

# Siddhartha S. Srinivasa

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## CONTACT INFORMATION

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## RESEARCH INTERESTS

I am interested in the dynamics and control of robots interacting with the world. My long term goal is to make this interaction faster, safer, more robust and use simpler actuation. I am currently working on the planning and control of dynamic manipulation with frictional contacts and on the synthesis of optimal gaits for passive dynamic walkers on rough terrain.

## EDUCATION

**Carnegie Mellon University**, Pittsburgh, Pennsylvania USA

Ph.D., Robotics (expected graduation date: August 2005)

- Dissertation Topic: “Dynamic contact manipulation - Planning, Control and Experiments”
- Advisors: Matthew T. Mason and Michael A. Erdmann

**Carnegie Mellon University**, Pittsburgh, Pennsylvania USA

M.S., Robotics, August 2001

- Dissertation Topic: “Experiments with Nonholonomic Manipulation”
- Advisors: Matthew T. Mason and Michael A. Erdmann

**Indian Institute of Technology Madras**, Tamil Nadu, India

B.Tech., Mechanical Engineering, May 1999

- Dissertation Topic: “Reverse Engineering using the Structured Lighting Technique”
- Advisors: Radhakrishnan A.

## RESEARCH EXPERIENCE

**Ph.D. research**, Carnegie Mellon University, Pittsburgh, PA **2001 - Present**

I am working on the planning and control of manipulation tasks where the object is in frictional contact both with the robot and the environment. I use the natural dynamics of the object and load-bearing contacts with the environment to perform tasks faster, with less effort, and with minimal actuation.

- Designed an algorithm that, given a manipulation task and a set of nonlinear contact constraints and actuator limitations, computes all feasible dynamic motions of the system.
- Implemented a planner that computes time-optimal trajectories, in Matlab.
- Implemented a feedback controller using dynamic programming, in C and Matlab.
- Currently working on demonstrating the algorithm on the Adept 550 robot, in V+.

**M.S. research**, Carnegie Mellon University, Pittsburgh, PA **1999 - 2001**

I worked on the *Mobipulator* (short for mobile manipulator), a desktop robot that uses its wheels both for locomotion and manipulation. I worked specifically on using the wheels to manipulate paper with feedback from a camera overlooking the desktop, a nonholonomic control problem.

- Designed and implemented a feedback controller for the system, in C.
- Implemented visual-servoing of the robot and paper using the Tomasi-Kanade tracker, in C.
- Demonstrated the controller, using feedback from the camera, on the *Mobipulator*.

**Kinesthetic sensing**, Carnegie Mellon University, Pittsburgh, PA **2002**

I worked on an NSF grant on the estimation of contact forces from the variations of internal shape and the stresses induced on a wheeled robot traversing rough terrain.

- Designed and built a wheeled robot with a flexible body and embedded force-torque sensor.
- Implemented an algorithm that estimates wheel contact forces and body shape from sensor data, in Matlab and C.
- Demonstrated shape recovery on the robot.

**Multi-robot coverage**, Carnegie Mellon University, Pittsburgh, PA **2000**

I worked with Howie Choset on an algorithm for complete coverage with a team of robots in a cluttered environment with limited communication.

- Designed an algorithm for multi-robot coverage, with a proof of completeness.
- Implemented a multi-robot simulator in C++.
- Demonstrated coverage task using Nomad Scout robots.

**Summer Internship**, Indian Institute of Science Bangalore **Summer 1997, 1998**

I worked with Roddam Narasimha on the the development of fluid structures across multiple spatial scales during the evolution of turbulent jets.

- Worked on the development of NALLETS, a (now commercial) wavelet based multi-scale visualizer for fluid dynamics in C++, at the National Aerospace Laboratories, Bangalore.
- Applied the Wavelet Transform to the Navier-Stokes equations of a turbulent jet to extract coherent structures.

TEACHING  
EXPERIENCE

**Teaching Assistant**, Carnegie Mellon University, Pittsburgh, PA **Fall 2001**

Lectured on the theory of curves and the applications of Frenet frames, designed and graded assignments, and held office hours for a graduate level mathematics course.

HONORS

Graduate Fellowship, The Robotics Institute, Carnegie Mellon University **1999 - present**  
 Jawaharlal Nehru Summer Research Fellowship, Indian Institute of Science **1997, 1998**  
 Rajiv Gandhi Award for Best Summer Research Fellow, Indian Institute of Science **1997, 1998**  
 Indian National Mathematics Olympiad **1994**

JOURNAL  
ARTICLES

Srinivasa S., Narasimha R., Basu A., Kailas S., *Coherent Structures in Numerically Simulated Jets with and without off-source heating*, Journal of Fluid Dynamics Research, 2000

CONFERENCE  
PAPERS

Srinivasa S., Erdmann M. and Mason M., *Using projected dynamics to plan dynamic contact manipulation*, IEEE/RSJ International Conference on Intelligent Robots and Systems, 2005

Srinivasa S., Erdmann M. and Mason M., *Control synthesis for dynamic contact manipulation*, IEEE International Conference on Robotics and Automation, 2005

Srinivasa S., Erdmann M. and Mason M., *Bilateral time-scaling for the control of task freedoms of a constrained nonholonomic system*, IEEE International Conference on Robotics and Automation, 2003

Srinivasa S., Baker C., Sacks E., Reshko G., Mason M. and Erdmann M., *Experiments with non-holonomic manipulation*, IEEE International Conference on Robotics and Automation, 2002

Latimer IV D., Srinivasa S., Lee-Shue V., Sonne S., Choset H., Hurst J., *Towards sensor based coverage with robot teams*, IEEE International Conference on Robotics and Automation, 2002

Latimer IV D., Srinivasa S., Lee-Shue V., Sonne S., Choset H., Hurst J., *Sensor based coverage with robot teams*, Mobile Robots XVI, Proceedings of SPIE, 2002

CITIZENSHIP

Indian, one year of work authorization available.