

Anne M. Murray

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OBJECTIVE:

To lead and conduct applied r&D in the design and evaluation of mechatronic systems and human-system interfaces with a team-oriented, interdisciplinary approach.

SKILLS:

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| Engineering | <ul style="list-style-type: none">• Systems integration• Analog and digital electronic system design and implementation• Sensor design, implementation, and integration with existing structure• Real-time sensor-based control system design and implementation• Controlled experimentation design |
| Computer Programming | <ul style="list-style-type: none">• Languages: C, ADA, Fortran, Pascal, Assembly (680x0)• Operating Systems: Unix, Macintosh, MS-DOS; Real-Time OS: Chimera• Mathematics Software: Matlab, Minitab, Mathematica |
| Project Leadership | <ul style="list-style-type: none">• Advising junior engineers, technicians, and undergraduates• Good communication and interpersonal skills |

EDUCATION:

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| Ph.D.
Carnegie Mellon University | 12/98 (expected). <i>Dept. of Electrical and Computer Engineering</i> , GPA:4.0/4.0
Research: Design and evaluation of Tactile Feedback for Human-Computer Interfaces.
Committee Members: Pradeep Khosla (advisor), Roberta Klatzky, Gary Fedder, and Karun Shimoga |
| M.S.E.C.E.
Carnegie Mellon University | 8/93. <i>Dept. of Electrical and Computer Engineering</i> , GPA: 3.9/4.0
Research: Developed and experimentally characterized a gripper-based force sensor for an automated sheet metal bending machine. Advisor: Pradeep Khosla.
<i>Two Patents Pending on the force sensing system.</i> |
| B.S.E.E.
Texas A&M | 12/88. College Station, Dept. of Electrical Engineering, GPA: 3.35/4.0 |

PROFESSIONAL EXPERIENCE:

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| 8/91-Present | Carnegie Mellon University , Pittsburgh, PA. Graduate Research Assistant <ul style="list-style-type: none">• Developed a tactile interface for telemanipulation and virtual reality environments.• Composed real-time reconfigurable software for robot teleoperation and tactile feedback.• Planned and conducted human-subject experiments to evaluate the effectiveness of various tactile interfaces.• Created a force sensor for the robot gripper of an automated sheet metal bending machine to improve process control.• Experimentally characterized the dynamic behavior of the force sensor.• Provided engineering consultation on several projects. Including a baby step counting device that will be featured in a BBC special on child development.• Advised several undergraduate students. |
| 1/89-7/91 | NASA Johnson Space Center , Houston, TX. Aerospace Technologist <ul style="list-style-type: none">• Established a test bed to evaluate a ten degree-of-freedom anthropomorphic robot for space suit testing |

- Improved and integrated the low-level control electronics and sensor signal conditioning electronics for a robotic hand and wrist system. This system was installed on a free-flying robot to evaluate space robotics applications.
- Created a test bed to examine advanced control and data transfer technologies with a two-link planar robotic manipulator
- Oversaw several Small Business Innovative Research Contracts and University Research Contracts with an approximate total value of \$600,000.
- Supervised research of support contractors.

9/86 - 8/88

NASA Johnson Space Center, Houston, TX. Co-op Engineering Trainee

- Designed a low-level control system for a robotic hand and wrist assembly. Augmented the robotic system with tactile, force, and proximity sensors. Developed the associated sensor signal conditioning electronics.
- Acquired ADA programming skills in preparation for Space Station projects.
- Developed a digital interface module for a portable hardware evaluation device for the Space Shuttle.

AWARDS:

Sustained Superior Performance Award (NASA Johnson Space Center), Outstanding Co-op Student Award (NASA Johnson Space Center), Tau Beta Pi (Engineering Honor Society), Eta Kappa Nu (Electrical Engineering Honor Society), Academic Excellence Memorial Scholarships (Texas A&M University).

ACTIVITIES:

Representative, Graduate Student Assembly (1994-Present); Member, Graduate Advisory Board for the Associate Provost for Academic Projects (1997-Present); Mentor, Undergraduate Women ECE Students (1995- Present); Volunteer, Engineering Your Future Summer Workshop (a one-day hands-on electrical engineering workshop for girls from Pittsburgh's inter-city middle schools, 1992-97); Invited Speaker, Kiwanis Club (1997).

PATENTS AND PUBLICATIONS:

Murray, A. M., Klatzky, R.L., Khosla, P.K., "Enhancing Subjective Sensitivity To Vibrotactile Stimuli", *ASME International Mechanical Engineering Congress and Exposition: Symposium on Haptic Interfaces for Virtual Environments and Teleoperator Systems*, Nov. 1998.

Murray, A. M., Klatzky, R.L., Shimoga, K.B., and Khosla, P.K., "Touch Feedback Using Binary Tactor Displays: Unexpected Results and Insights", *ASME International Mechanical Engineering Congress and Exposition: Symposium on Haptic Interfaces for Virtual Environments and Teleoperator Systems*, Dallas TX, November, 1997.

Murray, A. M., Shimoga, K. B., Klatzky, R.L., and Khosla, P.K., "Getting a Grip: Touch Feedback with Binary Stimulators", *Proceedings of HCI International*, San Francisco CA, August, 1997.
(This provides an overview of the work described in detail for ASME 1997).

Shimoga, K.B., Murray, A. M., and Khosla, P. K., "A Touch Reflection System for Interaction with Remote and Virtual Environments", *ASME International Mechanical Engineering Congress and Exposition: Symposium on Haptic Interfaces for Virtual Environments and Teleoperator Systems*, Atlanta GA, November, 1996.

Murray, Anne M., et. al., *A Shear Force Sensing System*, U.S./International Patent Disclosure, Application No. 08/338,095, Submitted November, 1994.

Moore, Richard M., et. al., *Methods and Apparatuses for Backgaging: Sensor-Based Control of Bending Operations*, U.S./International Patent Disclosure, Submitted January, 1995.

Murray, Anne M., *A Fingerpad Force Sensor for Manipulating Sheet Metal*, M.S. Thesis, Carnegie Mellon University, Pittsburgh PA, August, 1993.