
Murali Krishna

449, S. Evaline St., Apt #2
Pittsburgh, PA 15224
Home: (412) 621-6078
Work: (412) 681-5202

Email: mkrishna@ri.cmu.edu
Web: <http://www.cs.cmu.edu/~mkrishna>

Education

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| Ph.D., Robotics , (Expect to graduate in the summer of 1999) | The Robotics Institute, Carnegie Mellon University, Pittsburgh, PA - 15213 |
| M.E., Mechanical Engineering ,
1994 | Carnegie Mellon University (CMU) |
| B.Tech., Mechanical Engineering ,
1992 | Indian Institute of Technology (IIT), New Delhi, India |

Summary

- Extensive hands-on experience with field robots.
- Knowledge of working with and designing hydraulic control systems.
- Experience in mechanical design, fabrication and component testing for large robot systems.
- Varied experience in Dynamic Simulation of robots, Computer Graphics, Optimization methods, AI techniques and Computer Vision.

Industry, Research and Teaching Experience

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| The Robotics Engineering Consortium, The Robotics Institute, CMU, 1994-present | <ul style="list-style-type: none">• Researcher on the Autonomous Loading System Project funded by Caterpillar Inc. The project has aimed at developing core technologies for the automation of excavation.

Constructed dynamic models of a 25 ton hydraulic excavator and an 80 ton wheel loader for use in real-time path planning and high-fidelity simulations. Also developed a fast method for simulating hydraulic machine response, for which a patent application has been filed.• Ph.D. thesis research is in the area of optimal motion planning for robots. Am investigating the use of search techniques in planning optimal motions for robots. Have successfully demonstrated improved motions on a 25-ton hydraulic excavator testbed. |
| Systems and Controls Research, Caterpillar Inc., Peoria, IL, Summer 1997 | <ul style="list-style-type: none">• Developed a controller for the hydraulic pumps in a novel hydraulic excavator design. Involved understanding the proposed hydraulic system design and system identification prior to controller design. |

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**Field Robotics Center, The
Robotics Institute, CMU, 1993-
94**

- Research Assistant: Managed the design of the tethering system, a key component of the Dante II walking robot project funded by NASA. After extensive vendor interaction, designed and executed a rigorous testing program for the tethering system. Participated in the final two-month robot deployment in a live volcano in Alaska (Mt. Spurr) during the summer of 1994. Was awarded a Certificate of Merit for contributions to the Dante II Walking Robot project.

**Other work at CMU, 1993-
present**

- Teaching Assistant for “Introduction to Computer Vision” (Spring 96): Graded assignments and exams, designed programming assignments and the associated support software, and maintained the class software hierarchy.
- Participated in the preliminary design for the Lunar Rover Initiative, a NASA funded project at the Field Robotics Center to develop an autonomous rover for lunar exploration.
- Created a 30 sec. computer graphics animation which used stochastic ray-casting to generate soft shadows from finite sized light sources, and recursive ray-casting to simulate refraction through glass, and specular reflections on shiny objects in the scene.

IIT, New Delhi, India, 1991-92

- Retro-fitted a conventional center-lathe for computer control as part of the final year undergraduate project. Designed and fabricated the mechanical components for the retrofit, as well as the Intel 80286 based electronic controller board. The working machine was demonstrated in April '92 after a year of effort on the project.

Technical Interests

Current interests and thesis work are in the areas of dynamic modeling and optimal motion planning for robots using general purpose optimization algorithms.

Have interest and experience in a fairly broad range of topics including Computer Vision, Machine Learning, Hydraulic Controls, Computer Graphics and Modeling, and Mechanical Design.

Skills

- Languages:

C, C++, LISP, Pascal.

- Operating Systems:

UNIX (SunOS/Solaris/HP-UX/IRIX), Linux, MacOS, MS-DOS, WindowsNT, VxWorks (A Real -Time OS from WindRiver Systems)

- Graphics Environments:

OpenGL, WorldToolKit

- Simulation Environments:

Matlab/Simulink (from MathWorks), EASY5 (A dynamic simulation environment developed by Boeing Corp.)

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Patents and Publications

- “A Search Approach to Computing Optimal Robot Motions”, Murali Krishna and John Bares. In preparation.
- “Constructing Hydraulic Robot models using Memory-based Learning”, Murali Krishna and John Bares. To be published in the April 1999 issue of the ASCE Journal of Aerospace Engineering.
 - “Simulation Modeling of Non-linear Hydraulic Actuator Response”, Murali Krishna and Steve Lunzman, U.S. Patent (Patent application being processed).
 - “Hydraulic System Modeling through Memory-based Learning”, Murali Krishna and John Bares. IEEE International Conf. on Intelligent Robot Systems (IROS), Victoria, B.C., Canada, Oct '98, pp. 1733-8.
- “Tethering System Design for Dante II”, Murali Krishna and John Bares. IEEE International Conference on Robotics and Automation (ICRA), Albuquerque, New Mexico, April 1997, pp. 1100-5
- “Composite Tether Design”, Murali Krishna. Underwater Cable and Connector Workshop, March 1995, Houston, TX.

Other activities

- Avid volleyball player.
- Have been practising Hatha Yoga for the last three years.
- Deeply interested in Indian classical music.
- Dabble in rock climbing.
- Was Treasurer of the Robotics Student Organization for 2 years.