Mahendra Paipuri

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Research Interests

Discontinuous Galerkin methods, Multiphysics problems, Numerical analysis, Fluid and solid mechanics, Fluid structure interaction problems, Time integration, Traffic flow theory, Hyperbolic systems, MFD-based simulations, Data analysis.

Education

Instituto Superior Técnico (IST), Lisboa, Portugal
Universitat Politécnica de Catalunya (UPC), Barcelona, Spain

Ph.D., Simulation in Engineering and Entrepreneurship Development (SEED) (Double doctorate), Joint Doctorate program between IST and UPC, March 2018

- Thesis Topic: *Comparison and coupling of continuous and hybridizable discontinuous Galerkin methods: Application to multiphysics problems*
- Advisors: Carlos Tiago (IST) and Sonia Fernández–Méndez (UPC)

Universitat Politécnica de Catalunya (UPC), Barcelona, Spain
Swansea University, Swansea, Wales, United Kingdom

M.Sc., Computational Mechanics (Double master), Joint Master between UPC and Swansea university, July 2012

- Topic: *Numerical modelling of membrane filtration using Lattice Boltzmann and Finite Volume Methods*
- Advisor: Oubay Hassan (Swansea University)

National Institute of Technology, Tiruchirappalli, India

B.Technology., Mechanical Engineering, May 2012

- Topic: *Computational Fluid Dynamics simulation of laminar flow past a circular cylinder*
- Advisor: M. Udayakumar

Research Experience

Post Doctoral Researcher November 2017 to present
Laboratoire d'Ingénierie Circulation Transport (LICIT),
Université Gustave Eiffel - ENTPE,
Vaulx-en-Velin, France

Part of the ERC project Multiscale and Multimodal Traffic Modelling Approach for Sustainable Management of Urban Mobility (MAGnUM). Currently working on the multimodal dynamic simulations of large scale transportation systems. The work includes extending the existing framework of MFD-based macroscopic models that were developed within the group to multimodal networks by taking public transportation into account.

Doctoral studies September 2014 to August 2017
IST, Portugal and UPC, Barcelona

Proposed a novel coupling between Continuous (CG) and Hybridizable discontinuous Galerkin (HDG) methods for thermo-fluid multi-physics problem. Developed an in-house *arbitrary high-order* solver in FORTRAN. Verified and validated the proposed numerical scheme using the experimental results of Glass Fiber Reinforced Polymer (GFRP) sections exposed to fire.

Research Intern January 2013 to July 2013
Validation of software,
Compass Ingenieria y Sistemas,
Barcelona, Spain

Research Assistant May 2011 to July 2011
Institute für Raumfahrtsysteme,
Universität Stuttgart
Supervisor: C. Syring and G. Herdrich

Refereed Journal Publications

1. Guilhem Mariotte, Ludovic Leclercq, Sergio Batista, Jean Krug, **Mahendra Paipuri**. "Calibration and validation of multi-reservoir MFD models: A case study in Lyon". *Transportation Research Board Part:B Methodological* 2020 (Accepted)
2. **Mahendra Paipuri**, Ludovic Leclercq. "Bi-modal Macroscopic Traffic Dynamics in a Single Region". *Transportation Research Board Part:B Methodological* , 133:257–290, 2020.
3. **Mahendra Paipuri**, Ludovic Leclercq, Jean Krug. "Validation of MFD-based models with microsimulation on real networks: Importance of production hysteresis and trip length estimation". *Transportation Research Record*, 2673 (5):478–492, 2019.
4. Ludovic Leclercq, **Mahendra Paipuri**. "Macroscopic traffic dynamics in reservoirs under fast-varying demand profiles". *Transportation Science*, 53 (6):1526-1545, 2019.
5. **Mahendra Paipuri**, Sonia Fernández–Méndez, Carlos Tiago. "Coupling of continuous and hybridizable discontinuous Galerkin methods for conjugate heat transfer problem.". *Journal of Scientific Computing*, 78:321–350, 2019.
6. Igor Dimovski, Ice Gjumandeloski, Filip Kochoski, **Mahendra Paipuri**, Milena Veneva , Aleksandra Risteska. "Computer Aided (Filament Winding) Tape Placement for Elbows. Practically Oriented Algorithm.". *Balkan Journal of Applied Mathematics and Informatics*, 1(1):89–104, 2018.
7. **Mahendra Paipuri**, Sonia Fernández–Méndez, Carlos Tiago. "Comparison of high-order continuous and hybridizable discontinuous Galerkin methods in incompressible fluid flow problems". *Computers & Mathematics with Applications*, 153:35–58, 2018.
8. **Mahendra Paipuri**, Soo Hyeong Kim, Oubay Hassan, Nidal Hilal, Ken Morgan. "Numerical modelling of concentration polarisation and cake formation in membrane filtration processes." *Desalination*, 365:151–159, 2015.

Submitted Journal Publications

1. **Mahendra Paipuri**, Yanyan Xu, Marta C. Gonzalez, Ludovic Leclercq. "Calibration of Multi-region MFD models using Mobile Phone Data" 2020. Submitted to *Transportation Research Board Part:C Emerging Technologies* (Under review).
2. Guilhem Mariotte, **Mahendra Paipuri**, Ludovic Leclercq. "Flow exchanges in multi-trip MFD-based systems: A validation study versus microscopic simulation" 2019. Submitted to *Transportation Research Board Part:B Methodological* (Under review)
3. **Mahendra Paipuri**, Sonia Fernández–Méndez, Carlos Tiago. "Numerical simulation of GFRP models with high-order continuous and hybridizable discontinuous Galerkin methods and experimental validation."2019. Submitted to *Applied Mathematical Modelling* (Under review)

Proceedings in the conferences

1. Guilhem Mariotte, **Mahendra Paipuri**, Ludovic Leclercq. "Flow exchanges in multi-trip MFD-based systems: A validation study against microscopic simulation". *Transportation Research Board Annual Meeting*, Washington DC, US, 2019.
2. **Mahendra Paipuri**, Sonia Fernández–Méndez, Carlos Tiago. "Coupling of continuous and HDG methods". *European Conference on Computational Mechanics*, Glasgow, UK, 2018.
3. **Mahendra Paipuri**, Sonia Fernández–Méndez, Carlos Tiago. "Comparison of continuous and hybridizable discontinuous Galerkin methods in incompressible fluid flow problems". *Congress on Numerical Methods in Engineering*, Valencia, Spain, 2017.

Supervision of Master Thesis

- Victor Boulanger. "**Mise en place d'une simulation macroscopique sur la ville de Lyon, base sur la théorie du diagramme de zones"**, Laboratoire Ingénierie Circulation Transports, September 2018.

Awards

Student Awards — Swansea University

- Ernest Hinton Prize for Outstanding Civil M.Sc. Student — May 2014

Student Awards — National Institute of Technology, Tiruchirappalli

- Outstanding Student in Mechanical Engineering Department — May 2012
- Award for the Academic Proficiency — May 2011
- Award for the Academic Proficiency — May 2010
- Award for the Academic Proficiency — May 2009

Scholarship Awards

- Erasmus Mundus full scholarship for joint doctorate — 2014
- Erasmus Mundus full scholarship for joint master — 2012
- German Academic Exchange Service (DAAD)-WISE Fellowship — 2011

Conference Awards

- Awarded the registration for European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS) congress — June 2016

Workshop Invitations

- Awarded an invitation to an EU-funded COST action of Macedonia Modelling Week at Goce Delcev University, Stip, fYR Macedonia — February 2018.

Conferences

Transportation Research Board (TRB), Washington D.C., United States of America, January, 2020.

- Calibration of Multi-region MFD models using Mobile Phone Data.

European Association for Research in Transportation (hEART), Budapest, Hungary, September, 2019.

- Multimodal MFD models: General Formulations and Information Propagation.

TRISTAN X, The Tenth Triennial Symposium on Transportation Analysis, Hamilton Island, Australia, June, 2019.

- Multi-reservoir MFD-based simulation: An application to the city network of Lyon.

Transportation Research Board (TRB), Washington D.C., United States of America, January, 2019.

- Comparison of MFD-based approaches with microscopic simulation data for real networks: Production hysteresis and trip length estimation.

Mathematics Applied in Transport and Traffic Systems (MATTS), Delft, The Netherlands, October, 2018.

- A Multimodal Extension for MFD-based Modelling Framework.

European Association for Research in Transportation (hEART), Athens, Greece, September, 2018.
- Comparison of MFD-based approaches with microscopic simulation data for real networks: Production hysteresis and trip length estimation.

European Conference on Computational Mechanics (Solids, Structures and Coupled Problems, Glasgow, Scotland, U.K., June, 2018.
- Coupling of continuous and HDG methods.

Coupled Problems, Rhodes Island, Greece, June, 2017.
- A coupled continuous and hybridizable discontinuous Galerkin method: Application GFRP cross section and experimental validation.

Finite elements in Fluids (FEF), Rome, Italy, April, 2017.
- Coupling of continuous and hybridizable discontinuous Galerkin methods: Application to conjugate heat transfer flows.

ECCOMAS congress, Crete Island, Greece, June, 2016.
- Comparison of continuous and hybridizable discontinuous Galerkin methods for incompressible fluid flows.

Instituto Superior Técnico (IST), November, 2016
- Presentation of my thesis work to the department of civil engineering

Universitat Politécnica de Catalunya (UPC), July, 2016
- Laboratory of Computational Methods and Numerical Analysis (LaCaN) seminar talk

Skills

Programming Languages
- FORTRAN, C++, MATLAB, Python, bash script

Softwares
- FLUENT, Abaqus, ICEM-CFD, LS-DYNA, Mathematica, Paraview, TecPlot, Gmsh

Languages

English (Fluent), French (B2), Spanish (A1), Portuguese (Beginner), Telugu (Mother Tongue), Hindi (Advanced)

References

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