

# HARSHAVARDHAN MYLAPILLI

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## Formal Metrics

University of Southern California (USC)

Los Angeles, CA

- **Doctoral Candidate (Mechanical Engineering** - Dynamics & Controls) in the Aerospace & Mechanical Engineering Department, Aug 2009 - May 2014 (Expected).
- Earned a **Master of Science** degree in Mechanical Engineering (Dynamics & Controls), Aug 2007 - Dec 2008.
- Major GPA of **3.925** out of **4.0**

Indian Institute of Technology - Bombay

Mumbai, India

- Earned a **Bachelor of Technology** degree in **Aerospace Engineering**, Aug 2002 - Aug 2007.
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## Work Experience

May 2013 - Present

**NASA Jet Propulsion Laboratory - California Institute of Technology (Year-round Internship Program)**  
Pasadena, CA

- Worked under the mentorship of Dr. Abhinandan Jain at the DARTS (Dynamics and Real-Time Simulation) Lab, Robotics Division. Developed a nonlinear complementarity solver (in place of the existing linear solver) to handle unilateral/bilateral constraints in contact dynamics / friction problems. Contributed to JPL's software by developing new algorithms in C++/Matlab to solve linear and nonlinear complementarity problems. Test cases in Python have also been implemented to test these new techniques.

Summer 2008

**Viterbi School of Engineering (VSoE) - IT Division**

Los Angeles, CA

- Provided helpdesk, troubleshooting and IT support to approximately 100 employees of VSoE, USC. Answered software related queries (both on the phone and in person). Handled hardware related problems faced by the employees. Played a key role in upgrading the desktops of around 100 employees.

Summer 2005

**Air India (Summer Intern)**

Mumbai, India

- Led a group of five students on a project that was aimed at understanding the structure and maintenance operations of the flight control system of a Boeing 747-400 aircraft. Submitted a 59-page document to Air India suggesting improvements to the existing maintenance procedures of the elevator and rudder flight control systems.
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## Publications

**Harshavardhan Mylapilli**, "A Constrained Motion Approach to the Synchronization of the Multiple Coupled Slave Gyroscopes", Journal of Aerospace Engineering, Vol. 26, No. 4, pp. 814-828, October 2013.

**M. Harshavardhan**, Om Prakash, and N. Ananthkrishnan, "Flight Dynamic Simulation of a Multibody Configuration Using an Integrated Euler Solver", Recent Advances in Computational Mechanics and Simulations - Volume II, I.K. International Publishing House, New Delhi, 2006, pp 1339-1345.

*Under Review*

Firdaus E. Udwadia and **Harshavardhan Mylapilli**, "Constrained motion of mechanical systems and tracking control of nonlinear systems", Springer book series. *Currently, under review; Submitted November 2013.*

Firdaus E. Udwadia and **Harshavardhan Mylapilli**, "Constrained Motion of Mechanical Systems and Tracking Control of Nonlinear Systems: Connections and Closed-form Results", Intelligent Control and Automation. *Currently, under review; Submitted January 2014.*

*Under Preparation*

**Harshavardhan Mylapilli** and Firdaus E. Udwadia, "Energy Control of Non-homogeneous Toda chains", *Currently, under preparation.*

**Harshavardhan Mylapilli** and Firdaus E. Udwadia, "Energy Control of Nonlinear, Non-homogeneous Chains", *Currently, under preparation.*

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## Research Experience

2013 - Present	<b>Control of Hyperelastic Beams</b> (Advisor - Dr. Firdaus Udwadia, USC) <ul style="list-style-type: none"><li>• The problem of control of three dimensional hyperelastic beams is approached from a constrained motion perspective. Absolute nodal coordinate formulation is used to derive the equations of motion and three different nonlinear constitutive models based on hyperelastic theory are considered in order to model the hyperelastic beams.</li></ul>
2013 - Present	<b>Contact Dynamics and Nonlinear Complementarity Technique</b> (Advisor - Dr. Abhinandan Jain, JPL) <ul style="list-style-type: none"><li>• Unilateral and bilateral constraints in contact dynamics are approached using nonlinear complementarity techniques by recasting the complementarity problem as a problem of unconstrained convex optimization.</li></ul>
2010 - 2013	<b>A New Approach to the Energy Control of Toda Chains</b> (Advisor - Dr. Firdaus Udwadia, USC) <ul style="list-style-type: none"><li>• The problem of energy stabilization of a finite degrees-of-freedom non-homogenous Toda chain with fixed-fixed and fixed-free boundary conditions is approached from a constrained motion perspective.</li></ul>
2009 - 2010	<b>Synchronization of Multiple Coupled Slave Gyroscopes</b> (Dr. Firdaus Udwadia, USC) <ul style="list-style-type: none"><li>• The problem of synchronization of a master gyro exhibiting chaotic or periodic motion with multiple, non-identical, coupled slave gyroscopes is approached from a constrained motion perspective.</li></ul>
2008 - 2009	<b>Motion Synchronization and Energy Stabilization of Multi-Pendulum Systems</b> (Dr. Firdaus Udwadia, USC) <ul style="list-style-type: none"><li>• Approached the problem of energy stabilization and motion synchronization of a multi-pendulum system using the constrained motion approach.</li></ul>
2007 - 2008	<b>Formation Flight Maneuvers in Three Dimensions</b> (Dr. Firdaus Udwadia, USC) <ul style="list-style-type: none"><li>• Investigated the problem of synchronized formation flight and leader-follower formation flight of multiple aircrafts using the constrained motion approach. Numerous three-dimensional flight maneuvers are programmed and simulated using Matlab.</li></ul>
2006 - 2007	<b>Flight Dynamic Simulation of a Multibody Configuration Using an Integrated Euler Solver</b> (Advisors - Dr. N. Ananthkrishnan / Dr. A. Chatterjee, IIT Bombay) <ul style="list-style-type: none"><li>• Developed a 4-DOF longitudinal flight dynamic model of the wing-payload system. Performed Matlab simulations to obtain detailed time histories of the various parameters critical to flight.</li></ul>
2005 - 2006	<b>Aerodynamic Analysis of 3-D Aerodynamic Configuration using Euler Simulations</b> (Advisor - Dr. A. Chatterjee, IIT Bombay) <ul style="list-style-type: none"><li>• Modified the Langley Euler Code that solves the three dimensional Euler equation of fluid mechanics. Validated the modified code using the test case of an Onera M6 wing (modeled as a single block grid).</li></ul>
2004 - 2005	<b>Stealth Technology - Infrared Signature Studies</b> (Advisor - Dr. S.P. Mahulikar, IIT Bombay)

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## Conference Talks

- **Evaluation of Complementarity Techniques for Minimal Coordinate Contact Dynamics**, ASME - International Design and Engineering Technical Conferences, Buffalo, NY, 17-20 August, 2014 (*Paper submitted and is currently under review*).
  - **Energy Control of Nonlinear Nonhomogeneous Chains**, ASME - International Mechanical Engineering Congress and Exposition, San Diego, CA, 15-21 November, 2013.
  - **Energy Control of n-degrees-of-freedom nonhomogeneous Toda Chains**, ASME - International Mechanical Engineering Congress and Exposition, Houston, Texas, 9-15 November, 2012.
  - **A Constrained Motion Approach to the Synchronization of Multiple Coupled Slave Gyroscopes**, ASCE - Earth and Space Conference (ES 2012), Pasadena, Los Angeles, CA, 16-18 April, 2012.
  - **A New Approach to the Energy Control of Toda Chains**, ASCE - Engineering Mechanics Institute (EMI 2010) Conference, University of Southern California, Los Angeles, CA, 8-11 August, 2010.
  - **Flight Dynamic Simulation of a Multibody Configuration Using an Integrated Euler Solver**, 2nd Intl. Conf. on Computational Mechanics and Simulation (ICCMS-06), IIT-Guwahati, India, 8-10 December, 2006.
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## Teaching & Mentoring Experience at USC

- **Teaching Assistant Fellow (2013-2014), Center for Excellence in Teaching, Office of the Provost, USC.**
  - ❖ Collaborate with fellow TAFs and faculty from across the university to organize monthly workshops and TA training activities to help in the enhancement of teaching university-wide.
- **Teaching & Grading Assistant, USC (2008 - Present)**
  - ❖ Recognized by the **Viterbi School of Engineering (VSoE)** as an ‘**exceptional**’ teaching assistant (TA). Was invited to participate in panel discussions held at VSoE on the new TAs orientation day in Spring 2013 as well as Fall 2013 to offer my experience and expertise to help the school in training new TAs.
  - ❖ Worked as a teaching and grading assistant for 11 different courses (7 graduate level courses + 4 undergraduate courses) and 7 different Professors at USC. Responsibilities involved holding discussion sessions and office hours to class sizes of around 35 - 120 students, organizing assignments, their solutions and grading submitted homeworks.
  - ❖ Guest lectured for AME 525 (2 lectures), AME 526 (3 lectures), AME 524 & AME 522 (both 2 lectures).
  - ❖ Teaching experience at USC:  
**Teaching Assistant:**  
Spring 2010 - AME 522 - Nonlinear Dynamics, Vibrations and Chaos - Dr. Firdaus Udwadia  
Fall 2010 - AME 526 - Engineering Mathematics II - Dr. Paul Newton  
Fall 2010 - AME 201 - Statics - Dr. Charles Radovich  
Spring 2011 - AME 525 - Engineering Mathematics I - Dr. Paul Newton  
Fall 2011 - AME 526 - Engineering Mathematics II - Dr. Charles Campbell  
Spring 2012 - AME 526 - Engineering Mathematics II - Dr. Tait Pottebaum  
Fall 2012 - AME 526 - Engineering Mathematics II - Dr. Charles Campbell  
Spring 2013 - AME 526 - Engineering Mathematics II - Dr. Paul Newton  
Fall 2013 - AME 526 - Engineering Mathematics II - Dr. Charles Campbell  
  
**Grading Assistant:**  
Spring 2008 - AME 403 - Stress Analysis - Dr. Oussama Safadi  
Fall 2008 - AME 451 - Linear Control Systems I - Dr. Henryk Flashner  
Fall 2008 - AME 541 - Linear Control Systems II - Dr. Henryk Flashner  
Fall 2009 - AME 524 - Advanced Engineering Dynamics - Dr. Firdaus Udwadia  
Fall 2009 - AME 552 - Nonlinear Control Systems - Dr. Henryk Flashner  
Spring 2010 - AME 420 - Vibrations I - Dr. Firdaus Udwadia  
Summer 2010 - AME 525 - Engineering Mathematics I - Dr. Firdaus Udwadia  
Fall 2010 - AME 522 - Nonlinear Dynamics, Vibrations and Chaos - Dr. Firdaus Udwadia  
Summer 2011 - AME 525 - Engineering Mathematics I - Dr. Oussama Safadi  
Fall 2011 - AME 524 - Advanced Engineering Dynamics - Dr. Firdaus Udwadia  
Spring 2012 - AME 539 - Multibody Dynamics - Dr. Firdaus Udwadia
- **Graduate Student Mentor (2012 - 2013) - Viterbi School of Engineering**
  - ❖ Mentored two graduate students (Zhijun Cai & Ying Chen) admitted to the Mechanical Engineering Department, USC in Fall 2012. Helped both students adjust to life at USC and Los Angeles, offered them advice on academic issues as well as study strategies, language difficulty, time management, networking and jobs/internship related queries.

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## Positions of Responsibility

- **Reviewed** technical papers for Springer’s **Journal of Optimization Theory & Applications**, ASME’s **Journal of Computational & Nonlinear Dynamics** and Elsevier’s **Applied Math & Computation**.
- **Core Group Member** of Zephyr, 2006 - Zephyr 2006 was the 5th Annual AEA Workshop hosted by the Aerospace Engineering Department, IIT Bombay, India. Clinched a sponsorship deal with NGC India to organize the screening of a television documentary series - ‘*Air Crash Investigations*’ at IIT Bombay.

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### Academic Honors

- Recipient of the prestigious ***Gold medal*** awarded by Chief Minister of Andhra Pradesh, India for obtaining an All India Rank of 201 (RC) out of a total of 200,000 students in the IIT Joint Entrance Exam 2002.
- Recipient of the prestigious ***Prathibha Scholarship*** awarded by the State Government of Andhra Pradesh, India for academic excellence in Class X (2000-2001).

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### Technical Skills

- **Programming Languages:** Python, C++
- **Operating Systems:** Linux, Unix, Windows, Mac OS
- **Softwares:** Adams, Solidworks, Solidedge, MATLAB, MAPLE, Microsoft Office Suite, Adobe Suite.

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### Relevant Courses

Advanced Classical Mechanics • Multibody Dynamics • Classical & Modern Control Systems • Linear Quadratic Control • Multivariable Robust Control • Nonlinear Dynamics, Vibrations & Control • Nonlinear Control Systems • Spacecraft Flight Dynamics & Attitude Control • Advanced Engineering Vibrations • Engineering Mathematics I & II • Flight Mechanics • Fluid Mechanics • Aircraft Design • Probability Theory for Engineers • Introduction to Python • Algorithms • Data Structures

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