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NIPIN LOKANATHAN

SUMMARY

- *Simulation engineer with 15+ years' experience of carrying out research in the Space industry. Broad areas of work include Computational fluid dynamics and heat transfer, Rarefied fluid flow and mathematical modelling of space propulsion systems. Graduated from IISc, Bangalore, India specializing in Computational Fluid Dynamics.*

AREAS OF EXPERTISE/ RESEARCH INTERESTS

- *Numerical simulation of Single and Multi-phase flow*
- *Conjugate heat transfer*
- *Thermal testing of spacecrafts*
- *Dynamic modelling*
- *Rarefied gas dynamics*
- *Mathematical modelling of pneumatic, hydraulic and mechanical systems.*

COMPUTIONAL CAPABILITIES

• *ANSYS Fluent*	• *C++*	• *Amesim*	• *SolidWorks*
• *OpenFOAM*	• *Matlab*	• *ParaView*	• *Python*
• *UG NX*	• *Simulink/Simscape*	• *Linux/bash*	• *Python*

CONTRIBUTIONS TO THE COMMUNITY

- *Composite heat conduction code*
  Developed a conduction solver for composite shells/plates in C++ framework for simulation of heat transfer in composite tubes and plates.
  https://github.com/nipinl/compositeHeatConduction

- *HeaTra - A heat conduction simulation application*
  Developed an android app HeaTra for simulation of 1D & 2D heat transfer application in android.
  https://play.google.com/store/apps/details?id=com.nipinl.fvm1d

PROFESSIONAL EXPERIENCE

Scientist at Liquid Propulsion Systems Center, Indian Space Research Organization *(November 2006- July 2022)*

- *Development of Plasma Flow Simulation Code with Erosion Modelling*

Developed a 2D axisymmetric finite volume code in C++ framework to simulate plasma flow and resulting erosion in Hall effect thruster (HET). The solver is a node centered explicit FVM code employing Van-Albada limiter solving Euler equations for ion and neutral species.

- *Mathematical Model for Indian Moon Mission*

Development indigenous of mathematical model for the lander propulsion system of Indian moon mission Chandrayaan 2. A zero-dimensional lumped model was developed in C++ framework and validated with single engine hot test data and a commercial software. The complete propulsion system including pressurization system, flow throttling system, flow isolation system and throttle-able liquid engine were mathematically modeled from fundamental principles.

- *CFD Analysis of Vortex Phenomenon in Propellant Tanks*

Simulated the formation of vortex during draining of fuel in propellant tanks to identify the point of gas entry. Ingestion of gas to the feedline is catastrophic for the performance point of view of liquid rocket engines.

- *Performance Evaluation of Variable Area Valves for Indian Moon Mission*

Modelling cavitating flow in variable area valves and solenoid vales of lander engine for Indian moon mission using computational fluid dynamics.

- *CFD Modelling of Cavitation in LOX Cavitating Venturi*

Modeling cavitating flow of liquid oxygen in cavitating venturi of CRYO engine. Three dimensional CFD modelling was carried out to simulate cavitating flow using ANSYS Fluent.

- *Neutral Flow Uniformity in Stationary Plasma Thruster using OpenFOAM*

Analyzed the uniformity of rarefied neutral flow in the of acceleration channel of Stationary Plasma Thruster using montecarlo tool dsmcFoam of OpenFOAM.

EDUCATION

Master of Engineering from Department of Mechanical Engineering

- *Indian Institute of Science, Bangalore, India*
  Specialization: Computational Fluid Dynamics, July 2010-June 2012
  CGPA- 7.0/10

Thesis: Numerical simulation of plume formation in stratified media
Advisor: Prof. Gaurav Tomar

Two- and three-dimensional numerical simulations of plume formation in density and viscosity stratified fluid system characterized by high Rayleigh number convection. Similar flow system could be observed in engineering, such as in metallurgical and some chemical processes, as well as in natural processes such as atmospheric, oceanic and mantle convection. It is shown that ambient to plume fluid viscosity ratio strongly affects the near wall plume structures (line or sheet plumes) such as plume spacing and shape of plumes which has direct relation with heat or mass transfer according to the application. Gerris multiphase flow solver which employs VOF method for tracking sharp interface was used for simulation. Good agreement with the experiments for a wide range of viscosity ratio was observed and the effect of confinement on line plume spacing was also studied. Dynamics of line plumes due to interactions between convection cells was particularly interesting.

Bachelors in Technology in Mechanical Engineering

- *NSS College of Engineering, Palakkad, Kerala, India– University of Calicut, August 2002 – July 2006, Percentage- 72%*

CONFERENCES & PUBLICATIONS

- ***Journal Publication***

1. L. Nipin, Gaurav Tomar, Effect of viscosity contrast on plume formation in density stratified fluid- Published in Journal of Chemical Engineering Science, Volume 134, June 2015, Pages 510-520 https://www.sciencedirect.com/science/article/pii/S000925091500384X

- ***Conference Publications***

1. L. Nipin and T. John Tharakan, Monte Carlo simulation for rarefied axisymmetric flow in a Hall effect thruster-Presented at International Conference on Computer Aided Engineering (CAE-2013), IIT Madras, December 19-21, 2013

2. Pranav Nath, L. Nipin, Deepak Kumar Agarwal and S Sunil Kumar, Mathematical modeling of throttleable propulsion system for lunar lander mission-Presented at the 24th National and 2nd International ISHMT-ASTFE Heat and Mass Transfer Conference (IHMTC-2017), December 27-30, 2017, BITS Pilani, Hyderabad, India.