S U R E S H   R A J E N D R A N

Address: Assistant Professor, Dept. of Ocean engineering, IIT Madras, Chennai 36, India
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OBJ ECTIVE

Teach, inspire, carry out diligent research and learn in the field of naval architecture and marine hydrodynamics, and make significant contributions in the field of study

EDUCATION

PhD in Naval Architecture and Marine Engineering, Instituto Superior Tecnico, Lisbon, Portugal. (Distinction), 2012 Sept-2015 Dec.

M.S in Ocean Engineering, Texas A&M University, Tx-77840 (GPA – 3.75/4), spring 2007-Fall 2008.

Bachelor of Technology in Naval architecture and Ship building, Cochin University of Science and Technology, India, 1997- 2002 (First Class).

ACCADEMIC RESEARCH

Numerical modeling of wave-structure interaction, Nonlinear marine hydrodynamics, ship dynamics, wave mechanics and hydroelasticity.

PROFESSIONAL EXPERIENCE

2017 June to till the date - Dept. Of Ocean Engineering, Indian Institute of Technology Madras
Asst. Professor

- Teaching under graduate level courses related to naval architecture and ship hydrodynamics.
- Research in the field of ship hydrodynamics and guiding MS/PhD students.

2015 December to 2017May - Instituto Superior Tecnico, Lisbon, Portugal
Post-Doctoral Researcher

- Development of numerical tools for calculation of hydrodynamic loads acting on ships in extreme weather conditions.
- Development of numerical method for simulation of maneuvering of ships in waves
- Numerical investigation of parametric rolling of ships

2012 October to 2015 December - Instituto Superior Tecnico, Lisbon, Portugal
PhD student

- Development of hydrodynamic numerical tools for calculation of short term probability distribution of loads acting on a ship which includes
  - Numerical modeling of hydroelasticity of ultra large containership in severe head sea conditions and validation with the results obtained from the wave tank.
  - Numerical modeling of a body nonlinear time domain method with 2nd order Froude-Krylov pressure and prediction of the ship responses in irregular seas that represent extreme seas.
  - Development of a body nonlinear method based on strip theory which calculates the hydrodynamic and hydrostatic forces for the varying wet hull geometry for each time step.
  - Inclusion of surge mode in a linear and nonlinear 2D numerical model through a semi-empirical method to calculate the ship responses and analyze the effect.
- Probabilistic model for long term prediction of the loads acting on a ship during its lifecycle
- Developing numerical model for parametric rolling.
- Experimental investigation on the effect of ship scale on the roll viscous damping.

2010 August to 2012 September- Instituto Superior Tecnico, Lisbon, Portugal
Research Assistant

- Identification of critical sea state and calculation of extreme wave load acting on a ship.
- Higher order spectrum method to identify second order forces acting on a ship in extreme seas.
- Numerical calculation and detailed analysis of the vertical ship responses in Freak waves and extreme seas.

2008 to 2010- Technip USA, Houston
Design Specialist

- Subsea rigid and flexible pipe (Riser and flowlines) installation analysis using Orcaflex.
- Normal Pipelay analysis, Fatigue analysis during pipe lay, PLET (Pipe line End terminal)/subsea structure installation analysis, Spooling on the pipe reel analysis.

2006-2008- Texas A&M University
Research Assistant

- Higher order spectral Analysis of ship motions in high seas using Volterra Quadratic model.
- Prediction of ship motions in high seas using UNIOM (Universal Nonlinear Input Output Model)

2004-2006- Albwardy Marine engineering, Dubai, United Arab Emirates
Naval Architect

- Complete naval architecture and structural design, production support and   liaising with classification society and clients for a self propelled crane barge and a crew boat.
- Structural design of hull structures and foundation for offshore supply vessels.
- Inclining experiments and calculation of trim and stability, resistance and propulsion for a dredger and other ocean going vessels.
- Experience with ship design softwares like Auto Hydro, Staad Pro and Max Surf.

2002-2004- Mazagon Dock Ltd, Mumbai, India
Naval Architect

- Fabrication/production shop in-charge for the fabrication and welding of blocks for frigates, boats and submarine repair.
- Briefing and explaining of production drawing and troubleshooting at the site
- Trim and stability booklet and tonnage calculation for tugs, barges and offshore supply vessels

LIST OF PUBLICATIONS

JOURNAL PUBLICATIONS

1. **Rajendran, S**., Fonseca, N. and Guedes Soares, C. Effect of surge motion on the vertical responses of ship in waves. **Ocean Engg**. 2015; 96:125-138

2. **Rajendran, S**., Fonseca, N. and Guedes Soares, C. Simplified body nonlinear time domain calculation of vertical ship motions and wave loads in large amplitude waves. **Ocean Engg**. 2015. 107:157-177

3. **Rajendran, S**., Fonseca, N. and Guedes Soares, C. Body nonlinear time domain calculation of vertical ship responses in extreme seas using a 2nd order Froude-Krylov Pressure. **Applied Ocean Research**. 2016; 54:39-52

4. **Rajendran, S**., Fonseca, N., and Guedes Soares, C., A numerical investigation of the flexible vertical response of an Ultra Large Containership in high seas compared with experiments. **Ocean Eng**. 2016

5. **Rajendran, S**. and Guedes Soares, C. Numerical investigation of the vertical response of a containership in large amplitude waves, 2016. **Ocean Engg.** 123: 440-451

6. **Rajendran, S**., Fonseca, N. and Guedes Soares, C. Prediction of vertical responses of a container ship in abnormal waves. SI: Ships in Extreme Seas, 2016. **Ocean Engg**. 119:165-180

7. **Rajendran, S**., Fonseca, N. and Guedes Soares, C. Prediction of extreme motions and vertical bending moments on a cruise ship comparing with experimental data, SI: Ships in Extreme Seas, 2016. **Ocean Engg.** 127:368-336

8. **Rajendran, S**., Fonseca, N. and Guedes Soares, C. Effect of bow flare on the vertical ship responses in abnormal waves and extreme seas, Ocean Engineering. SI: Ships in Extreme Seas, 2016. **Ocean Engg.** 124:419-436

9. Klein, M., Clauss, G., **Rajendran, S**., Guedes Soares, C. Onorato, M. Peregrine breathers as design waves for wave-structure interaction. 2016. **Ocean Engg.** 128:199-212

10. **Rajendran, S.,** Fonseca, N. and Guedes Soares, C. Estimation of Short and long Term Probability Distributions of Wave Induced Loads Acting on a Cruise Vessel in Extreme Seas., **Journal of Offshore Mechanics and Arctic Engineering - JOMAE 2017**

11. Sandeepkumar, R., **Rajendran, S**., Mohan, R., & Pascoal, A. (2022). A unified ship manoeuvring model with a nonlinear model predictive controller for path following in regular waves. Ocean Engineering, 243, 110165.

12. Paramesh, S., & **Rajendran, S**. (2021). A unified seakeeping and manoeuvring model with a PID controller for path following of a KVLCC2 tanker in regular waves. Applied Ocean Research, 116, 102860.

13. Patil, N., & **Rajendran, S.** (2021). A time-domain method for analyzing the ship roll stabilization based on active fin control. Ocean Systems Engineering, 11(3), 275-299.

14. Sivaraj, Sivaraman, **Suresh Rajendran**, and Lokukaluge Perera Prasad. "Data driven control based on Deep Q-Network algorithm for heading control and path following of a ship in calm water and waves." Ocean Engineering 259 (2022): 111802.

CONFERENCE PAPERS

1. Dubey, A. C., Gajapathy, R., & **Rajendran, S**. (2021, September). An experimental and numerical investigation on the autopilot design of a KVLCC2 tanker. In OCEANS 2021: San Diego–Porto (pp. 1-6). IEEE.

2. Peddamallu, P., Menon, A. K., & **Rajendran, S**. (2021). On the water entry problem of 2D wedges and bow flare section. In Developments in Maritime Technology and Engineering (pp. 305-318). CRC Press.

3. **Rajendran, S.,** & Ameer Hassan, A. S. (2021). Surf-riding and Broaching—A Numerical Investigation on the Vulnerability of Ships. In Proceedings of the Fifth International Conference in Ocean Engineering (ICOE2019) (pp. 493-500). Springer, Singapore.

4. Paramesh, S., & **Rajendran, S.** (2020, October). Numerical investigation of the manoeuvring motions and trajectory tracking of a KVLCC2 tanker using PID controller in regular waves. In Global Oceans 2020: Singapore–US Gulf Coast (pp. 1-6). IEEE.

5. Vijith, P. P., & **Rajendran, S.** (2020, August). Horizontal and Torsional Modes of an Ultra Large Container Ship (ULCS). In International Conference on Offshore Mechanics and Arctic Engineering (Vol. 84386, p. V06BT06A039). American Society of Mechanical Engineers.

6. **Rajendran, S**., & Guedes Soares, C. (2019). Effect of Slamming and Green Water on Short-Term Distribution of Vertical Bending Moment of a Containership in Abnormal Waves. In Proceedings of the Fourth International Conference in Ocean Engineering (ICOE2018) (pp. 333-345). Springer, Singapore.

7. Wang, S., **Rajendran, S**., & Guedes Soares, C. (2018, June). Investigation of bottom slamming on ships in irregular waves. In International Conference on Offshore Mechanics and Arctic Engineering (Vol. 51326, p. V11AT12A018). American Society of Mechanical Engineers.

8. **Rajendran, S**. and Guedes Soares, C. Short term statistics of hydroelastic loads of a containership in head and oblique seas, Proceedings of the 36th International Conference on Offshore Mechanics and Arctic Engineering **OMAE 2018-77486**, June17-22, 2018, Madrid, Spain.

9. Wang, S., **Rajendran, S** and Guedes Soares, S. Investigation of bottom slamming of ships in irregular waves, Proceedings of the 36th International Conference on Offshore Mechanics and Arctic Engineering **OMAE 2018-77900**, June17-22, 2018, Madrid, Spain.

10. **Rajendran, S**. and Guedes Soares, C. Effect of slamming and green water on short term distribution of vertical bending moment of a containership in abnormal waves, 4th International Conference in Ocean Engineering, **ICOE 2018-234**, Feb 18-21, 2018, Chennai, India.

11. **Rajendran, S**. and Guedes Soares, C.Numerical Investigation of Parametric Rolling of a Container ship in Regular and Irregular Waves, Proceedings of the 36th International Conference on Offshore Mechanics and Arctic Engineering **OMAE 2017-62490**, June25-30, 2017, Trondheim, Norway.

12. **Rajendran, S**., Fonseca, N., and Guedes Soares, C., 2015, Calculation of Vertical Bending Moment Acting on an Ultra Large Containership in Large Amplitude Waves, Proceedings of the 34th International Conference on Offshore Mechanics and Arctic Engineering, **OMAE 2015-42405**

13. **Rajendran, S**., Fonseca, N., and Guedes Soares, C., 2015, Calculation of Short Term Load Distribution of a Cruise Vessel in Extreme Seas Using a Bodynonlinear Time Domain Method With Second Order Froude Krylov Pressure, Proceedings of the 34th International Conference on Offshore Mechanics and Arctic Engineering, **OMAE 2015-42406**

14. **Rajendran, S**., Fonseca, N., and Guedes Soares, C., 2014, Prediction of ship responses in large amplitude waves using a body nonlinear time domain method with 2nd order Froude Krylov Pressure, Proceedings of the 33rd International Conference on Offshore Mechanics and Arctic Engineering, **OMAE 2014-24698**

15. **Rajendran, S**., Fonseca, N., and Guedes Soares, C., 2014, Analysis of vertical bending moment on an ultra large containership induced by extreme head seas, Proceedings of the 33rd International Conference on Offshore Mechanics and Arctic Engineering, **OMAE 2014-24602**

16. **Rajendran, S**., Fonseca, N., and Guedes Soares, C., 2013, Estimation of Short Term Probability Distributions of Wave Induced Loads Acting on a Cruise Vessel in Extreme Seas. Proceedings of the 32nd International Conference on Offshore Mechanics and Arctic Engineering, **OMAE 2013**-11638

17. **Rajendran, S.,** Fonseca, N. and Guedes Soares, C., 2012, Experiment and Time Domain Method Comparison for the Responses of a Container Ship induced by the Three Sisters abnormal waves**, Marine Technology and Engineering**. C. Guedes Soares et al. (Ed.), Taylor & Francis, UK:, pp.223-230.

18. **Rajendran, S**., Fonseca, N., and Guedes Soares, C., 2011, Time Domain Comparison With Experiments For Ship Motions And Structural Loads on a Container Ship in Abnormal Waves, Proceedings of the ASME 30th International Conference on Offshore Mechanics and Arctic Engineering, **OMAE** 2011, Rotterdam, the Netherlands

19. Pessoa, J., Fonseca, N., **Rajendran, S**., and Guedes Soares, C., Experimental Investigation Of the First and Second Order Wave Exciting Forces on a Restrained Body in Long crested Irregular Waves, Proceedings of the ASME 30th International Conference on Offshore Mechanics and Arctic Engineering, **OMAE** 2011, Rotterdam, the Netherlands

20. Rajendran.S, Kim,C.H. and Kwon, S.H., 2011 UNIOM for Vertical Motion of a Structure in High Seas, 21st International Offshore and Polar Engineering, **ISOPE 2011 ,** Maui, Hawaii, USA

21. Kim, C.H. and Rajendran.S.,Vertical Response of Offshore Structures Affected by Sea Severities, Proceedings of Eighteenth (2008) International Offshore and Polar Engineering , **ISOPE 2008**, Vancouver , BC, Canada

BOOK CHAPTERS

1. **Rajendran, S**., Fonseca, N., and Guedes Soares, C , 2017, Vertical wave loads acting on a cruise ship in head, oblique and following regular waves, Proceedings

of the 6th International Conference On Marine Structures (Marstruct 2017), 8-10 May 2017, Lisbon, Portugal Edited by C. Guedes Soares and Y. Garbatov

2. **Rajendran, S**., Fonseca, N., and Guedes Soares, C , 2011, Experiment and Time Domain Method Comparison for the Responses of a Container Ship induced by the Three Sisters abnormal waves, Marine Technology and Engineering. C. Guedes Soares et al. (Ed.), Taylor & Francis, UK:, pp.223-230**.**

LIST OF MAJOR SPONSORED RESEARCH PROJECTS

No.	Title	PI	Co-PI	Sponsored Agency	BUDGET (Rs)
1	Development of Numerical Methods for Calculation of Hydroelastic Responses of Ships in Extreme Sea	Dr. Suresh Rajendran	Dr. Vijayakumar. R	Naval Research Board	36,17,520
2	Development of Numerical and Experimental Model for Unified Seakeeping and Manoeuvring of Ships in Seaway	Dr. Suresh Rajendran		DST-SERB (Core Research Grant)	35,28,300
3	Development of a Numerical and Experimental Model for Manoeuvring of Ships in Adverse Weather Condi	Dr. Suresh Rajendran		IC&SR SEED Grant	24,30,000
4	Development of Guidance and Control Systems for Sea Going Autonomous Surface Vehicles (ASV)	Dr. Suresh Rajendran	Dr. Ranjith Mohan	Scheme for Promotion of Academic and Research Collaboration (SPARC)	40,13,382
5	Advanced Ship Manoeuvring Prediction based on Machine Learning and Artificial Intelligence for Autonomous Ship	Dr. Suresh Rajendran	Dr. Ranjith Mohan	Scheme for Promotion of Academic and Research Collaboration (SPARC)	43,13,750

	Navigation				
6	Study of Hydro-acoustic Performance of a DTMB4119 Propeller in Non-Cavitating Regime	Dr. Vijayakumar. R	Dr. Suresh Rajendran	Naval Research Board	23,55,040
7	Numerical study of ship motions in waves	Dr. Suresh Rajendran		IC&SR Initiation Grant	5,00,000