitialization scheme has been proposed which when applied preserves the individual fluid volumes within the prescribed tolerance limit. The effectiveness of the method has been demonstrated by simulating a wide range of two-fluid systems including, the determination of equilibrium shape of free surface in a rotating cylinder, zero-gravity drop oscillations, surface tension induced evolution of a starfish interface, drop deformation in an extensional flow field, buoyancy driven bubble motion, and small amplitude oscillation of liquid in partially filled containers.

Research Interests

Numerical simulation of multiphase flows, level set methods, sloshing dynamics, bubble dynamics, and Rayleigh–Benard convection.

Teaching

At IIST-Trivandrum

Undergraduate

- AE468 [Computational Fluid Dynamics](#) (currently teaching)
- AE222 Heat Transfer (spring 2021)
- AE468 Computational Fluid Dynamics (fall 2020)
- AE222 Heat Transfer (spring 2020)
- AE216 Thermodynamics (fall 2019)
- AE468 Computational Fluid Dynamics (fall 2019)
- AE216 Thermodynamics (fall 2018)
- AE463 Advanced Fluid Mechanics (fall 2017)
- AE216 Thermodynamics (fall 2017)
- AE463 Advanced Fluid Mechanics (fall 2016)
- AE213 Fluid Mechanics (fall 2016)
- AE468 Computational Fluid Dynamics (fall 2014)
- AE463 Advanced Fluid Mechanics (spring 2014)
- AE213 Fluid Mechanics (fall 2012)
- AE463 Advanced Fluid Mechanics (fall 2012)
- AEM321 Gas Dynamics – Minor (spring 2012)
- AE221 Gas Dynamics (spring 2012)
- AEM311 Fluid Mechanics – Minor (fall 2011)
- AE468 Computational Fluid Dynamics (fall 2011)
- AE463 Advanced Fluid Mechanics (spring 2011)
- AEM311 Fluid Mechanics – Minor (fall 2010)
- AE463 Advanced Fluid Mechanics (fall 2010)
- AE213 Fluid Mechanics (fall 2010)
- AE468 Computational Fluid Dynamics (spring 2010)
- AE213 Fluid Mechanics (fall 2009)
- AE222 Heat Transfer (spring 2009)
- AE213 Fluid Mechanics (fall 2008)

- AE215 Engineering Mechanics (fall 2008)
 AE121 Basic Mechanical Engineering II (Analysis of Experimental Data) (spring 2008)
- Master's AE616 Computational Fluid Dynamics (spring 2019)
 AE616 Computational Fluid Dynamics (spring 2018)
 AE616 Computational Fluid Dynamics (spring 2017)
 AE616 Computational Fluid Dynamics (spring 2016)
 AE601 Mathematical Methods in Aerospace Engineering (fall 2015)
 AE813 Computational Fluid Dynamics (spring 2015)
 AE601 Mathematical Methods in Aerospace Engineering (Topics: PDE, Calculus of Variations, and Perturbation Methods) (fall 2014)
 AE813 Computational Fluid Dynamics (spring 2014)
 AE611 Advanced Fluid Mechanics (fall 2013)
 AE601 Mathematical Methods in Aerospace Engineering (Topics: PDE and Calculus of Variations) (fall 2013)
 AE813 Computational Fluid Dynamics (spring 2013)
 AE611 Advanced Fluid Mechanics (fall 2012)

At NIT-Trichy

- Undergraduate Engineering Graphics, Fluid Mechanics, Gas Dynamics, Hydraulic Machinery, Heat Transfer, Thermal Engineering, Turbomachines, Computational Fluid Dynamics, and Finite Element Method.
- Master's Advanced Fluid Mechanics, Computational Fluid Dynamics, and Finite Element Method.

Publications

Journals:

1. Jishnu Chandran R. and A. Salih. (2021). "Development of a benchmark solution in compressible liquid flows: analytical solution to the water shock tube problem." *Journal of Thermal Analysis and Calorimetry*. (Published online, June 2021)
2. Risha Raju, Jishnu Chandran R., A. Salih, and K. Joseph. (2020). "Numerical analysis of mixing chamber non-uniformities and feed conditions for optimal performance of urea SCR." *Reaction Chemistry & Engineering*. 5, 2236-2249.
3. Jishnu Chandran R. and A. Salih. (2020). "A comparative performance analysis of HLLC and AUSM+-up Riemann Solvers." *Cankaya University Journal of Science and Engineering*. 17(2), 108-117.
4. R. J. Chandran, R. Raju, and A. Salih. (2020). "An adaptively-damped compressible-liquid model for non-cavitating hydraulic surges." *International Journal of Engineering - Transactions A: Basics*. 33(10), 2047-2056.
5. Jishnu Chandran R. and A. Salih. (2020). "A Pressure-based Compressible-Liquid Flow Model for Computation of Instantaneous Valve Closure in Pipes." *Science and Technology Journal*. 7(2), 60-66.

6. Vijayan, S., P. Wilson, K. Prabhakaran, A. Salih, and K. Joseph. (2019). "Preparation of ceramic foam spheres by injection molding of emulsions." *Journal of Asian Ceramic Societies*, 8(1), 21-28.
7. Jishnu Chandran R. and A. Salih. (2019). "A modified equation of state for water for a wide range of pressure and the concept of water shock tube." *Fluid Phase Equilibria*, 483, 182-188.
8. Rahul Anand, P. R. Ajayalal, Vikash Kumar, A. Salih, and K. Nandakumar. (2016). "Spray and Atomization Characteristics of Gas-centered Swirl Coaxial Injectors." *International Journal of Spray and Combustion Dynamics*, 9(2), 127-140.
9. Yalagach, A. and A. Salih. (2016). "Study of Vortex Breakdown in a Cylindrical Cavity with a Rotating Endwall." *International Journal of Fluid Mechanics Research*, 43(3), 189-205.
10. Agarwal, D., P. Basu, T. J. Tharakan, and A. Salih. (2014). "Prediction of Gas-Core Vortices during Draining of Liquid Propellants from Tanks." *Aerospace Science and Technology*, 32(1), 60-65.
11. Salih, A. and S. Ghosh Moulic. (2013). "A Mass Conservation Scheme for Level Set Method Applied to Multiphase Incompressible Flows." *International Journal for Computational Methods in Engineering Science & Mechanics*, 14(4), 271-289.
12. Basu, P., D. Agarwal, T. J. Tharakan, and A. Salih. (2013). "Numerical Studies on Air-Core Vortex Formation during Draining of Liquids from Tanks." *International Journal of Fluid Mechanics Research*, 40(1), 27-41.
13. Salih, A. and S. Ghosh Moulic. (2010). "Numerical Simulation of Buoyancy-Driven Bubble Motion Using Level Set Method." *International Journal for Computational Methods in Engineering Science & Mechanics*, 11(4), 211-229.
14. Salih, A. and S. Ghosh Moulic. (2009). "Some Numerical Studies of Interface Advection Properties of Level Set Method." *Sadhana*, Indian Academy of Sciences, 34, Part 2, 271-298.
15. Salih, A. and S. Ghosh Moulic. (2006). "A Level Set Formulation for the Numerical Simulation of Impact of Surge Fronts." *Sadhana*, Indian Academy of Sciences, 31, 697-707.

Conferences:

1. Risha Raju, Jishnu Chandran R., and A. Salih. (2019). "Numerical Modelling of NO_x Reduction on Cu-ZSM 5 Foam Reactor", *25th National and 3rd International ISHMT-ASTFE Heat and Mass Transfer Conference*, IHMTC-2019, IIT Roorkee, December 28-31.
2. Jishnu Chandran R. and A. Salih. (2018). "Equivalence of Density-Based and a Customized Pressure-Based Approach for Compressible Modelling of Instant Valve Closure in Irrigation Pipes", *7th International and 45th National Conference on Fluid Mechanics and Fluid Power*, FMFP2018–Paper No. 238, IIT Bombay, December 10-12.
3. Jishnu Chandran R. and A. Salih. (2017). "Water Shock Tube Simulation with Tait Equation of State", *24th National and 2nd International ISHMT-ASTFE Heat and Mass Transfer Conference (IHMTC-2017)*, BITS-Pilani, Hyderabad, India, December 27-30.

4. Jishnu Chandran R. and A. Salih. (2016). "A Comparative Study of AUSM Scheme with Some Common Finite Difference Schemes in Solving One-Dimensional Shock-Tube Problem", *6th International and 43rd National Conference on Fluid Mechanics and Fluid Power*, FMFP2016–Paper No. 88, Motilal Nehru National Institute of Technology Allahabad, December 15-17.
5. Rahul Anand, P. R. Ajayalal, K. Nandakumar, and A. Salih. (2015). "Parametric Study on the Performance of Gas Centered Swirl Coaxial (GCSC) Injectors", *24th National Conference on I.C. Engines and Combustion*, Dehradun, 30 Oct - 1 Nov.
6. Tambe, Sumit and A. Salih. (2013). "Numerical Study of Liquid Sloshing with Experimental Validation", *6th Symposium on Applied Aerodynamics and Design of Aerospace Vehicles – SAROD 2013*, Hyderabad, November 21-23.
7. Tharakan, T. J., P. Basu, D. Agarwal, and A. Salih. (2011). "Computational Investigations into Gas-Core Vortex Formation during Draining of Liquid from a Tank", *Proc. 38th National Conference on Fluid Mechanics and Fluid Power*, FMFP2011, National Institute of Technology, Bhopal, December 15-17.
8. Soni, K., K. Sankaranarayanan, A. Salih, and A. K. Das. (2007). "Modeling of Tank Fires", *Proc. National Conference on PETROSAFE 2007*, Kochi, Kerala, April 23-25.
9. Renjith, V. R., G. Madhu, and A. Salih. (2007). "Explosion Modeling of Hazardous Materials Stored in Udyogamandal Industrial Area – A Case Study", *Proc. National Conference on PETROSAFE 2007*, Kochi, Kerala, April 23-25.
10. Salih, A. and S. Ghosh Moulic. (2006). "Simulation of Rayleigh–Taylor Instability Using Level Set Method", *Proc. 3rd International and 33rd National Conference on Fluid Mechanics and Fluid Power*, NCFMFP2006–1303, IIT–Bombay, December 07-09.
11. Salih, A. and S. Ghosh Moulic. (2005). "A Level Set Method for Simulation of Coalescence of Droplets", *Proc. ASME International Mechanical Engineering Congress and Exposition*, Orlando, Florida, USA, ASME Publications, 261, 723-732.
12. Salih, A. and S. Ghosh Moulic. (2002). "Oscillation of a Liquid Drop in a Zero-Gravity Environment – A Benchmark Problem for Two-phase Flow Computations", *Proc. 2nd International Conference on Fluid Mechanics and Fluid Power*, FMFP2002, IIT–Roorkee, December 12-14.

Short-Term Course Organized

- One week short-term course titled "Numerical Methods in Fluid Flow and Heat Transfer" (Department of Aerospace Engineering, IIST Trivandrum, July 2010) – Co-coordinators: Dr. G. Rajesh and Dr. M. Deepu. About 60 people, including teachers from engineering colleges and scientists from ISRO attended the course.

Invited Talks/Lectures

- 2019 *Solution of Inviscid Burgers Equation: Method of Characteristics and Numerical Methods*: Invited lecture delivered in the Two days seminar on "Computer Methods on Applied Mathematics and Engineering (CMAME-2019)" at the National Institute of Technology Calicut, 16 May 2019.
- 2017 *Partial Differential Equations in Engineering*: Expert lecture delivered in the AICTE sponsored Short Term Course on "Applied Mathematics for Engineering Research" at the College of Engineering Trivandrum, 12 December 2017.

- 2016 *Introduction to Computational Fluid Dynamics*: Expert lecture delivered in the DTE sponsored Short Term Training Programme on “Computational Fluid Dynamics” at the Govt. College of Engineering Thrissur, 19 December 2016.
- 2016 *Galerkin Formulation of Finite Element Method*: Expert lecture delivered in the TEQUIP sponsored one-week Faculty Development Programme on “Finite Element Methods in Engineering” at the College of Engineering Adoor, 6 December 2016.
- 2014 *Hyperbolic Conservation Laws*: Expert lecture delivered in the Directorate of Technical Education (Kerala) sponsored Short Term Programme on “Introduction to CFD and Its Applications” at the College of Engineering College, Trivandrum, 11 December 2014.
- 2014 *Governing Equations in Fluid Dynamics and Their Discretization*: Invited talk delivered in the QIP Sponsored Short Term Course on “Computational Methods in Fluid Flow and Heat Transfer” at the Government Engineering College, Thrissur, 17 February 2014.
- 2014 *PDEs in Fluid Dynamics and Heat Transfer and Discretization Methods*: Invited talk delivered in the TEQUIP II sponsored Short Term Course on “Applications of CFD in Heat Transfer and Fluid Flow” at the NIT Tiruchirappalli, 10 January 2014.
- 2013 *Introduction to Computational Fluid Dynamics*: Inaugural talk delivered in the TEQUIP II sponsored one-week Faculty Development Programme on “Computational Fluid Dynamics and Its Application” at the TKM College of Engineering, Kollam, 19 August 2013.
- 2013 *Introduction to Level Set Method and Its Applications*: Talk delivered in the Three day In-house Training Programme on “CFD in Propulsion” at the Vikram Sarabhai Space Centre, Trivandrum, 6 March 2013.
- 2012 *Introduction to Computational Fluid Dynamics and Meshing Basic Geometry*: Inaugural talk delivered in the “Three-day Workshop on Computational Fluid Dynamics” at the Department of Mechanical Engineering, Noorul Islam University, Thackalai, 27 September 2012.
- 2012 *Theoretical Solution to Boundary Layer Equations*: Keynote lecture delivered in the Directorate of Technical Education (Kerala) sponsored National Workshop on “Advances in Theoretical and Computational Fluid Dynamics (ATCFD-2012)” at the College of Engineering, Trivandrum, 2 February 2012.
- 2011 *Conservation Equations in Fluid Dynamics – Integral and Differential Formulations*: Invited lecture delivered at the Government Engineering College, Thrissur, 19 Oct 2011.
- 2011 *Navier–Stokes Equations*: Invited lecture delivered at Government Engineering College, Barton Hill, Trivandrum, March 2011.
- 2010 *Governing Equations of Fluid Dynamics*: Lecture delivered in the one-week short term course on “Numerical Methods in Fluid Flow and Heat Transfer” organized by Department of Aerospace Engineering, IIST, Thiruvananthapuram, July 2010.
- 2010 *Introduction to CFD*: Invited talk delivered in the AICTE sponsored winter course on “Quantitative Research Techniques for Engineers & Researchers”, organized by Department of Mechanical Engineering, NIT Tiruchirappalli, 21-12-2009 to 2-1-2010.
- 2007 *Galerkin Finite Element Method*: Talk delivered in the TEQUIP sponsored 2-day workshop on “Finite Element Method and Applications in Engineering Using ANSYS” at NIT Tiruchirappalli, November 26-27, 2007.
- 2007 *Navier–Stokes Equations and Its Development*: Lecture delivered in the TEQUIP sponsored 2-day workshop on “Computational Fluid Dynamics” conducted by Department of Mathematics at NIT Tiruchirappalli, September 18-19, 2007.

- 2007 *Numerical Solution of Navier–Stokes Equations*: Lecture delivered in the AICTE sponsored short term course on “Recent Trends in IC Engine Testing and Analysis” at NIT Tiruchirappalli, February 2007.
- 2004 *Finite Element Methods in Engineering*: Invited talk delivered in the AICTE sponsored winter school on “Recent Trends in Modelling and Analysis of PManufacturing Systems” at NIT Tiruchirappalli, December 2004.
- 2004 *Introduction to Computational Heat Transfer*: Invited lecture delivered in the AICTE sponsored summer school, “Latest Trends in Refrigeration with Special Emphasis on Food and Medical Preservation” at Dr. Mahalingam College of Engineering and Technology, Pollachi, March 2004.

Conference Session Chair

- Dec 2017 *44th National Conference on Fluid Mechanics and Fluid Power (FMFP – 2017)*, Amrita Vishwa Vidyapeetham, Amratapuri, India. 14-16 December 2017.
- Dec 2015 *23rd National and 1st International ISHMT–ASTFE Heat and Mass Transfer Conference (IHMTTC2015)*, Trivandrum, India. 17-20 December 2015.
- Dec 2013 *International Conference on Energy and Environment – ICEE 2013*, Rajiv Gandhi Institute of Technology, Kottayam, India. December 2013.

Committees

- 2017 Member, Advisory Committee, *44th National Conference on Fluid Mechanics and Fluid Power (FMFP – 2017)*, Amrita Vishwa Vidyapeetham, Amratapuri, India. 14-16 December 2017.
- 2015 Member, Technical Committee, *23rd National and 1st International ISHMT–ASTFE Heat and Mass Transfer Conference (IHMTTC2015)*, Trivandrum, India. 17-20 December 2015.

Research Projects

- (1) Title *Development of N₂O₄ Scrubber System*
 Investigators Kuruvilla Joseph (Principal Investigator), K. Prabhakaran (Co-investigator), and A. Salih (Co-investigator)
 Amount 14 Lakhs INR
 Duration 2017- on going
- (2) Title *Numerical Simulation of Turbulent Reacting Flows in Semi-Cryogenic and Tri-Propellant Engines*
 Investigators M. Deepu (Principal Investigator) and A. Salih (Co-investigator)
 Amount 3.27 Lakhs INR
 Duration 2009-12

Ph.D. Thesis Supervision

Current Scholars:

Risha Raju (joined 2016)

Past Scholars:

2021 Jishnu Chandran R.

M.Tech. Project Supervision (IIST)

Past Students:

- 2019 Adarsh V. R. – *Numerical Simulation of Geometrical Aspects of Rectangular Regenerative Cooling Channels*, IIST Thiruvananthapuram. (Co-supervisor Dr. Deepu M.)
- 2019 Bebbhash S. Raj – *Study of Ground Effects in 2-D Aerofoils over Solid and Wavy Surfaces*, IIST Thiruvananthapuram.
- 2014 P. R. Ajayalal – *Spray Atomization Studies on Gas Centered Swirl Co-axial Injectors (GCSC)*, IIST Thiruvananthapuram.

M.Tech. Project Supervised (NIT Trichy)

- 2008 A. Aravind Kumar – *Study of Drop Deformation in an Extensional Flowfield*, NIT Trichy.
- 2008 CH. Durga Mallik – *Study of Heat Transfer in Micro and Mini Channels*, NIT Trichy.
- 2007 Soni Kuriakose – *Consequence Analysis of Hazardous Storage Facilities, Phase II*, NIT Trichy.
- 2006 K. Venkata Ravi Shankar – *Analysis of Buoyancy Driven Flow in a Lid Driven Square Cavity*, NIT Trichy.
- 2006 S. Anki Reddy – *Numerical Simulation of Forced Sloshing in a Partially Filled Cylindrical Container*, NIT Trichy.
- 2006 T. Rajeswary – *Numerical Simulation of Viscous and Forced Sloshing in a Partially Filled Rectangular Container*, NIT Trichy.
- 2005 K. Lakshmanan – *Numerical Simulation of Spin-Up in Rectangular Container*, NIT Trichy.
- 2005 V. R. Renjith – *Consequence Analysis and Disaster Management Plan for Udyogamandal Industrial Area in Kerala, Phase II*, NIT Trichy.
- 2005 A. Sarath Chandra – *Numerical Simulation of Couette–Taylor Flow*, NIT Trichy.
- 2004 M. K. Prabakaran – *Numerical Simulation of Two-Dimensional Incompressible Flow Using SIMPLE Algorithm*, NIT Trichy.
- 2004 K. Sreekanth – *Numerical Simulation of Buoyancy Driven Flow in a Square Cavity*, NIT Trichy.

B.Tech. Project Guided (IIST)

Past Students:

- 2021 Vishruti Gohel – *Transient Analysis of Floater for Spent Stage Recovery from Sea Water Surface*, IIST Thiruvananthapuram.
- 2018 Ajitha Nishma V. – *Numerical Simulation of Mixed Convection in Lid-Driven Cavity Flow*, IIST Thiruvananthapuram.
- 2018 Nakka Ramakrishnaiah Nagavarma – *Numerical Study of Natural Convection in Vertical Enclosure with Fins*, IIST Thiruvananthapuram.
- 2018 Gautam Kumar Jha – *Thermal Characterisation and Modelling of PCM Module and Suspended Plate in Phase Change Media*, IIST Thiruvananthapuram.

- 2015 Deepanshu Tiwari – *Study of Perturbation Techniques and Its Applications to the Parametrically Excited Systems*, IIST Thiruvananthapuram.
- 2014 Raja Sekhar Reddy and Jarpula Dharma Naik – *Numerical and Experimental Investigation on Supersonic Second-Throat Exhaust Diffuser for Evaluating Upper-Stage Rocket Motors*, IIST Thiruvananthapuram.
- 2013 Sumit Tambe – *Behaviour of Liquid Freesurface in a Partially Filled Container under Excitation*, IIST Thiruvananthapuram.
- 2013 Akash Yalagach – *Study of Vortex Breakdown in a Cylindrical Cavity with a Rotating End-Wall*, IIST Thiruvananthapuram.
- 2012 Aman Raj Verma – *Study of Effect of Gas Injection over a Torpedo on Flow-Field Using CFD*, IIST Thiruvananthapuram.
- 2012 Priyanka Bovad – *Study of Parasitic Currents in Level Set Method*, IIST Thiruvananthapuram.
- 2011 Pradeep Basu and Dheeraj Agarwal – *Study of Gas-Core Vortex Formation during Draining of Liquid from a Tank*, IIST Thiruvananthapuram.

Memberships in Professional Societies

- Since 1992 Life Member, The Indian Society for Technical Education (LM 12409).
- Since 2017 Life Member, Indian Society for Heat and Mass Transfer (ISHMT 1156).