

**Mobile:** +91-7406052278**E-Mail:** yvjeppu@gmail.com, **LinkedIn:** <http://in.linkedin.com/in/yoganandajeppe> **Web:** <https://sites.google.com/site/yvjeppu/>***I want to contribute my experience in the field of Optimization, Formal Methods, Design and Independent Verification and Validation of Safety Critical Embedded Control Systems*****PROFESSIONAL SYNOPSIS**

- Recognized as a Technical Fellow by the technical community at Honeywell.
- A doctorate in Reliability Engineering from Indian Institute of Technology, Bombay.
- A rich 33 years of experience in the field of control system design, coding, six degree of freedom simulation and verification and validation of safety critical control systems using MIL, DO 331, DO178B/C standards and supplements. Certification of Aerospace Systems using ARP4754 and ARP4761 standards.
- Selected by All India Council for Technical Education (AICTE) and Indian National Academy of Engineering (INAE) as Distinguished Visiting Professor for NMAM Institute of Technology (NIITE), Karkala and RV College of Engineering, Bangalore.
- Adjunct Faculty, Instrumentation and Controls Engineering, MIT, Manipal University, India
- Adjunct Faculty, Computer Science and Engineering, NITK, Surathkal, India.
- Divisional Scientific Committee (DSC) member for Flight Mechanics and Control Division of National Aerospace Laboratories, Bangalore – advising and reviewing of their R&D projects.
- Expert Member - Formal Methods, Aerospace Electronics and Systems Division, National Aerospace Laboratories, Bangalore – advising and reviewing their Formal Methods projects.
- Approved External Research Supervisor for MS/Doctoral Research Programme, IITM, NITK, MSRUAS, VTU, UPES.
- Been a member of the National Control Law Team, a national effort to design control laws for the Indian Light Combat Aircraft (LCA) - Tejas.
- Member of the technical review committee for the Indian SARAS autopilot, stall warning and BMS design.
- Fostered Industry-Academia relations with a signing of MOU between Moog India Technology Center and Universities. A member of the advisory board for Software Engineering at VIT, Vellore, and KLE Technological University, Hubli.
- Thirty-Two years of experience working with Matlab, Simulink, Model Based Design (MBD) and Testing (MBT).
- Several publications in national and international conferences, journals, book chapters and books.

**SYSTEMS ENGINEERING CORE COMPETENCIES**

Systems Integration	Training	Tool Support (Matlab Simulink FM)
Verification and Validation	Architecture	Technical Planning
Requirements Engineering	Model Based Designing	Quality Assurance

**ORGANIZATIONAL EXPERIENCE****National Institute of Technology, Surathkal** **Since Jan' 20****Adjunct Faculty**

- CO366 – Formal Methods
- CO467 – Software Quality Assurance
- Open project – Develop a Aircraft Deceleration System using Model Based System Engineering, provided by National Aerospace Laboratory (30 members have registered to work on this)

**Manipal Institute of Technology****Since Jan' 16****Adjunct Faculty**

- Minor in Systems Engineering (4 subjects)
- Missile Guidance and Control (MTech program from DRDO)

**Fellow**

A recognized and accepted technical leader of Honeywell Aerospace. Working on innovation, problem solving, and cutting-edge technologies driving company growth. Strategizing company's technical directions for the next 5 and 10 years.

**Principal Systems Engineer**

- Collaborate with respective domain leaders to bring a new focus in design reviews. Look across the Centre of Excellences (COE) to identify opportunities for furthering new techniques such as model based development, formal methods and common repositories. I am looking at Property Based Requirements to formally model system behavior. Enable innovation and growth ideation by participating and contributing towards specific COE initiatives. I am looking at aircraft environmental control systems, on board weather radars and flight controls as potential projects for implementation of MBD and formal methods. I am actively involved in team competency development programs by providing hands on training in controls, systems engineering, formal methods, MBD using Matlab and Simulink. I am actively involved in reviewing R&D projects and internal research papers. A member of the Urban Air Mobility Community of Practice.

**Highlights**

- Defining high level software requirements for a new platforms system from Honeywell.
- A set of benchmark models for evaluating Formal Methods using Simulink Design Verifier and NuSMV model checkers.
- Implementation of MBD and Formal Methods in a new Radar RDR7000 project. This is an upgrade from an existing system. Successful implementation of MBD under DO178C / DO331 for the antenna control system. The product is available in the market after certification and TSO.
- A modelling guidelines document for Honeywell MBD projects.
- Automated test case generation for model, functional and code coverage.
- Contributed to the Honeywell CLEAR – Constrained Language Enhanced Approach to Requirements notation
- Contributed to MIDAS - Modeling Intent-Defined Abstract Specification: A Knowledge-based Approach
- Training teams on environmental control systems for aircrafts, MBD, FM

**Head - R & D – Systems and Member Technical Staff**

- Member of the Management Council and Innovation Council at Moog India – a management role supporting the Director, Moog India.
- I was responsible for research and development of process improvement tool chains using model-based systems engineering. I was looking at specifications to certification tool process using the DO178C standards and its supplements. I have explored formal methods for the validation of control system blocks as R&D initiatives.
- Delegated approver and signatory for Moog product artefacts – ensure product and process quality.
- I was responsible for innovation, training and developing the University relations – a mentorship role.

**Highlights**

- As part of the Future Technology Initiative program my team completed a CAN and EtherCat based hydraulic valve and actuator control system as a new product line in adjacent markets. This project was in collaboration with IIT, Italy.
- My team completed a full-fledged two channel autopilot for an aircraft with redundancy management and channel synchronization. This is a new product offering from Moog.
- My team adapted this technology to a helicopter autopilot problem. The team looked at parameter identification of unstable plant, controller design, redundancy management and implementation on the three channel on board computer with ARINC connectivity to a PC based simulation platform for system tests. This project explored new markets for Moog.
- Developed DEFECT - A Design of Experiments Framework for Control system Tests. This uses a new concept of control theoretic metrics designed by me for 100% requirements coverage of control system elemental blocks. This was used for Boeing 747-8 control system testing.

**Senior Systems Specialist (Apr' 09 to Jan' 14)**

- I was responsible for the Digital Flight Control System testing of controllers developed for various commercial aircraft programs. The test process was as per DO178B Level A standard for safety critical systems. I was responsible for the Model Based Test activity and the training of the team. Model based testing makes use of Matlab, Simulink and Scilab software. I was responsible for MBT tool design and qualification based on the new standard DO178C and DO331.

## Highlights

- Developed and trained teams who have successfully obtained certification from FAA for control laws of Gulfstream G280, G650, G500, Boeing 747-8, Airbus A350 and Comac C919 aircrafts. Simulink tool qualification as per DO178B requirements. The team developed a 50,000 element control model for the Boeing 747-8 aircraft control law.
- Trained scientists of Center for Military Airworthiness & Certification (CEMILAC) and Aeronautical Development Agency (ADA), in DO178B/DO178C process. Trained US team members in Matlab and Simulink and Model Based Development and Testing.
- Developed University relations with VIT (Vellore), NMAMIT (Nitte), RV College of Engineering, Bangalore, MIT (Manipal), NITK (Surathkal) and Acharya Institute of Technology, Bangalore. Project trainees from these institutions have successfully completed their post-graduate and undergraduate projects under my guidance.
- Designed a "Lateral Autopilot Benchmark Problem" for validating the Asynchronous Logic Automata for Massachusetts Institute of Technology, USA
- Three new Matlab/Simulink tools were developed to enable the process improvements in Model Based Test process under my guidance. These tools are qualified according DO178B process by Boeing, FAA representatives.
- Designed a generic autopilot for Moog future business goals. The Mode Transition Logic was completed and validated using semiformal methods and assertions.

**AFCS, Honeywell Technology Solutions, Bangalore**

**Oct'07 – Mar'09**

### Technology Specialist

I have worked on an autonomous vehicle control system at Honeywell. The work involved the control loop development and six degree of freedom simulation of the ground vehicle. Various scenarios were tested using simulation. This simulation platform was used to test the localization algorithms using a simulated LIDAR data. As part of the Automatic Flight Control Systems domain I was involved in the system testing of the SARAS aircraft autopilot. The aircraft was designed by the National Aerospace Laboratories, Bangalore and the autopilot was developed by Honeywell.

## Highlights

- Testing of localization algorithm in a closed loop mode using the 6DOF vehicle model and the actual on-board code.
- Development of the vehicle using an electric golf cart and field testing of the algorithms.
- Identification of worst-case scenarios for field testing using Design of Experiments and simulation.
- Closed loop testing of SARAS autopilot on the system test bench using Honeywell tools.
- Test case optimization using Random Generate and Select greedy algorithm for the Mode Transition logic.
- Test case optimization using Design of Experiments for the closed loop tests. The reduced test covered the complete flight envelop.
- Designed a detailed control architecture for the Regional Transport Aircraft, to be developed by NAL, Bangalore

**IFCS, Aeronautical Development Agency, Bangalore**

**Aug'95 – Sep'07**

### Scientist F (Deputy Project Director IFCS – Control Laws)

I was a member of the National Control Law Team, a national effort to design the Indian Light Combat Aircraft controller. This team was formed by the former President of India, Late Dr APJ Abdul Kalam when he was the Scientific Advisor to the RM. I joined this team as Scientist D in 1995 and was Scientist F in 2003. I was responsible for the Control Law coding, configuration control and Independent Verification and Validation of the Control Law and Airdata Algorithm on board software.

## Highlights

- As lead of an independent test team I have evolved the methodology to test the software in a Non Real Time mode. Randomization, Genetic Algorithm and Orthogonal Array based testing have been successfully explored on this platform.
- The overall test effort has been reduced from 30 days in 1995 to just one week in 2005. This has resulted in several publications and is accepted as a mandatory test before hardware-in-loop tests.
- I was also involved in the Flight-testing, hardware in loop testing and data analysis activity for the LCA where telemetered data and flight data recorder data is analyzed against the mathematical models.
- I was on the board of experts for SARAS Autopilot software development and V&V. I have conducted several reviews with the team. A new methodology of Random Generate and Select was used to validate the Mode Transition Logic of SARAS autopilot.
- I was responsible for the redesign of the Transient Free Switch for the Indian LCA which had given problems in flight.

- I was an external member for the NAL's ISO certification audits.
- I was responsible for the Russian Airdata System development for the LCA program.
- Authorized by CEMILAC as a signatory for the testing and clearance of Control Laws.

**Systems Directorate, Defence Research and Development Laboratory, Hyderabad**

**Dec'87 – Aug'95**

### **Scientist C**

I was in charge of the Digital Simulation Laboratory of the Systems Directorate. I have worked on six degree of freedom missile model coding, guidance loop analysis, modern guidance algorithm development and testing, verification of the onboard controller in an OBC-in-Loop mode, flight-testing and data analysis for Akash missile system.

### **Highlights**

- Development of missile guidance algorithms using augmented proportional navigation and modern guidance laws.
- Optimal design of guidance loop for Trishul missile system.
- Optimal design of roll autopilot for Nag missile system using Variable Structure Control

### **ACADEMICS**

- PhD (Reliability, Electrical Engineering), Indian Institute of Technology, Bombay.
- ME Mechanical (Guided Missiles), Institute of Armament Technology, University of Poona, First Class
- Graduate 23<sup>rd</sup> Special Weapons Course (SWC), Institute of Armament Technology, Pune
- BE (Electronics and Communication), Manipal Institute of Technology, Mangalore University, First Class.

### **ACCOLADES/PATENTS/TRADE SECRETS**

- "Platform Independent Model Image Generation System And Method", Patent Number: US2010122233 A1, Publication date: 13 May 2010
- "Methods And Systems For Controlling Weather Radar And Electro-Optical And Imaging Systems Of Search And Rescue Vehicles" – Publication date June 18, 2020, US20200191946 A1
- "Systems And Methods For Supplemental Navigation Using Distributed Avionics Processing" - Publication date US2021132233 A1, May 6, 2021
- "Systems And Methods For Cross-Reference Navigation Using Low Latency Communications"– Application EP 3968056 A3, USA Application #20220057473
- A Statistical Threshold for Automated Testing of Control System (Not Patentable – Declared Trade Secret Honeywell, USA INVENTION DISCLOSURE: H0020626)
- Commendation Certificate for "Significant Contributions made to the Integrated Guided Missiles Programme", July 1989
- National Aerospace Laboratories Technology Shield for Outstanding Achievement in LCA Control Law Design, Certification and Successful Flight Tests, August 2001
- First International Award for a Philatelic Website – Limca Book of Records 2003.
- Felicitated as Top 25 Teachers during Teachers Day celebration Honeywell, 2016.
- Individual Innovation Award – Honeywell
- Several Team Excellence and Individual Excellence Awards – Honeywell

### **ANNEXURE**

### **PERSONAL DETAILS**

- Date of Birth : 30 April 1965
- Address : H003, Tower 3, Daffodils, Adarsh Palm Retreat, Devarabisanahalli, Bangalore - 560103.

### **PUBLICATIONS**

### **Journals**

1. YV Jeppu, "Aryabhata's Kaliyuga Revisited: An Optimization Problem", Indian Journal of History of Science, 36, 3-4 (2001), pp 117-125 (JCI 0.16)

2. Rajalakshmi K, Jeppu Y V, Karunakar K, "Ensuring software quality - experiences of testing Tejas airdata software". Defence Science Journal 2006, 56(1), pp13-19. DOI: 10.14429/dsj.56.1863 (JCI 0.14)
3. Jeppu, Yogananda, "Flight Control Software: Mistakes Made and Lessons Learned," Software, IEEE , vol.30, no.3, pp.67,72, May-June 2013 DOI: 10.1109/MS.2013.42 (JCI 0.94)
4. Yogananda Jeppu, Gonzalo J. Rey, and Prakash R. Apte. "Generating Test Cases with 100-Percent Requirements Coverage Using Design of Experiments", Journal of Aerospace Information Systems, Vol. 11, Special Section on Software Challenges in Aerospace (2014), pp. 632-648. DOI: 10.2514/1.1010159 (JCI 0.54)
5. Chethan Upendra Chithapuram, Aswani Kumar Cherukuri, Yogananda V. Jeppu, "Aerial vehicle guidance based on passive machine learning technique", International Journal of Intelligent Computing and Cybernetics, (2016) Vol. 9 Iss: 3, pp.255 – 273, DOI: 10.1108/IJICC-12-2015-0042 (JCI 0.17)
6. Raghavendra M. Shet, Nalini C. Iyer and Yogananda Jeppu, "Fault Tolerant Control System for Autonomous Vehicle: A Survey", JARDCS, Vol 12, 08-Special Issue, pp 813-830, DOI: 10.5373/JARDCS/V12SP8/20202585 (SJR 0.12)
7. D. Pal, V. Bundele, B. Banerjee and Y. Jeppu, "SPN: Stable Prototypical Network for Few-Shot Learning-Based Hyperspectral Image Classification," in *IEEE Geoscience and Remote Sensing Letters*, doi: 10.1109/LGRS.2021.3085522. (JCI 1.09)
8. Savitha, D., Latha, H. K. E., Lalithamba, H. S., Mala, S., & Jeppu, Y. V. (2022). Structural, optical and electrical properties of undoped and doped (Al, Al+ Mn) ZnO nanoparticles synthesised by green combustion method using terminalia catappa seed extract. Materials Today: Proceedings. doi:10.1016/j.matpr.2021.12.365.

### **Books and Book Chapters**

1. Sukant K. Giri, Atit Mishra, Yogananda V. Jeppu and Kundapur Karunakar, "A Randomized Test Approach to Testing Safety Critical Ada Code", Reliable Software Technologies, Ada-Europe-2004, edited by Albert Lamosi and Alfred Strohmeier, Lecture Notes in Computer Science, Vol 3063, 190-199. (ISSN 0302-9743 (Print) 1611-3349 (Online) ISBN 978-3-540-22011-4)
2. YV. Jeppu, K Karunakar and P.S. Subramanyam, "Testing Safety Critical Ada Code Using Non Real Time Testing", Reliable Software Technologies ADA-Europe 2003, edited by Jean-Pierre Rosen and A Strohmeier, Lecture Notes in Computer Science, Vol 2655, pp 382-393. (ISSN 0302-9743 (Print) 1611-3349 (Online), ISBN 978-3-540-40376-0)
3. Manjunatha Rao, Atit Mishra, Yogananda Jeppu, and Nagaraj Murthy, "A Methodology to Design a Validated Mode Transition Logic", V. Vijay et al. (eds.), *Systems Thinking Approach for Social Problems*, Lecture Notes in Electrical Engineering 327, DOI 10.1007/978-81-322-2141-8\_24 Softcover ISBN 978-81-322-3516-3
4. Manju Nanda, Yogananda Jeppu (Eds) Formal Methods for Safety & Security - Case Studies for Aerospace Applications, Springer Singapore, ISBN 978-981-10-4120-4, Nov 2017, DOI: 10.1007/978-981-10-4121-1
5. Nanda M., Jayanthi J., Jeppu Y. (2018) Formal Methods—A Need for Practical Applications. In: Nanda M., Jeppu Y. (eds) Formal Methods for Safety and Security. Springer, Singapore, DOI:10.1007/978-981-10-4121-1\_1
6. Jeppu N., Jeppu Y. (2018) Arguing Formally About Flight Control Laws Using SLDV and NuSMV. In: Nanda M., Jeppu Y. (eds) Formal Methods for Safety and Security. Springer, Singapore, DOI:10.1007/978-981-10-4121-1\_7
7. Mamatha Jeppu, Yogananda Jeppu, Bach Flower Remedies – Our Notes, ISBN 978-935-40-7436-3, Kindle, Jun 2020

### **Conferences**

1. KN Swamy, IG Sarma, TK Bhattacharya, YV Jeppu, "Performance Studies on a Dual Gain APN Guidance Scheme for Aerial Engagements", International Symposium on Advances in Aerospace Sciences and Engineering, Dec 1992.
2. YV Jeppu, CM Nair, KK Mangrulkar, SB Phadke, "Design of Roll Autopilot Using Sliding Mode Control", 19th National Systems Conference, Dec 1995.
3. YV Jeppu, CH Harichoudary, Wg Cdr BB Misra, "Testing of Real Time Control System: A Cost Effective Approach" SAAT 2000, Advances in Aerospace Technologies, Hyderabad, India
4. Y V Jeppu, Dr K Karunakar, P S Subramanyam, "A New Test Methodology to Validate and Verify the Control Law on the Digital Flight Control Computer" 3rd Annual International Software Testing Conference 2001, Bangalore, India
5. YV Jeppu, K Karunakar, PS Subramanyam, "Flight Clearance of Safety Critical Software using Non Real Time Testing", American Institute of Aeronautics and Astronautics, ATIO, 2002, AIAA-2002-5821, DOI: 10.2514/6.2002-5821
6. S.K. Giri, Atit Mishra, YV Jeppu, K Karunakar, "A Randomized Test Approach to Testing Safety Critical Code" presented as a poster session at the International Seminar on "100 Years Since 1st Powered Flight and Advances in Aerospace Sciences", Dec 2003.
7. Sukant K. Giri, Atit Mishra, Yogananda V. Jeppu and Kundapur Karunakar "Stress Testing Control Law Code using Randomised NRT Testing" 43rd American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting and Exhibit, 10 - 13 Jan 2005 - Reno, Nevada, AIAA 2005-1253, DOI: 10.2514/6.2005-1253

8. Atit Mishra, Sukant K. Giri, Yogananda Jeppu and Kundapur Karunakar, "Samsambhavik Avasthavik Samay Parikshan Riti" (Randomised Non Real Time Test Methodology), Hindi paper presented at the Akil Bharatiya Rajbhasha Takniki Sangoshti (All India National Language Technical Seminar), February 2005.
9. Atit Mishra, Y.V. Jeppu, Kavitha Rajalakshmi, Dr. K. Karunakar "Non Real Time Testing of Safety Critical Air Data System Onboard (Ada) Software", Workshop on Software Validation and Verification, 20-21st October, 2005, DRDL Hyderabad.
10. Sukant Giri, YV Jeppu, K Karunakar, "Eight Years of Stress Testing Tejas Control Laws – Best Practices for Software Quality", International Conference on Quality and Reliability in Aerospace Systems and Exhibition, CONQUESTS 2006, Hyderabad, India
11. Yogananda V. Jeppu, K. Karunakar, Prakash R Apte "Optimized Test Case Generation Using Taguchi Design of Experiments", 7th AIAA Aviation Technology, Integration and Operations Conference (ATIO), September 2007, DOI: 10.2514/6.2007-7824
12. Rohit Jain, Srikanth Gampa, Yogananda Jeppu, "Automatic Flight Control System For The Saras Aircraft" HTSL Technical Symposium, Bangalore, India, December 2008
13. Rituraj Shrivastava, Hardik Choksi, Yogananda Jeppu, Sivasubramanian S, "Integrated Flight Control System Architecture Design for Regional Aircrafts with Turbo-prop Engines", HTSL Technical Symposium, Bangalore, India, December 2008
14. Yogananda Jeppu, "Automatic Testing of Simulink Blocks using Orthogonal Arrays" 2009 Moog Engineering Conference, Moog Inc, 26 May 2009
15. K.S.Rajagopal, Srinath Bheemaraju, Chethan CU, Jeppu Yogananda, Murthy Nagaraj Narayan, Divyashree, "Qualifying Simulink Control Blocks for DO-178B Tool Qualification", 9th Annual Software Testing Conference, STC 2009, Bangalore, India
16. Yogananda Jeppu, Prasad K, Chethan C U, Selvamurugan Hariram, Nagraj Murthy, Prakash R Apte, "Efficacy of Randomised Testing - A Model Based Benchmark Problem", 10th International Software Testing Conference, STC 2010.
17. Divyesh Divakar, K. Samatha, A. V. Veena Rani, Hariram Selvamurugan, Yogananda Jeppu, Nagaraj Murthy and Shreesha Chokkadi, "Optimization of Test case and Coverage Analysis for Model Based Design", 34th National Systems Conference, 10-12th December, 2010.
18. Cu, C.; Jeppu, Y.; Hariram, S.; Murthy, N.N.; Apte, P.R., "A new input-output based model coverage paradigm for control blocks," Aerospace Conference, 2011 IEEE, vol., no., pp.1,12, 5-12 March 2011, DOI: 10.1109/AERO.2011.5747530
19. Samatha K, Chetan C U, Yogananda Jeppu, NN Murthy, Shreesha Chokkadi, "Optimization of Test case using Genetic Algorithm for Safety Critical Control Blocks", International Conference on Emerging Trends in Engineering, ICETE-11.
20. Veena Rani A.V, Chethan CU, Yogananda Jeppu, NN Murthy, Shreesha Chokkadi, "A New Paradigm of Coverage Metrics for Control System Blocks", International Conference on Emerging Trends in Engineering, ICETE-11.
21. Divyesh Divakar, Hariram Selvamurugan, Yogananda Jeppu. "A Processor in Loop Test Method for Safety Critical Controls", CEMC2011, Sep 20-21, 2011
22. Chethan C U, Jeppu Yogananda, "Efficacy of Modified Condition/Decision Coverage (MC/DC)", 2011 Moog Engineering Conference, Moog Inc, 2011
23. Chethan Chithapuram, Jeppu Yogananda, "New Input-Output Based Model Coverage Paradigm for Control Blocks", 2011 Moog Engineering Conference, Moog Inc, 2011
24. K. Samatha, Shreesha Chokkadi, Jeppu Yogananda, "A Genetic Algorithm Approach for Test Case Optimization of Safety Critical Control", Procedia Engineering, Volume 38, 2012, Pages 647-654, ISSN 1877-7058, DOI:10.1016/j.proeng.2012.06.080.
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26. Aparna S Nair, Atit Mishra, Yogananda Jeppu, C J Nayak , Nagaraj Murthy. "Mode Transition Logic For Lateral Autopilot In Aircraft", CISCON 2012, Nov 2012.
27. Atit Mishra, Yogananda V Jeppu, Gunasekaran S, "An Approach to Control Design for Electric Load Simulator", CISCON 2012, Nov 2012.
28. Yogananda Jeppu, Nagaraj Murthy, Shreesha Chokkadi, "Safety and Standards in Control Education-A Need of the Hour", The Dubai International Conference in Higher Education: Succeeding in the Pursuit of Quality Michigan State University, Dubai, 28-29 January 2013, ISBN-10: 1612337031, pp 280-291
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30. Atit Mishra, Manjunatha Rao, Chethan CU, Vanishree Rao, Yogananda Jeppu, and Nagaraj Murthy. 2013. "An auto-review tool for model-based testing of safety-critical systems", In Proceedings of the 2013 International Workshop on

- Joining AcadeMiA and Industry Contributions to testing Automation (JAMAICA 2013). ACM, New York, NY, USA, pp 47-52, DOI: 10.1145/2489280.2489294
31. Chithapuram, Chethan; Jeppu, Yogananda; Kumar, Cherukuri Aswani, "Artificial Intelligence learning based on proportional navigation guidance," *Advances in Computing, Communications and Informatics (ICACCI)*, 2013 International Conference on , vol., no., pp.1140,1145, 22-25 Aug. 2013, DOI: 10.1109/ICACCI.2013.6637338
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  45. R. Raman and Y. Jeppu, "Formal Validation of Emergent Behavior in a Machine Learning Based Collision Avoidance System," 2020 IEEE International Systems Conference (SysCon), Montreal, QC, 2020, pp. 1-6, doi: 10.1109/SysCon47679.2020.9275870
  46. G. V. Nair, Y. Jeppu and M. P. Tahiliani, "Teaching EARS to Undergrads in the Pandemic - Industry Academia Experience," 2020 IEEE Bombay Section Signature Conference (IBSSC), Mumbai, India, 2020, pp. 169-174, doi: 10.1109/IBSSC51096.2020.9332163.
  47. R. Raman and Y. Jeppu, "Does The Complex SoS Have Negative Emergent Behavior? Looking For Violations Formally," 2021 IEEE International Systems Conference (SysCon), 2021, pp. 1-7, doi: 10.1109/SysCon48628.2021.9447127.
  48. Jeppu A.Y., Jeppu Y. (2021) Learning Model-Based Safety-Critical System Engineering: The Fun Way. In: K V S., Rao K. (eds) *Smart Sensors Measurements and Instrumentation. Lecture Notes in Electrical Engineering*, vol 750. Springer, Singapore. doi:10.1007/978-981-16-0336-5\_19
  49. Kiran R., Jeppu Y. (2021) Autopilot Mode Transitions and Voter Logic Validation Using Model Checking: A Design Study of Formal Methods. In: K V S., Rao K. (eds) *Smart Sensors Measurements and Instrumentation. Lecture Notes in Electrical Engineering*, vol 750. Springer, Singapore. doi:10.1007/978-981-16-0336-5\_22
  50. Ramakrishnan Raman, Nikhil Gupta, Yogananda Jeppu, (2021) "Framework for Formal Verification of Machine Learning Based Complex System-of-System" (Best paper award at the 31<sup>st</sup> INCOSE Annual International Symposium), doi: 10.1002/j.2334-5837.2021.00840.x

51. R. Singh, O. Prakash, S. Joshi and Y. Jeppu, "Development of 3DOF Longitudinal Dynamic Model of Generic Air-breathing Hypersonic Vehicle," 2022 International Conference for Advancement in Technology (ICONAT), 2022, pp. 1-5, doi: 10.1109/ICONAT53423.2022.9725896.
52. R. Singh, O. Prakash, S. Joshi and Y. Jeppu, "Linear Controller Design for Generic Air-Breathing Hypersonic Vehicle for different Control Inputs," 2022 International Conference for Advancement in Technology (ICONAT), 2022, pp. 1-6, doi: 10.1109/ICONAT53423.2022.9725951.
53. D. Pal, V. Bundele, R. Sharma, B. Banerjee and Y. Jeppu, "Few-Shot Open-Set Recognition of Hyperspectral Images with Outlier Calibration Network," 2022 IEEE/CVF Winter Conference on Applications of Computer Vision (WACV), 2022, pp. 2091-2100, doi: 10.1109/WACV51458.2022.00215.
54. Jeppu, Y. and Raman, R., "A Framework for Teaching Safety Critical Artificially Intelligent Control Systems to Undergrads," SAE Technical Paper 2022-26-0025, 2022, <https://doi.org/10.4271/2022-26-0025>.

### **Popular Articles**

1. YV Jeppu, "Its About Time", Cover Story, Science Reporter, pp 9-15, 22-23, Vol. 40, Oct 2003.
2. Philatelic Consultant to the Limca Book of Records 2003, pp 57-59
3. Webmaster "Dakshina Kannada Philatelic and Numismatic Association", [http://webspaces.webring.com/people/md/dakshina\\_kan\\_pa/](http://webspaces.webring.com/people/md/dakshina_kan_pa/)
4. YV Jeppu, "The Tantras and Mantras of Testing", Software Test and Performance Magazine, Sep 2005, pp 39-43
5. Yogananda Jeppu, "Thou Shalt Experiment With Thy Software", Software Test and Performance Magazine, June 2007
6. Yogananda Jeppu and Ambalal Patel, "Let Not Your Project Become a Tragedy of Errors", Software Test & Performance Magazine, January 2008
7. YV Jeppu, "Aryabhata's Longitude - Revisited using Genetic Algorithm"
8. Y V Jeppu, "First Airmail"
9. Yogananda Jeppu, Testing of Safety Critical Control Systems (DOI: 10.13140/RG.2.2.24758.19523) (<http://www.mathworks.in/matlabcentral/fileexchange/39047-testing-of-safety-critical-control-systems>, updated on 12 Aug 2017 [MATLAB Central Pick of the Week 3 Jul 2015]).

***This material, a compendium of 460 slides on the subject, is being used by Prof Manuel Béjar to teach a new Master Degree in Computer Science at University Pablo de Olavide, Seville, Spain. This material was used for the Formal Methods course by Chennai Mathematical Institute, Chennai, India.***

10. Yogananda Jeppu, "A Benchmark Problem for Model Based Control System Tests – 001" <http://www.mathworks.fr/matlabcentral/fileexchange/28952-a-benchmark-problem-for-model-based-control-system-tests-001>
11. Yogananda Jeppu, "MC/DC Test Case Generator", <http://www.mathworks.com/matlabcentral/fileexchange/37953-mcdc-test-case-generator>
12. Yogananda Jeppu, "A Benchmark Problem for Model Based Control System Tests – 002" <http://www.mathworks.in/matlabcentral/fileexchange/37973-a-benchmark-problem-for-model-based-control-system-tests-002>
13. Yogananda Jeppu, Chethan C U, "Automated Model Based Requirement Coverage Analysis Tool", Matlab Expo 2012, August 8, 2012
14. Manjunatha L Rao, Yogananda Jeppu, "Mutation Testing for Model Based Requirements", Matlab Expo 2012, August 8, 2012
15. Yogananda Jeppu, "Benchmark Problem 02 - Matlab code" <http://www.mathworks.in/matlabcentral/fileexchange/41838-benchmark-problem-02-matlab-code>
16. Blog on Safety critical model based development <http://safetycriticalmbd.wordpress.com>
17. Yogananda Jeppu, Anti-Windup PID Example, <http://www.mathworks.in/matlabcentral/fileexchange/45657-anti-windup-pid-example>, 22 Feb 2014.
18. Yogananda Jeppu, Benchmark Problem 03, <http://www.mathworks.com/matlabcentral/fileexchange/51608-benchmark-problem-03>, 28 Jun 2014.
19. Yogananda Jeppu, Solving Ferryman Problem with Simulink Design Verifier, <http://www.mathworks.com/matlabcentral/fileexchange/55054-solving-ferryman-problem-with-simuink-design-verifier>, (Jan 2016)
20. Yogananda Jeppu, How do I teach Formal Methods to kids?, Feb 2016 LinkedIn
21. Yogananda Jeppu, Just One More Test Case, Feb 2016 LinkedIn



22. Yogananda Jeppu, Formal methods – to use or not to use, Jul 2016, LinkedIn
23. Yogananda Jeppu, A Mantra for Safety Critical System Design, Oct 2016, LinkedIn
24. Yogananda Jeppu, A 12-year Dormant Error found in just 1.474 seconds!!, February 10, 2017, LinkedIn
25. Yogananda Jeppu, The Schiaparelli Analysis, September 2017, LinkedIn

#### MEMBERSHIPS

- Associate Member Institution of Engineers (IE), AM056856-5
- Member Aeronautical Society of India (AeSI), M15020
- Member Astronautical Society of India (ASI), LM1227
- Member Society for Aerospace Quality and Reliability (SAQR), LM221
- Member International Council on Systems Engineering (INCOSE), 31239 – Office bearer INCOSE India Chapter
- Member of The Indian Science Congress Association (ISCA), L20206
- Member Computer Society of India (CSI), I1501230
- Committee Member Special Interest Group-SIG on Formal Methods, Computer Society of India
- Member Indian Society of Systems for Science and Engineering (LM01824)
- Senior Member, IEEE (97430831)

#### INVITED TALKS/ TEACHING EXPERIENCE

##### **Invited Talks**

- "17 Years of Using Matlab – Some Experiences", CEP course of Matlab at Institute of Armament Technology, 2005
- "Habituated to Matlab" – First Mathworks Conference in India, 2010
- "Aircraft Flight Controls - What we engineers do", N.M.A.M.I.T, Nitte, Karkala, 2010 and VIT University, Vellore, 2011
- "Design & Simulation Tools - Designing with Minimal Resources ", EFY Design Engineers' Conference 2011
- "Testing Safety Critical Control Systems", Eighth Control Instrumentation System Conference, CISCON-2011, Manipal
- "Software Failures – Who do we Blame?", VIT Vellore, 2012 (Faculty development program)
- "Verification and Validation – Best Practices", VIT, Vellore, 2012 (Faculty development program)
- "Safety Critical Control Systems, Bridging the gap between academia and industry for 2025", Workshop on Industry Academia Interaction in Control & Automation: A critical look & path forward, 2-Nov-2012, IEEE Control System Chapter
- "Safety Critical Control Systems", Pre-Conference Workshop, CISCON, 2012 (Advisory Committee member)
- "DO178B/DO178C – The Safety Critical Software Standard" – DRDO CEP, Nov 2012.
- "Aircraft Flight Controls - What we engineers do PART I and II", Industry Webinar Series, Indo US Collaboration for Engineering Education, 2013
- "Mission Critical Software - Can we afford defects?" Step in Summit 2013, June 18-21, 2013.
- "Error detection, recovery and graceful degradation", Two day National Symposium on Reliability and Fault Tolerance 26th and 27th July 2013, Supported by Dept. of Space, Govt. of India, (Advisory Committee member)
- "Model Based Test Automation for Safety Critical Control", Techgig Expert Speak, webinar, 19 Dec, 2013, [http://www.youtube.com/watch?v=EIMMzEKIM-0&feature=player\\_embedded](http://www.youtube.com/watch?v=EIMMzEKIM-0&feature=player_embedded)
- "Emerging trends in Safety Critical Software", Techgig Expert Speak, webinar, Jul 14, 2014, [https://www.youtube.com/watch?v=-0zJKYCjJ48&feature=player\\_embedded](https://www.youtube.com/watch?v=-0zJKYCjJ48&feature=player_embedded)
- "Error detection, recovery and graceful degradation in safety critical systems", PESIT, Bangalore, 12 April 2014
- "Challenges in Building Safety Critical Systems", LDRA Academic Alliance Program, April, 2014
- Anyone Can Test Software - Can They? - Step in Summit 2014, June 25-27, 2014.
- "What are formal methods", inaugural talk at National Workshop/Conference on Formal Methods-NCFM, October 2014
- "Introduction to Formal Methods" & "Catastrophic Failures in Software", CEP course for Center for Artificial Intelligence and Robotics, DRDO, Nov 14, 2014
- "Innovation & Optimization", invited talk at Flipkart, Bangalore, Feb 12, 2015.
- "Open Source Software in Safety Critical System, What we need to do", CEP course at Center for Artificial Intelligence and Robotics, DRDO, Feb 23, 2015
- "How to Accelerate Innovation in Your Company", Techgig Expert Speak, webinar, 6 Mar, 2015
- "Formal methods In Flight Control Systems", Workshop at Computer Society of India, May 2015
- IEEE AESS Technical Talk - Verification and Validation in Safety Critical Control Systems: Past and the Future, Aug 2015
- Control Software V&V - Requires a paradigm shift – GATET, Bangalore, Dec 2015.
- Formal Methods for Assurance of Safety Critical Systems, This is the way to go!, CSI-DRDO, March 2016

- "Systems Engineering - requires a paradigm shift", Keynote speaker – Matlab Expo Hyderabad, Apr 2016
- "Models, Properties and Formal Methods the way forward for safety critical software" – Talk at Indian Airforce Software Development Institute – Silver Jubilee, Jan 2017
- "Flight Control System Validation what we need to do", Iowa State University, Feb 2017, Oct 2019
- "Systems Engineering - Need and Scope in Engineering Curricula", MIT Manipal as part of ISSE, Sep 2019
- "Safety Analysis using STPA" – Vikram Sarabhai Space Centre, Oct 2019
- "Flight Controls - What we systems engineers do!", [https://www.youtube.com/watch?v= dlrt\\_onmmU](https://www.youtube.com/watch?v= dlrt_onmmU)
- "Safety Critical Fault Tolerant Control - develop, test & certify", AAV20, Jan 2020
- "Safety Ingrained MBSE – a Must for UAVs?", AAV21, Jan 2021

## **Mentoring**

- Lab Work at workshop on Digital Control Design using CAD Tools, Indian Institute of Science, Bangalore
- Lecture on Non Real Time Testing at the CEP course on Software Certification conducted by RCMA (Aircraft), 2002
- Software Testing – NAL- ASTE Lecture series February 2005
- Guide for Short Term B Tech Projects
  - "Feedback Loop Control System Design and Simulation", NITK Surathkal
  - "Modelling of Airdata System in Matlab", Visvesvaraya Technological University, Belgaum
  - "Simulink Model of an Aircraft Airdata System", MSc project Work, Mangalore University
  - "Model Based Testing Using Simulink Schematics", PEC, Pondicherry
  - "Implementation and Testing of Control Elements in an Aircraft Safety Critical System", Visvesvaraya Technological University, Belgaum
  - "A Model based Implementation and Testing of Digital Controller", VIT, Vellore
  - "Generation and Simulation of Autoland System in Aircraft", MIT, Manipal
- Guide MTech Projects
  - "A New Paradigm of Coverage Metrics for Control System Blocks" – Visvesvaraya Technological University, Belgaum
  - "Safety Critical Control System Coding and Automated Testing" - Visvesvaraya Technological University, Belgaum
  - "A Processor in Loop Test Method for Safety Critical Controls" – Visvesvaraya Technological University, Belgaum
  - "A Practical Design and Implementation of Lateral Autopilot Modes for Commercial Aircrafts Using Extended State Observer" - MIT, Manipal
  - "A Practical Design and Implementation of Longitudinal Autopilot Modes for Commercial Aircrafts Using Extended State Observer" - MIT, Manipal
  - "DO331 Compliant Model Based Automated Optimized Test Case Generation" - MIT, Manipal
  - "Methodology to Ensure Security in an Embedded Executable Build" – Visvesvaraya Technological University, Belgaum
  - "Design, Implementation, Verification and Validation of Autopilot Mode Transition Logic for a Generic Aircraft", BITS, Pilani
  - "Guidance and Navigation of Aeronautical Vehicles using Artificial Intelligence", VIT, Vellore
  - "Autopilot Mode Transitions and Voter Logic Validation using Model Checking – A Design Study of Formal Methods"- Visvesvaraya Technological University, Belgaum
- Guide/Co Guide PhD
  - Power electronics application for solar cells, IIT Madras, in progress
  - Reconfigurable Fault Tolerant Control Systems, VTU, in progress
  - Development of a Fuzzy-Dynamic Model to Predict the Fruition of Innovation with respect to Aircraft Control Systems Projects, MSRUAS, in progress
  - Electrical Solutions to Potential Induced Degradation (PID) of Solar Panels, VTU, in progress
  - Flight Dynamic Analysis of Generic Air-Breathing Hypersonic Vehicle using Bifurcation Method, UPES, in progress
- Workshop on "Flight Control Systems" – NITK, Surathkal, Engineer -2009, 12-15 Feb 2009
- Automatic Flight Control Systems training at Honeywell (3 Weeks)

- Training in Control Systems, Matlab/Simulink, Requirements, Model Based Testing at Moog Controls, USA and India (10-day program)
- Tutorial on "Model Based Testing", ISSRE 2009, Mysore, 16 Nov 2009.
- Workshop on "Model Based Development and Testing of Safety Critical Control System", 25-27 Feb 2010, N.M.A.M.I.T, Nitte, Karkala.
- Organized FIBS-2010, a Model Based Testing Contest, Moog India
- External Examiner for MTech projects from Visvesvaraya Technological University, Belgaum
- Workshop on "Model Based Development and Testing of Safety Critical Control System", RV College of Engineering, Bangalore, 2010
- "Model Based Development and Testing of Safety Critical Control System", Proficiency Course in RV College of Engineering, Bangalore in July 2011
- "Experiences with DO 178B Level A"- 5 Day Workshop On DO178 B For Military, April 2012
- Two-day Hands-On National Workshop On Safety Critical Software Testing, VIT Vellore, 9-10 April, 2012
- "Model Based Development and Testing of Safety Critical Control Systems", MIT Manipal, April 17-18, 2012
- Matlab and Simulink, Proficiency Course in RV College of Engineering, Bangalore in June 2012
- A three-day workshop at MIT Manipal on safety critical system testing. Students made a set of test cases and a set of mutant files. Two teams played against each other trying to find errors seeded by the other team. – Jan 4, 2013
- Two-day workshop on Safety Critical Control Systems at RVCE, 19th and 20th of April, 2013
- Three-week workshop on Embedded Control System Design and Implementation ConSys-2013 for Acharya Institute of Technology students, July 15 - Aug 02 2013.
- Two-day workshop on Aircraft Modelling and Auto Pilot Design Using MATLAB/SIMULINK, VIT Vellore, June 2015
- Workshop on Formal Methods, Thiagarajar College of Engineering, Madurai, March 2016
- Series Workshop at various Honeywell sites on Control, Matlab, Simulink and Formal Methods, Jan to Mar 2016
- Workshop on Simulink Design Verifier and NuSMV at the Application of Formal Methods for Safety & Security Critical Systems - AFMSS 2016, Bangalore, May 2016
- Two-day workshop on Environmental Control System at MIT Manipal, Feb 2017
- One day workshop on Model Based Systems Engineering, MIT Manipal, Jan 2018
- One day workshop on STPA and OPM, MIT Manipal, Sep 2018

#### TRAININGS ATTENDED

- Automatic Target Recognition, DRDO CEP, May 1993
- Course on Signal processing, DRDO CEP, December 1994
- Object oriented programming using C++, Hyderabad 1995
- Tutorial on Neural Networks and Fuzzy Logic for Intelligent Control, November 1995.
- Aircraft Flight Control and Simulation, NAL UNI, August 1997
- Course on Multi-disciplinary Optimization, ADA, 2002
- Tutorial on Requirements Management using Doors, NAL, 2004
- Workshop on Formal methods in Safety Critical and Industrial Applications, IIT Bombay, June 2005
- Workshop on Scilab, IIT Bombay, March, 2007
- DO 178B course at Honeywell, 2008
- Certified Six Sigma Green Belt, Honeywell, 2008
- Course on Project Management, QAI, 2009
- Leadership Training - Moog India Leadership Institute (MILI), 2010
- Business Process Innovation, November, QAI, 2011
- Executive Development Sessions – Sunzer 2012
- Leading Strategic Innovation in Organizations – online course from Vanderbilt University Owen Graduate School of Management, USA, May 2013
- Crash Course on Creativity - online course from Stanford University, USA, June 2013
- Business Development - November 2013
- Critical Perspectives on Management – online course from IE Business School, March 2014
- On Strategy: What Managers Can Learn from Great Philosophers – online course Ecole Centrale Paris, June 2014
- Developing Innovative Ideas for New Companies: The First Step in Entrepreneurship - University of Maryland, College Park, April 2015

- Establishing and Managing Corporate Innovation: Lessons from the Israeli Experience, IIM, Bangalore, Nov 2017
- Four-day workshop on STPA at MIT, Massachusetts, Mar 2018