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## Pradeep K. Khosla

Pradeep Khosla assumed office as the 8<sup>th</sup> Chancellor of University of California, San Diego, on August 1, 2012. Since January 2016, he also serves as the President of the UC San Diego Foundation which is an independent nonprofit that manages the philanthropic contributions to UC San Diego and has assets in excess of \$1.3B. He holds academic appointments as Distinguished Professor in the departments of Electrical and Computer Engineering, Computer Science and Engineering, and Halicioglu Data Sciences Institute.

As Chancellor, he is the CEO of the campus that enrolls more than 43,000 students, employs more than 30,000 faculty and staff members, and has an annual budget of approximately \$7.5B including a sponsored research budget of more than \$1.6B in FY22-23. The campus is organized into eight undergraduate residential colleges with unique general education requirements, and eleven Schools that offer undergraduate majors and graduate degrees (Engineering, Arts and Humanities, Social Sciences, Physical Sciences, Biological Sciences, Marine Sciences, Global Policy and Strategy, Rady School of Management, Medicine, Pharmacy, Public Health and Human Longevity). The campus is also home to the unique Scripps Institution of Oceanography which includes the Birch aquarium and operates 4 ocean-going international research vessels. The UC San Diego Health System includes two hospitals (Hillcrest and Jacobs Medical Center), multiple outpatient centers, and has an affiliation with Rady Children's Hospital. With more than 30,000 employees, UC San Diego is the largest employer in San Diego County.

### Leadership at UC San Diego

During Chancellor Khosla's tenure, UC San Diego developed its first ever strategic plan that included input from several thousand people representing students, staff, faculty, donors, alumni, industry, and the local community. Chancellor Khosla's vision of UCSD as a student/patient-centered research-focused service-oriented public-university that will be a destination for art and culture in addition to research, education, and healthcare for students, patients, and the community has been enabled by a \$3B ten-year (August 2012-July 2022) fundraising campaign that achieved its fund-raising goal in June 2022, and raised \$1B more than the original goal of \$2B. This campaign raised resources to transform the campus physically, intellectually, and culturally by enhancing infrastructure and program support for students, faculty, and staff. The campaign has achieved several milestones including surpassing \$300M for three consecutive years, and exceeding \$400M in annual fundraising for the first time in FY21.

During his tenure, the campus has experienced significant growth in all aspects. The campus budget has grown from about \$3.2B in FY13 to more than \$7.5B in FY23. The total endowment for the campus has increased significantly from about \$555M on June 30, 2012 to more than \$2.6B on June 30, 2022. The annual fundraising has grown from about \$130M in FY13 to more than \$400M in FY22. The total number of students have grown from about 29,000 to more than 43,000 and the four-year graduation rate has improved from 55% to 74%. The campus received more than 160,000 applications for admission in Fall 22 making it the second highest in the nation and more than double the number it received in 2013.

During the period 2012 to 2022, the campus has invested more than \$8.8B in new buildings to support its medical center and to provide state-of-the-art facilities for research and teaching. In addition to building a new 246 bed hospital, the campus has also built several research and teaching buildings. To improve the student experience, the campus has added several thousand beds for both undergraduate and graduate students with the aim of offering 4-year housing guarantee at 20% below market. A complete list of the projects is at <https://www.sandiegouniontribune.com/news/list/khosla-era-poi-list>

Chancellor Khosla has championed and initiated the creation of 2 new undergraduate colleges (Seventh college and Eighth college), and several multidisciplinary initiatives (such as Robotics, Design, Microbiome, Tata Institute for Genetics and Society, Data Sciences Institute, Institute for Practical Ethics, Center for Gender Equity, Institute for the Arts and Humanities, Meta-Institute for Airborne Disease in a Changing Climate, Institute for RNA-based Therapeutics) that have exploited campus-wide synergies by integrating Scripps Oceanography, Health Sciences, and the General Campus in order to position UC San Diego for the future.

Chancellor Khosla has built and strengthened community relationships and partnerships, and is committed to ensuring and expanding access to, and affordability of, UC San Diego education. He has expanded access for underserved populations by creating the Chancellors Associate Scholarship program that allows for loan-free four-year education for up to 1000 students a year. His focus on diversity and access has resulted in more than a 100% increase in undergraduate students from underrepresented groups (URG/URM) while the total undergraduate population increased by about 40%. At the same time the 4-year graduation rate has increased from 55% (in 2013) to 75% (in 2020) while simultaneously closing opportunity gaps.

His focus on diversifying the faculty, through the strategy of disproportionate hiring, has resulted in significantly increasing the proportion of URM and women faculty members at UC San Diego. While growing the overall faculty by 21%, the number of black faculty have grown by 107%, Latinx/Chicanx faculty have grown by 55%, and women faculty have grown by 43%.

During Chancellor Khosla's tenure UC San Diego has seen consistent improvement in its rankings. UCSD has been consistently ranked #1 public university by Washington Monthly, and the US News ranks it the 8<sup>th</sup> best public university (in 22-23) in the USA. QS World University Rankings ranked UC San Diego as 6<sup>th</sup> best public university in the USA, and the 2020 ARWU rankings placed it as the 5<sup>th</sup> best university in the USA. The campus research budget that exceeds \$1.6B places it in 6<sup>th</sup> place amongst all research universities in the USA. In order to enhance the impact of the research funding, he has enabled changes in the Office of Innovation and Commercialization to make technology transition frictionless and company creation process easy. Recognizing the role of UC San Diego as an engine of economic development, he has built connections with elected officials, and business and entrepreneurial communities in the county and the State.

### **Prior Experience at Carnegie Mellon University and DARPA**

Carnegie Mellon: Prior to joining UC San Diego, he served as Dean of the College of Engineering, and the Philip and Marsha Dowd University Professor at Carnegie Mellon University. As Dean, a position he held from July 2004 till July 2012, he served as the Chief Academic Officer and the Chief Administrative Officer for the College of Engineering. His previous leadership, administrative, and organization building experience includes serving as: Founding Director, Carnegie Mellon CyLab; Head, Department of Electrical and Computer Engineering; Director, Information Networking Institute; Founding Director, Institute for Complex Engineered Systems (ICES).

During his tenure as Dean of Engineering, the college experienced significant improvement in its ranking from 11<sup>th</sup> in 2004 to 4<sup>th</sup> in 2012; the total college budget doubled to nearly \$180M in FY 2012; and research expenditures, and the MS and PhD programs each grew by nearly 100%. He provided leadership for, developing and implementing strategies to improve quality of life for students, faculty and staff, and increasing diversity; defining several multidisciplinary and multi-college research centers; developing research centers with industry; developing multidisciplinary graduate programs; developing international programs; and developing programs that enhance the undergraduate experience. During his tenure as Dean, the college established visionary international collaborations and programs in Japan, Korea, Portugal, China, and Rwanda.

At Carnegie Mellon, he played a key role in defining the strategy, and fundraising for the university-wide Sustainable Energy Institute, and for the \$100M 100,000 square foot College of Engineering Bio-Energy-Nano building in addition to fundraising for other college initiatives (endowed fellowships and scholarships, endowed chairs, and Dean's Innovation Fund).

**DARPA:** From January 1994 till August 1996, he served as Program Manager at Defense Advanced Research Projects Agency (DARPA) where he managed a portfolio of programs (a total of \$50M per year in 1996) in real-time planning and software systems, internet enabled software infrastructure, autonomous robots and intelligent systems, distributed design and manufacturing, and distributed information systems. The technologies developed in his programs are currently embodied in various autonomous robotic systems (cars and drones), internet-based systems, and design and manufacturing systems.

From 1980 to 1982 he worked for Tata Consulting Engineers and Siemens (in India) in the areas of Power Systems design, specification, and real-time control of distribution. He joined Carnegie Mellon as an Assistant Professor in 1986 and rose through academic and administrative ranks to become University Professor and Dean of Engineering.

### **Professional Recognition, Honors and Awards**

Chancellor Khosla's leadership in education and research have been recognized by several awards: the ASEE George Westinghouse Award for Education (1999), Silicon India Leadership award for Excellence in Academics and Technology (2000), the W. Wallace McDowell award from IEEE Computer Society (2001), Cyber Education Award from the Business Software Alliance (2007), the ASME Computers in Engineering Lifetime Achievement Award (2009), the inaugural Pan IIT American Leadership Award for Academic Excellence (2009), IBM Faculty Award (2011), and the Light of India award (2012). He was awarded the Philip and Marsha Dowd Professorship in 1998, and elected University Professor (at Carnegie Mellon) in 2008.

For his contributions to technology and education he has been elected member of the US National Academy of Engineering (NAE), Fellow of American Academy of Arts and Sciences (AAAS), Fellow of the National Academy of Inventors (NAI), Fellow of the Indian National Academy of Engineering (INAE), Fellow of the Indian Academy of Science, Fellow of Institute of Electrical and Electronics Engineers (IEEE), Fellow of American Association of Artificial Intelligence (AAAI), Fellow of American Association for Advancement of Science (AAAS), and Fellow of American Society of Mechanical Engineers (ASME).

In September 2012 he was named as the one of the 50 most influential Indian Americans by Silicon India. He is the recipient of the Distinguished Alumnus award from IIT Kharagpur, and also the recipient of honorary doctorates from SRM University (Chennai,

India), IIT (Kharagpur, India), and National University (San Diego, California). He is a frequent keynote speaker at international conferences, and invited to participate in thought leadership forums organized by Fortune Magazine, Advanced Micro Devices (AMD), Milken Institute, Technomy, Dialog, World Economic Forum, and Blouin Foundation, amongst others. He has served on editorial boards of journals and book series.

## Boards and Government Committees

Chancellor Khosla serves and has served as a member of advisory board or board of directors for non-profits, high tech start-ups, and public and private companies.

He currently serves as an Independent Director of Tata Consultancy Services (TCS - traded on Bombay Stock Exchange). He is also a member of the Audit Committee and Chairs the Stakeholders Relation Committee. In the past he has served as Director of Quantapoint Inc., an Independent Director of HCL Infosystems (HCLI - traded on Bombay Stock Exchange), and Independent Director of Avigilon (traded on Toronto Stock Exchange). Chancellor Khosla is a Founding Charter Member of TiE-Pittsburgh, and currently a Charter member of TiE-San Diego.

Chancellor Khosla has served as a Trustee and Chair of the Board of Internet2 LLC – a non-profit that provides high speed internet infrastructure for research universities. His other service on non-profit boards includes Rady Children's Hospital, Economic Development Corporation of San Diego, CONNECT San Diego, and IIT Startups Palo Alto. He is a member of the executive committee of the Council on Competitiveness and was appointed as Chair of the Global Federal of Competitiveness Councils (GFCC) University Forum in November 2016. In the past he has served as a member of the board of Directors of several non-profit organizations including The Children's Institute - Pittsburgh, the IIT Foundation, Mellon-Pitt (MPC) Corporation, and the Pittsburgh Technology Council.

He has served on the advisory board of Government organizations and Universities. His current service includes serving on the Board of Governors of Academy for Research and Innovation in India (he was appointed to this by the Prime Minister of India in Feb 2020), member of the Board of Governors of SRM University – Amravati, India, and Director of Reliance Foundation of Education and Research.

His past service includes being a member of the IT advisory committee, CSIRO, Australia, ITU High Level Experts Group (HLEG) for the Global Cybersecurity Agenda (GCA), and member of the congressionally mandated Visiting Committee on Advanced Technology (VCAT) for NIST. He has served as member of the Strategy Review Board for Ministry of Science and Technology, Taiwan; Council of Deans of the Aeronautics Advisory Committee, NASA; National Research Council Board on Manufacturing and Engineering Design; member of e-Treasury Pennsylvania Advisory Board (appointed by Pennsylvania Treasurer Robin Weissman), member of Senior Advisory Group for the DARPA Program on Joint Unmanned Combat Air Systems, and a member of World Economic Forum's Global Agenda Council on Innovation. In 2016 he was appointed by the Secretary of Commerce as member of the National Advisory Council on Innovation and Entrepreneurship (NACIE).

Chancellor Khosla served as Chair of the Jury for the prestigious Infosys Foundation Prize in Engineering and Computer Science (2013 – 2019), and was a member of the Draper Prize Committee of the National Academy of Engineering till 2017 (as Chair in 14-15). He served as Chair of a congressionally mandated National Academies Study to evaluate ARPA-E – the final report was published in July 2017.

## Academic Background

Chancellor Khosla's educational and research contributions have resulted in 3 books and more than 350 articles in journals, conferences, and book contributions. His research interests are in the areas of autonomous robotic systems, embedded software, cybersecurity of embedded systems, and applications of AI in robotics and design. He received a B. Tech (Hons) degree in Electrical Engineering from Indian Institute of Technology, Kharagpur in 1980, and a MS and Ph.D. in Electrical and Computer Engineering from Carnegie Mellon in 1984, and 1986, respectively.

## Links to More Information

UCSD Chancellor Blog: <http://chancellor.ucsd.edu/>

UCSD Strategic Plan: <http://plan.ucsd.edu/>

UCSD Campus Transformation: <http://chancellor.ucsd.edu/chancellor-khosla/letters/the-transformation-of-uc-san-diego>

UCSD Campus Visioning Videos: <http://plandesignbuild.ucsd.edu/projects/videos.html>

UCSD Women in Leadership: <https://ucsdnews.ucsd.edu/feature/women-rising>

<https://ucsdnews.ucsd.edu/feature/uc-san-diego-ranks-second-in-forbes-americas-best-employers-for-women>

# Pradeep K. Khosla

## Education

**Bachelor of Technology (Honors), Dept of Electrical Engineering**, Indian Institute of Technology, Kharagpur, India. May 1980. **Honors Thesis:** Design of a Simulator and De-Assembler for a TDC-316 Mini-Computer.

**M.S., Dept of Electrical and Computer Engineering**, Carnegie Mellon University, Pittsburgh, PA 15213., May 1984. **Thesis Title:** Simulation of a Sensor Based Robotic Spatial Seam Tracing System. **Thesis Advisor:** Professor Fritz Prinz (Currently Rodney Adams Professor of Mechanical Engineering and Chairman, Mechanical Engineering, Stanford University).

**Ph.D., Dept of Electrical and Computer Engineering**, Carnegie Mellon University, Pittsburgh, PA 15213. 1986. **Thesis Title:** *Real-Time Control and Identification of Direct-Drive Manipulators*. **Thesis Advisor:** Professor Takeo Kanade (Whittaker University Professor of Computer Science and Robotics).

## Positions

**2016 – present:** President, UC San Diego Foundation. (A non-profit 501(c)3 created to manage the endowment for UC San Diego. The Foundation has more than \$1B in assets and is governed by a board of trustees.)

**2012 (August) – present:** Chancellor, University of California, San Diego. Distinguished Professor of Electrical and Computer Engineering, and Computer Science and Engineering, University of California, San Diego. [www.chancellor.ucsd.edu](http://www.chancellor.ucsd.edu)

**2008 (April) – 2012 (July):** Philip and Marsha Dowd University Professor, Carnegie Mellon University, Pittsburgh, PA. (The University Professor title is conferred by the President upon election by and recommendation of other University Professors. The number of University Professors are limited to less than 10% of full professors).

**2004 (July) – 2012 (July):** Dean, Carnegie Institute of Technology (College of Engineering), Carnegie Mellon University, Pittsburgh, PA.. [www.cit.cmu.edu](http://www.cit.cmu.edu)

**2001 (March) – 2008 (October):** Founding Director, CyLab, Carnegie Mellon University, Pittsburgh, PA. (CyLab is a university-wide multidisciplinary research Institute focused on Cybersecurity technology and policy). [www.cylab.cmu.edu](http://www.cylab.cmu.edu)

**2003 (August) – 2010 (July):** Adjunct Professor, Faculty of Computer Science, Tata Institute of Fundamental Research (TIFR), Mumbai, India. (This is an honorific position).

**2000(October) – 2004 (June):** Director, Information Networking Institute (INI), Carnegie Mellon University, Pittsburgh, PA.

**1999 (July) – 2004 (June):** Department Head, Electrical and Computer Engineering, College of Engineering, Carnegie Mellon University, Pittsburgh, PA. [www.ece.cmu.edu](http://www.ece.cmu.edu)

**1998 (December) – 2012 (July):** Philip and Marsha Dowd Professor of Engineering and Robotics, College of Engineering and School of Computer Science, Carnegie Mellon University, Pittsburgh, PA.

**1997 (February) – 1999 (June):** Founding Director, Institute for Complex Engineered Systems (ICES), College of Engineering, Carnegie Mellon University, Pittsburgh, PA.

**1994 (July) – 2012 (July):** Professor of Electrical and Computer Engineering and Robotics, College of Engineering and The Robotics Institute (School of Computer Science), Carnegie Mellon University, Pittsburgh, PA.

**1994 (January) - 1996 (August):** Program Manager, Software and Intelligent Systems Technology Office (till August 1995), and Defense Sciences Office and Tactical Technology Office (August 1995 - August 1996), Defense Advanced Research Projects Agency (DARPA), Arlington, VA.

- Responsibilities included conceptualization, development, and execution of advanced research and development programs in the areas of Real-Time Planning, Artificial Intelligence, Real-Time Software, Sensor-based Control, Autonomous Robots, Manufacturing, and Design. Managed the following programs in the above areas: Real-Time Planning and Control (RTPC), Manufacturing Automation and Design Engineering (MADE), National Intelligent Integration of Information and Protocols (NIIP) TRP, Software Interoperability Testbed TRP, and Focus HOPE Center for Advanced Manufacturing Technologies. The total budget for these programs exceeded \$50M in Fiscal Year '96.

**1990 (July) - 1994 (June):** Associate Professor of Electrical and Computer Engineering and Robotics, Engineering Design Research Center (College of Engineering), and The Robotics Institute (School of Computer Science), Carnegie Mellon University, Pittsburgh, PA.

**1986 (September) - 1990 (June):** Assistant Professor of Electrical and Computer Engineering and Robotics, Engineering Design Research Center (College of Engineering), and The Robotics Institute (School of Computer Science), Carnegie Mellon University, Pittsburgh, PA.

**1983 (September) - 1986 (August):** Graduate Research Assistant. The Robotics Institute, and Department of Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, PA.

**1980 - 1981:** Assistant Engineer. Tata Consulting Engineers, Bangalore, India.

- Worked in the area of Real-Time Control of Power Systems. Developed control algorithms and software for load flow analysis and load frequency control. Worked on the specifications of a computer for real-time monitoring and control. Bid analysis of switchgear and instrumentation for a 210 MW power plant. Developed a graphics package on a DEC 20 system for automating the design of a Power distribution substation.

**1981 - 1982:** Project Engineer. Siemens India, Ltd., Bombay, India.

- Worked in the area of Real-Time Control of Power Systems and Load Flow Analysis. Developed real-time control software for a Load Dispatch Center. Developed graphics software for design of transmission lines.

## Membership/Fellowship in Professional and Honor Societies

- Fellow of National Academy of Inventors (NAI), USA.
- Member, National Academy of Engineering (NAE), USA.
- Fellow, American Academy of Arts and Sciences (AAAS)
- Honorary Fellow, Indian Academy of Science (The number of foreign fellows is limited to 60).
- Fellow, Indian National Academy of Engineering (INAE).
- Fellow, Institute of Electrical and Electronics Engineers (IEEE).
- Fellow, American Association for Artificial Intelligence (AAAI)
- Fellow, American Association for Advancement of Science (AAAS).
- Fellow, American Society for Mechanical Engineering (ASME).

## Awards and Honors

- Conferred degree of Doctor of Science (Honoris Causa), National University, May 2022, San Diego, CA, USA.
- Listed in Apolitical's **100 Most Influential Academics in Government**. <https://apolitical.co/list/en/apoliticals-100-most-influential-academics-in-government/>
- ACE/Fidelity Investment Award for Institutional Transformation, UC San Diego, 2021.
- Excellence in Technology and Education Award, Indo American Press Club (IAPC), October 2020.
- Elected Fellow of National Academy of Inventors, Dec 2018.
- Innovative leadership Award, IMPACT leadership 21, New York, March 2018.
- Elected Fellow of American Academy of Arts and Sciences (AAAS), April 2017.
- Listed as one of five higher education leaders to watch, Education Dive, January 2017. <http://www.educationdive.com/news/5-higher-ed-leaders-to-watch-in-2017-and-beyond/433175/>
- San Diego Urban League, Diversity and Equity Award, November, 2016.
- Conferred degree of Doctor of Science (Honoris Causa), 10<sup>th</sup> Convocation of SRM University, March 2015, Chennai, India.
- DyNAMC Leaders for a Changing World award for "leadership in increasing diversity, improving the climate for diverse groups, and educating communities to appreciate an increasingly diverse society", February, 2015.
- Conferred degree of Doctor of Science (Honoris Causa), 60<sup>th</sup> Convocation of IIT Kharagpur, June 2014, Kharagpur, India.

- Asian Heritage Awards Special Recognition honoree for “distinguished academic career, strong dynamic leadership and pioneering efforts to ensure diversity, reform curriculum and promote multidisciplinary research and global outreach,” September, 2013.
- Included in the list 51 Influential Global Indian Men, 2013. <http://www.mensxp.com/work-life/leadership/21425-51-influential-global-indian-men-p46.html> .
- Named as 50 most influential Indian Americans, September 14, 2012, Silicon India. <http://www.siliconindia.com/news/usindians/50-Most-Influential-Indian-Americans-nid-129209-cid-49.html>
- Light of India Award, Jury Award in Science and Technology category, June 2012.
- Elected Honorary Fellow, Indian Academy of Science, January 2012. (The number of foreign fellows is limited to 60).
- Elected Fellow of Indian National Academy of Engineering, September, 2011.
- IBM Faculty Award, January 2011.
- Elected Fellow of American Society of Mechanical Engineers (ASME), January 2010.
- (Inaugural) Academic Excellence Award, Pan IIT American Leadership Awards, October, 2009.
- Lifetime Achievement Award, ASME Computers in Engineering Division, September, 2009.
- Appointed University Professor, April, 2008. (Elected by other University Professors and appointed by the President of Carnegie Mellon).
- Cybereducation Champion Award, Business Software Alliance (BSA), March 2007, Washington, DC.
- Distinguished Alumnus Award, Indian Institute of Technology, Kharagpur, India, July, 2006.
- Elected Member of the US National Academy of Engineering (NAE), February 2006.
- Elected Fellow of American Association for Advancement of Science (AAAS), November, 2004.
- Elected Fellow of American Association of Artificial Intelligence (AAAI) “for significant contributions to automated modeling, reconfiguration, and design of robotic and real-time software systems, and for encouraging the field through professional leadership” April, 2003.
- Finalist (one of 4) for the Philips Anton Best Student paper Award, “Interactive Multimodal Robot Programming”, 2002 IEEE Intl Conference on Robotics and Automation, Washington D.D., May, 2002.
- W. Wallace McDowell Award, “for significant contributions to the design of reconfigurable real-time software systems, and for significant contributions to undergraduate and graduate education in electrical and computer engineering and robotics”, IEEE Computer Society, 2001.
- Academic of the Year award, “for excellence and leadership in technology, education, and business”, Siliconindia, October, 2000.
- George Westinghouse Award for Education, “in recognition of distinguished contributions to teaching for students of engineering”, American Society for Engineering Education (ASEE), June, 1999.
- Awarded Philip and Marsha Dowd Chair in Engineering, College of Engineering, December, 1998.
- Distinguished Lecturer, IEEE Robotics and Automation Society, 1998-2003.
- Focused Giving Program Award, “in recognition of outstanding research toward the advancement and science and technology in healthcare”, Johnson and Johnson, 1997-1999.
- Elected Fellow of IEEE “for contributions to reconfigurable manipulators and reconfigurable software for sensor- based control and leadership in undergraduate and graduate education”, January 1995.
- Finalist (one of five) for the Best Student paper Award, “Improved Force Control Through Visual Servoing”, 1995 American Control Conference, Seattle, WA. June 1995
- Finalist (one of five) for the Phillips Anton Award, “Mapping Tasks into fault Tolerant Manipulators”, 1994 IEEE Intl. Conf. on Robot. Autom., San Diego, CA, May, 1994.
- Class I NASA Tech Brief Award, “Integration of Reusable Software Control Modules for Multiprocessor Systems” January, 1993.
- Class I NASA Tech Brief Award, “An Experimental Evaluation and Comparison of Explicit Force Control Strategies for Manipulators”, June 1992.
- Finalist (one of five) for the Phillips Anton Award, “Vision and Control Techniques for Robotic Visual Tracking”, 1991 IEEE Conference on Robotics and Automation, Sacramento, CA, April, 1991.

- George Tallman Ladd Award for Excellence in Research, Carnegie Institute of Technology, Carnegie Mellon University, October 1989.

## Consulting and For-Profit Advisory Boards

- June 1989: Modicon/ICC, Pittsburgh, PA.
- Sept. 1986 - Feb. 1987: Digital Equipment Corporation, Colorado Springs, CO.
- March 1989 - April 1991: Science Applications International Corporation, Mclean, VA and US Air Force.
- October 1989 - September 1991. RedZone Robotics Inc., Pittsburgh, PA.
- Nov 1989 - March 1990. Law firm of Dickie, McCamey and Chilcote, Pittsburgh, PA. Expert Consultant for evaluating proprietary information pertaining to the design of single axis controller cards.
- July 1991 - March 1992. Jet Propulsion Laboratory, Pasadena, CA.
- May 1997 - May 1999: Beam Technologies Inc., Member of Technology Advisory Board.
- May 1998 – January 2000: Raytheon Inc., VA.
- November 2000 – December 2001, Technical Advisory Board, Abeona Networks inc., Palo Alto, CA.
- January 2001 – December 2007, Member, CIO's Advisory Board, Alcoa, Pittsburgh, PA 15213.
- March 2001 – Dec 2008, Advisor, ITU Ventures (VC Fund), Los Angeles, CA
- June 2001 – June 2003, Member, Technical Advisory Board, Eizel Inc. (acquired by Nokia)
- April 2003 – March 2006, Technical Advisor for Information Security, Dynamix, Pittsburgh, PA.
- June 2004 – July 2005, Technical Advisor, ClearSpring Technologies, Pittsburgh, PA.
- August 2004 – March 2007, Advisory Board, iPolicy Networks, Palo Alto, CA.
- January 2015 – July 2016, Member, Advisory Board, Thar Energy, Pittsnurgh, PA.
- January 2011 – December 2014, Member, Advisory Board, PropellIT Inc., Pittsburgh, PA.

## Public and Privately held Company Boards

- Nov 91 – July 2015: Quantapoint Inc. (previously known as K2T Inc.), Pittsburgh, PA. Co-Founder and Serve on Board of Directors. Also member of Audit Committee and Governance Committee (Acquired by Qualspec Group Inc., July 2015)
- January 1999 – August 2002: Halosoft Inc., Co-Founder and Serve on Board of Directors and consult about strategic technology development for Internet P2P applications.
- July 2004 – Dec 2010, Member, Board of Directors, BitArmor Systems, Pittsburgh, PA. (Acquired by Trustwave, 2010).
- January 2010 – July 2015, Member, Board of Directors, Thar Energy, Pittsnurgh, PA.
- August 2011 – June 2017, Independent Director, HCL Infosystems, India (Traded on Mumbai Exchange). Also, member and Chair of the Technology Committee, and member of Audit committee.
- January 2016 – June 2017, Independent Director, Board of Directors Avigilon, Vancouver, Canada. Also member of Audit Committee, Compensation Committee, and Governance Committee. (Traded on Toronto Stock Exchange).
- November 2016 – November 2022, Member, Board of Trustees, Internet2 LLC. Vice Chair (April 2020 – Nov 2020), Chair (Nov 2020 – Nov 2022). Served as member of the Nominations committee.
- January 2018 – , Independent Director, Tata Consultancy Services (Traded on Mumbai Stock Exchange). Audit Comm (member), Stakeholders Relations Committee, Chair.

## Government and Non-Profit Committees/Panels/Boards

- Invited Participant, "Workshop on Research Needs and Directions in Flexible Assembly Systems", National Science Foundation, June 21-24, 1989, Cincinnati, OH.

- Member of Review Committee, "Workshop to Review the Telerobotic Concepts for US Air Force", Washington, DC, 1989.
- Invited Participant, "Department of Commerce Workshop on Intelligent Manufacturing Systems Proposal", Department of Commerce, Washington, DC, September, 1990.
- Invited Participant, "Workshop on R&D Consortia and US-Japan Collaboration", Office of Japan Affairs, National Research Council, Washington, DC, November, 1990.
- Member of Technology Review Board, Next Generation Controller Project (NGC), Wright Patterson Airforce Base. January 1990 - October 1991.
- Member of Review Board, Sample Acquisition Analysis and Preservation (SAAP) Project, Jet Propulsion Laboratory. January 1990 - 1992.
- Member, Carnegie Science Center Committee, Buhl Science Center, Pittsburgh, PA. January 1991 - August 1991.
- Invited Participant, "Workshop on Japanese Investment and Technology Transfer: An Exploration of its Impact", Office of Japan Affairs, National Research Council, Washington, DC, February, 1991.
- Member, Peer Review Committee, Center for Advanced Technology in Automation and Robotics, Rensselaer Polytechnic Institute, Troy, NY., December, 1992.
- Member, Site Visit Team, Institute for Systems Research, National Science Foundation Engineering Research Center (NSF-ERC), University of Maryland, March 1994.
- Served as a member several DARPA and interagency review panels and committees during my tenure at DARPA, January 1996 - August 1996.
- Member, Panel Review Team, Several Programs during the last 15 years, National Science Foundation.
- Member, Board of Directors, Pittsburgh Tissue Engineering Initiative (PTEI), January 1999 - January 2001.
- Member, NSF Committee of Visitors, Division of Information and Intelligent Systems, February, 1999.
- Member, Board of Directors, Robotics Industries Association, January 1999 - January 2003.
- Member, Review Committee on Infrastructure Projects, Canada Foundation for Innovation, May, 2000.
- Member, Committee on Modeling and Simulation Enhancements for 21-st Century Manufacturing and Acquisition, June 2000 – July 2001, National Research Council.
- Member, College of Engineering Review/Advisory Board, Michigan State University, East Lansing, MI, October 2000.
- Member, Robotics World Magazine, Industrial Advisory Committee, October 2000 – June 2005.
- Founding Member, Technical Advisory Board, Indian Institute for Software Engineering (IISE), Mahape, January 2000 – December 2003.
- Member, Technical Advisory Council, MURI on Complex Dynamic Systems, Penn State, May 2001 – May 2006.
- Member, Board of Governors, Biomedical Security Institute (BMSI), May 2001 – Jan 2003.
- Member, Blue Ribbon Panel to review Computer Science, Virginia Commonwealth University, Richmond, VA, January 2002.
- Member, External Review Committee, EECS Department, Vanderbilt University, February 2002.
- Strategic Advisory Committee, Institute for Systems Research, University of Maryland, January 1999 – June 2010.
- Member, Department of Electrical and Computer Engineering Advisory Board, Michigan State University, February 2002.
- Member, PA State Boterrorism Preparedness Planning Advisory Committee (appointed by Pennsylvania State Secretary of Health), March 2002 – March 2006.
- Member, Advisory Board, Computer Engineering Program, San Diego State University, November 2002.
- Member, Advisory Board for Athens Information Technology Institute (AIT), March 2002 – December 2008.
- Member, Transition Team of PA State Governor elect Ed Rendell, December 2002 – February 2003.
- Member, Technical Review Panel for VeriSign's Site Finder service, Verisign. January 2004.
- Member, Pittsburgh Digital Greenhouse Taskforce to evaluate the economic development potential of Cybersecurity for the region, January 2003 – Dec 2004.
- Member, Board on Manufacturing and Engineering Design (BMED), National Research Council (NRC), Feb 2003 – Dec 2005.



- Member, Senior Advisory Group, DARPA Program on Joint Unmanned Combat Air Systems, SRS Technologies, March 2004 – March 2006.
- Member, Advisory Board, Prabhu Goel Internet and Computer Security Research Center, IIT Kanpur, June 2004 – July 2011.
- Member, Board of Directors/Trustees, The Children's Institute, Pittsburgh, PA., Sept 2004 – July 2012.
- Member, Board of Directors, Internet Security Alliance (ISA), Washington DC, September 2004 – present.
- Member, Strategy Review Board (SRB), Cabinet of Taiwan, August 2004.
- Member, IT Advisory Committee, CSIRO, Australia, July 2004 – December 2009.
- Member, Board of Directors, Mellon-Pitt Corporation (MPC) Corporation, Pittsburgh, July 2004 – July 2012.
- Member, Council of Deans of the Aeronautics Advisory Committee, NASA, July 2004 – May 2006.
- Member, IIT Foundation Board of Directors, Sept 2004 – present.
- Member, Board of Directors, Pittsburgh High Technology Council, January 2007 – July 2012.
- Member, Board of Directors, Doyle Center for Manufacturing, January 2007 – December 2011.
- Member, eTreasury Pennsylvania Advisory Board (Appointed by Treasurer Robin Weissman), Sept 2007 – Sept. 2008.
- Member, High Level Experts Group (HLEG) for Global Cyber Security Agenda (GCA), ITU, Geneva, Switzerland. (Appointed by the Secretary General of ITU).
- Member, Visiting Committee on Advanced Technology (VCAT), National Institute of Standards and Technology (NIST), June 2008 – present. (This committee is mandated by the US Congress and appointed by the Director of NIST).
- Member, World Economic Forum's Global Agenda Council on Geography of Technology Innovation, June 2008 – June 2011.
- Member, Advisory Committee, College of Engineering, Illinois Institute of Technology, Jan. 2007 – July 2012.
- Member, Indian Advisory Committee, PA Senator R. Casey's Office, January 2008 – 2012.
- Member, Advisory Board, Electronic Privacy Information Center (EPIC), Washington DC, 2009 – 2012.
- Member, Advisory Board, Center for Advanced Security Research (CASED), Technical University of Darmstadt, Germany, September 2009 – 2013.
- Member, International Advisory Board, SRM University, Chennai, India, December 2009 – 2012.
- Member, Advisory Board for Mechanical Engineering, Stanford University, February 2010.
- Member, Board of Visitors, Temple Medical School at West Penn Allegheny Hospital, December 2011.
- Member, Governing Board, Carnegie Mellon – Portugal Program (ICTI), July 2006 – July 2012.
- Member, External Advisory Board CMU-Rwanda Program, June 2013 – present.
- Chair, Infosys Foundation Prize Jury on Engineering and Computer Science, Infosys Foundation, Bengaluru, India. March 2011 – present.
- Member, Draper Prize Selection Committee, National Research Council, June 2013 – June 2018. Vice Chair (2013 - 2014) and Chair (2014 - 2015). Immediate Past Chair (till Dec 31, 2017).
- Member, Board of Directors, Rady Children's Hospital, San Diego, 2013 – present.
- Member, Board of Directors, CONNECT, San Diego, 2013 – present.
- Member, Board of Trustees, La Jolla Playhouse, San Diego, 2013 – present.
- Member, Board of Directors, Economic Development Corporation, San Diego, 2013 – present.
- Member, National Advisory Council on Innovation and Entrepreneurship (NACIE), 2016-2018. (Appointed by Secy of Commerce).
- Member, Board of Governors, SRM University, Amravati, Oct 2018 – present.
- Additional Director, Reliance Foundation for Education and Research, Oct 2019 – present.
- Member, Board of Governors, Academy of Scientific and Innovative Research, February 2020 – present. (Appointed by the Prime Minister of India)

## Positions in Professional Societies

- Director, Robotics and Expert Systems Division, Instrument Society of America, April 1992 - Dec 1994.
- Associate Director, Robotics and Expert Systems Division, Instrument Society of America, October 1987- December 1991.
- Representative of the IEEE Circuits and Systems Society in the Robotics and Automation Council AdCom, January 1988-December 1988.
- PACE (Professional Activities Council for Engineers) Chairman, IEEE Robotics and Automation Society, January 1988 - December 2004.
- Chairman, Education Committee, IEEE Robotics and Automation Society, January 1990 - December 1996.
- AdCom Member, IEEE Systems, Man, and Cybernetics Society, January 1991 - December 1993.
- AdCom Member, IEEE Robotics and Automation Society, January 1993 - December 1995.
- Member, Long Range Planning Committee, IEEE Robotics and Automation Society, Jan 1997 – December 2003.
- Member, Fellow Evaluation Committee, IEEE Robotics and Automation Society, Jan, 1997 - Dec 1997.
- AdCom Member, IEEE Robotics and Automation Society, Jan 1999 - Dec 2001; Jan 2004 – Dec 2006.
- At-large Member, Board of Directors, ECE Department Heads Association (ECEDHA), July 2002 – July 2004.
- Member, Electorate Nominating Committee, Engineering Section, AAAS, January 2009 – 2012.

## Editorial Roles

- Consulting Editor, Control and Robotics Series, Marcel Dekker, Inc., New York. April 1992 - December 1998.
- Technical Editor, IEEE Transactions on Robotics and Automation, April 1991 - March 1994.
- Served as reviewer for papers submitted to: IEEE Journal of Robotics and Automation, IEEE Trans. on Automatic Control; IEEE Trans. on Systems, Man, Cybernetics; International Journal of Robotics Research; Control Systems Magazine; Algorithmica; IEEE Transactions on Biomedical Engineering; IEEE Conference on Robotics and Automation; IEEE Conference on Decision and Control; Automatic Control Conference; IJCAI; International Journal of Robotics and Automation; Journal of Robotic Systems; IEEE Computer Magazine, IEEE Spectrum Magazine, IEEE Transactions on Education.
- Proposal Reviewer for National Science Foundation, Western Pennsylvania Advanced Technology Council (Ben Franklin Program), US Department of Energy, National Science and Engineering Research Council (NSERC) of Canada, Louisiana State Regents Program, New York University Research Program, US Army Research Office.
- Book Reviewer for McGraw Hill, Kluwer, Springer-Verlag, and Academic Press Publishers.
- Reviewer, 'Design and Manufacturing in 2010 and Beyond: Meeting the Changing Needs of National Defense', National Research Council (NRC) Study, 1998.
- Associate Editor, Journal of Computing and Information Science in Engineering, May 2000 – April 2003.
- Member of the Editorial Board, IEEE Spectrum Magazine, Jan 2002 – December 2006.
- Member of the Editorial Board, IEEE Security and Privacy, June 2003 – December 2007.

## University Committees (Carnegie Mellon)

- Ad Hoc Committee for Signals and Systems Curriculum, 1986-87.
- Member of the Program Committee for the Carnegie Institute of Technology, Graduate School of Industrial Administration, and School of Computer Science joint Ph.D. program in Robotics and Intelligent Systems. The output of this committee was a curriculum for the interdisciplinary Robotics Ph.D. program - the first of its kind in the country.
- Graduate Admissions Committee, Dept. of Electrical and Computer Engineering, September, 1987 - August, 1989.
- Undergraduate Education Committee, Dept. of Electrical and Computer Engineering, September, 1989 - August, 1992.
- Ad Hoc Committee on Ph.D. Qualifiers, Dept. of Electrical and Computer Engineering, 1989. The charge to this committee was to develop a recommendation for a Ph.D. qualifier structure. The proposed structure was adopted (with minor changes) and implemented in Spring 1989.

- Curriculum Committee, Interdisciplinary Robotics and Intelligent Systems Engineering Ph.D. Program, September, 1987 - 1990. The charter of this committee is to update the curriculum.
- Member of Faculty Search Committee of the Interdisciplinary Robotics Ph.D. program, January 1989 - 1993
- ECE Representative, Carnegie Institute of Technology Strategic Planning Committee, May 1989. The goal of this committee was to create a strategic plan for the next 5 years for the college of engineering.
- Carnegie Institute of Technology Manufacturing Assessment Committee, 1989 -present. The goal of this committee is to develop a recommendation for a graduate program in Manufacturing Engineering within the college of engineering.
- Member of "Wipe the Slate Clean Committee". This committee was charged with creating from scratch an undergraduate program in Electrical and Computer Engineering. October 1989 - December 1990.
- Ad Hoc Committee for Invention Disclosure Evaluation. November 1989.
- Member of The Robotics Institute Strategic Planning Committee, October 1991. This 4 member committee was charged with creating a strategic plan for The Robotics Institute.
- Member, CMU Board of Trustees Committee on Educational Affairs and Enrollment, October 1991 - October 1993.
- Member, Sub-Task Force to Evaluate Teaching Center and Undergraduate Education, October 1991 - May 1992. (Chairman Harry Paxton).
- Member of Advisory Board, Eberly Teaching Center, Susan Ambrose (Director). September 1996.
- Member of Faculty Search Committee, Department of Electrical and Computer Engineering, Sept 1996 – July 1999.
- Member, Ad-hoc Committee to Evaluate CMU-Caterpillar Collaboration, August 1998.
- Member, School of Computer Science Dean Search Committee, Sept 1998 - April 1999.
- Member, DSSC Director Search Committee, College of Engineering, Sept 1998 - February 1999.
- Chair, Committee on Faculty Expectations, September 1999 - June 2000.
- Member, CMU Board of Trustees Committee on Development, September 1999 - 2005.
- Member, CMU Board of Trustees Committee on Research and Technology Commercialization, 2005 – July 2012.
- Member, Committee to Evaluate the Director of SEI, Fall 2001.
- Member, CIT Committee for Cost of Graduate Students in Research, September 2001 – August 2002.
- Member, Committee for developing CMU IT Strategy, January 2002 – December 2002.
- Member, Search Committee for the CFO, Carnegie Mellon, May 2002 – August 2002.
- Member, Search Committee for the Robotics Institute Director, January 2004 – May 2004.
- Member, Campus Design Vision Committee, October 2005 – July 2011.
- Member, Campus IT Advisory committee, December 2006 – July 2012.
- Member, HR Advisory Committee, September 2006 – July 2012.
- Member, Leadership Academy Selection Committee, Dec 2008.
- Member, Board on Administration, Regulation, and Finance (Appointed by President Cohon), October 2009 – July 2012.
- Member, Institutional Master Plan Steering Committee, April 2010 – July 2012
- Chair, Building Planning, and Architect Selection Committee for the Bio-Energy-Nano building, May 2011 – July 2012.

## Conference Organization Committees

- Publications Chairman, Third Annual Workshop on Robotics and Expert Systems, June 1987, Pittsburgh, PA.
- Executive Committee, Robotics and Expert Systems Workshop, Instrument Society of America, June, 1987, Pittsburgh, PA.
- Program Vice-Chairman, IEEE International Conference on Systems Engineering, August, 1989, Dayton, Ohio.
- General Chairman, IEEE International Conference on Systems Engineering, August, 1990, Pittsburgh.
- Program Vice-Chairman, 1993 IEEE Conference on Robotics and Automation, Atlanta, GA, April, 1993.
- General Co-Chair, 1995 Conference on Intelligent Robotics and Systems (IROS), USA.
- Program Vice-Chairman, 1994 IEEE Conference on Robotics and Automation, San Diego, CA, April, 1994.
- Program Vice-Chair, 1997 IEEE Conference on Robotics and Automation, Albuquerque, NM., May, 1997.

- Organizing Committee, Gordon Conference on Theory of Design, June 2000.
- Served as a Panelist in several international conferences.
- Served as session chair/co-chair in several international conferences.
- Served on Program Committees of several international conferences.

## Invited Tutorials and Keynote/Plenary Talks

- More than 100 invited tutorials, and keynote or plenary talks at international conferences during the last 30 years.

## Undergraduate Students

Supervised more than 50 undergraduate research projects (from 1986-2004) including Honors Thesis.

## M.S. Theses Students

1. Steve Weinberg, Implementation of a Cartesian Space Trajectory Planner for the Reconfigurable Manipulator, May 1988. (Non-Thesis Option).
2. Laura Kelmar, Automatic Generation of Kinematics for a Reconfigurable Manipulator System, February 1988.
3. Sandra Ramos, Parallelism in Manipulator Dynamics: Analysis and Implementation Issues for High Speed Control, March 1988.
4. Alan Berger, On Using a Tactile Sensor for Real-Time Feature Extraction, December 1988.
5. K. Arun, A Methodology to Determine the Dynamic Configuration of a Reconfigurable Manipulator, August 1989.
6. M. Raju, Determining the Assembly Sequence from a 3-D Model, August 1989.
7. David Stewart, CHIMERA: A Real-Time Unix Compatible Environment for Real-Time Sensor Based Control, December 1989.
8. Dean Hering, Neural Networks: Applications in Tactile Sensing and Manipulator Control, December 1989. (Co-Advisor: Professor Vijaya Kumar).
9. Wayne Carriker, The Use of Simulated Annealing to Solve a Mobile Manipulator Task-Planning Problem, December 1989. (Co-Advisor: Professor Bruce Krogh).
10. Henry Schneiderman, Issues in a Telerobotic System: Control, Trading, Sharing, and Safety during Manual Operation, August 1990.
11. Christaan Paredis, An Approach for Mapping Kinematic Task Specifications into a Manipulator Design, August, 1990.
12. Matthew Gertz, Simulation of Models to Minimize the Force of Impact between a Redundant Manipulator and the Environment, February, 1991.
13. Susan Hartman, Real-Time Image Based Visual Servo Control, May, 1991.
14. Eric Hoffman, AMREDS: A Human-Computer Interface for Controlling Multiple Robotic Systems, February, 1992.
15. W. K. (Fred) Au, Fault Tolerant Manipulator Design, May 1992.
16. Fred Seiler, Automatic Assembly of a Transformer Yoke using Dual Manipulator System, May, 1993.
17. Anne Murray, Sensor-based control of a manipulator for an Intelligent Bending Workstation, August 1993.
18. Colin Taylor, Real-Time Control of Transformer Winding Process, August 1994.
19. Brian Bankler, Robot Assisted NeuroSurgery, August 1994.
20. Shin Teraji, Visual Servoing in Real-Time, May, 1996.
21. Bob Grabowski, Design of Millibots for Distributed Robotic Applications, May 1999.
22. Mario Gomez, Six DOF Sensing for Hand held Surgical Instruments and Computer Interfaces, May 1999.
23. Marios Savvides, Real-Time Tracking of Moving Objects, May 2000.
24. Mahesh Saptarishi, Differential Learning for Visual Tracking, May 2000.

25. Richard Malak, Skill Acquisition for Creating Mobile Robot Programs, July 2000.
26. Jay Wylie, Consensus Algorithms for Distributed Information Systems, May 2000.
27. Spence Oliver, A Human-Machine Interface for Command and Control of Autonomous ATVs, July 2000.
28. Jonathan Jackson, Task Decomposition for a team of Distributed Robots, July 2000.
29. Curt Bererton, Design of Self Repairing Robot Systems, July 2000.
30. Ted Pham, Adaptive Software for Distributed Sensor Networks, August 2002.

## Ph.D. Students

31. Richard A. Volpe, Real and Artificial Forces in the Control of Manipulators: Theory and Experiments, August, 1990. Employment: Jet Propulsion Laboratory, California Institute of Technology, CA
32. Nikoloas Papanikolopoulos, Real-Time Visual Servoing: An Example of Controlled Active Vision, August, 1992. Employment: Professor, Department of Computer Science, Univ of Minnesota, MN.
33. Jin-Oh Kim, Task Based Design and Control of Reconfigurable Manipulators, August, 1992. Employment: Associate Professor, KAIST, Korea.
34. David Stewart, Reconfigurable Software Design and Analysis for Reconfigurable Sensor-Based Systems, May 1994. Employment: Assistant Professor, Department of Electrical and Computer Engg., Univ of Maryland, College Park.
35. M. Raju, Representation for Reasoning about Assemblability Using 3-D Solid Models, August, 1994. Employment: Senior Engineer, Boeing Computer Services, Seattle.
36. Matthew Gertz, Onika: An Iconic Programming Language and Interface for Control of Sensor-Based Reconfigurable Robots, December, 1994. Employment: Microsoft, Seattle.
37. Bradley Nelson, Real-Time Visual Servoing and its Applications in Automatic Assembly, August, 1995. Employment: Professor, ETH, Zurich.
38. Wayne Carriker, Automatic Programming of Sensor-Based Robot for Flexible Assembly, December, 1995. Employment: Senior Manufacturing Engineer, Intel, Oregon.
39. Christaan Paredis, An Agent based Approach for the Design of Rapidly Deployable Fault Tolerant Manipulators, August 1996. Employment: Associate Professor, Mechanical Engineering, Georgia Tech, Atlanta, GA.
40. Hal Aldridge, Redundant Robot Control and Fault Tolerance, November, 1996. Employment: Research Engineer, NASA Langley Research Center.
41. Dan Morrow, Sensorimotor Primitives for Programming Robotic Assembly Tasks, April 1997. Employment: Senior Research Engineer, Sandia National Lab.
42. Richard Voyles, Multi-Agent based Composition of Software for Gesture-based Programming, August 1997. Employment: Associate Professor, Department of Computer Science, Univ of Minnesota, MN.
43. Anne Murray, Development and Evaluation of Haptic Interfaces for Virtual Environments, June, 1999. Employment: Senior Staff Engineer, IBM.
44. Antonio Diaz-Calderon, Multi-Level Simulation Models and Composition for Mechatronic Systems, July, 2000. Employment: Staff Scientist, Jet Propulsion Lab, CalTech.
45. Chris Diehl, Collaborative Surveillance using multiple Robots (co-advisor with Dr. John Hampshire), December 2000. Employment: Member of Technical Staff, APL, Johns Hopkins University.
46. Rajarishi Sinha, Extracting Composable Mechanics-based Assembly Models from CAD Representations, December, 2001. Employment: IC Mechanics, Pittsburgh, PA.
47. Alvaro Soto, Probabilistic Agent-based System for Adaptive Integration of Multiple Visual Cues, December 2002. Employment: Assistant Professor, Pontificia Universidad Catolica de Chile, Santiago, Chile.
48. Poj Tangmachit, Control Strategies and Learning in a Distributed Robot Team, September 03. Employment: Assistant Professor, King Mok University, Bangkok, Thailand.
49. Kevin Dixon, Learning from Human Gestures and Agent-based programming for Distributed Robots, January 2004. Employment: Senior Member of Technical Staff, Sandia National Labs.
50. Marios Savvides (co-advisor with Vijaya Kumar), Robust Face Recognition for Biometric Authentication, April 2004. Employment: Associate Research Professor, CyLab and ECE department, Carnegie Mellon University
51. Soshi Iba, Multi-Modal Gesture-based Programming of Collaborating Heterogeneous Systems, May 2004. Employment: Sony Corporation, Japan

52. Xiao Feng Wang, Multi Agent Coordination under Untrusted and Uncertain Environments, June 2004. Employment: Assistant Professor, Indiana University.
53. Robert Grabowski, Path Planning for Distributed Robots, Aug 2004. Employment: MITRE Systems
54. Luis Navarro Serment, Design and Evaluation of Localization and Control Algorithms for Millibots, September 2004. Employment: Systems Scientist, Carnegie Mellon University
55. Kiran Bhat, Creating 3D Mosaics from Visual Information, July 2004. Employment: Epson Palo Alto Lab, CA.
56. Curt Bererton, Adaptive Repair for Survivable Distributed Robot Systems, Aug 2004. Employment: Enterprenuer.
57. Wei Tech Ang (co-advisor Cameron Riviere), Active Tremor Compensation in Handheld Instrument for Microsurgery, July 2004. Employment: Associate Professor, National Technical University, Singapore.
58. Jay Wylie (co-advisor with Greg Ganger), Perpetually Available and Secure Distributed Storage Systems, September 05. Employment: HP Labs, CA.
59. Mahesh Saptarishi, Discriminative Learning for Visual Pattern Recognition, September 05. Employment: Entrepreneur
60. Yaron Rachlin, Target Tracking and Hand-off in a Distributed Visual Surveillance Systems, May 07. Employment: Senior Member of Technical Staff, Draper Laboratory.
61. Arvind Seshadri (co-advisor with Adrian Perrig), A Software Primitive for Externally-verifiable Untampered Execution and its Applications to Securing Computing Systems, June 09. Employment: IBM T. J Watson Research Labs.
62. Brian Kian Hsian Low (co-advisor with John Dolan), Multi-Robot Adaptive Exploration and Mapping for Environmental Sensing Applications, August 2009. Employment: Assistant Professor, National University of Singapore.
63. Balakrishnan (Murali) Narayanaswamy (co-advisor with Rohit Negi), Sparse Measurement Systems: Applications, Analysis, Algorithms, and Design, February 2011. Employment: Amazon, CA, USA.

## Visitors/PostDocs/Staff Supervised

- Mr. Phillipe Couvigno, Visiting Researcher, Renault, France. October 1990 - April 1992
- Dr. Eve Coste-Maniere, Post-Doc, INRIA, France. September 1991 - August 1992.
- Mr. Masao Kume, Visitor from Sanyo, Japan. September 1991 - August 1993.
- Dr. Marie Gatenholm, Visiting Researcher, Sweden. January 1992 - September 1993.
- Dr. John Dolan, Project Scientist, Carnegie Mellon University, October 1992 - present. (presently Senior Systems Scientist)
- Dr. Karun Shimoga, Post Doctoral Fellow, February 1993 – May 1997.
- Mr. Ethan Evans, Visiting Project Scientist, January 1993 - January 1995.
- Dr. John Hampshire, Research Faculty, ECE, August 1995 – July 1998.
- Dr. Cam Riviere, Post Doctoral Fellow, The Robotics Institute, September 1995 – July 1997. (presently System Scientist)
- Dr. Chris Paredis, Research Faculty, ICES, September 1996 – August 2002.
- Mr. Peter Brown, Senior Engineer, ICES, September 1995 – August 1999.
- Ms. Carol Hoover, Senior Engineer, January 1995 – Dec 1997.
- Mr. Prithvi Rao, Project Engineer, January 1995 – Dec 1997.
- Olivia Barron, Visiting Research Engineer, December 1995 - December 1996.
- Dr. Jesus Salido, Visiting Research Scientist, September 1996 - December, 1998.
- Dr. Han Killicote, Research Faculty, September 1997 – May 2000.
- Dr. Ashitey Trebi-Ollenu, September 1997 – Jan 2000. (presently at Jet Propulsion Laboratory)
- Michael Van DeWegh, September 1998 – December 2002.
- Michael Bigrigg, May 1999 – April 2002.

## List of Publications

## Books

1. Carley, R., and Khosla, P. K., Introduction to Electrical and Computer Engineering: Taught in Context, McGraw Hill College Custom Series, January, 1997. 316 pages
2. Carley, R., and Khosla, P. K., Experimental Context for Introduction to Electrical and Computer Engineering, McGraw Hill College Custom Series, September, 1996. 122 pages.
3. Unetich, R. Carley, R., and Khosla P. K., Experimental Context for Introduction to Electrical and Computer Engineering – GPS System, McGraw Hill College Custom Series, September, 1998.

## Book Contributions

4. R. Negi, Y. Rachlin, and P. Khosla, "The sensing capacity of sensor networks," (eds) A. Swami, Q. Zhao, Y. Hong, and L. Tong, *Wireless Sensor Networks. Signal Processing and Communications Perspectives*, Wiley, 2007.
5. Savvides, M., Vijayakumar, B. V. K., Khosla, P. K., Core Faces: A Shift-Invariant Principal Component Analysis (PCA) Correlation Filter Bank for Illumination-Tolerant Face Recognition, in *Face Biometrics for Personal Identification*, pp 61-71, Springer Verlag, April, 2007
6. J. Fan, Q. He, D. Wu, and P. Khosla, Location Privacy Protection in Mobile Wireless Networks," in *The Handbook of Mobile Middleware*, P. Bellavista and A. Corradi, Eds., ch. 29, pp. 769{786, Taylor & Francis, October 20, 2006. ISBN: 0849338336.
7. Stanley-Marbell, P., Marculescu, D., Marculescu, R., and Khosla, P. K., Modeling Computational, Sensing, and Actuation Surfaces, Piquet C. (ed), *Low Power Electronics Design*, CRC Book Press, 2003.
8. Qi, He., Khosla, P. K., and Zhongmin, Su., A Practical Study on Security of Agent-based Ubiquitous Computing, Workshop on Deception Fraud and Trust in Agent Societies, Falcone R., Barber, S., Korba, L., and Singh M. (eds), *Lecture Notes in AI 2631*, June 2003, Springer, New York.
9. X.F. Wang, X. Yi, R. Krishnan, C K Siew and P. K. Khosla. 2002. "Mobile Agent Based Auctionlike Negotiation in Internet Retail Commerce". Book Chapter. J. Segovia, P.S. Szczepaniak, M. Niedzwiedzinski (Eds.) *E-Commerce and Intelligent Methods, Studies in Fuzziness and Soft Computing*, Vol. 105., pages: 342-362. ISBN 3-7908-1499-7. Published by Springer-Verlag.
10. Soto, A., and Khosla, P., "Probabilistic Adaptive Agent Based System for Dynamic State Estimation Using Multiple Visual Cues," *Robotics Research: The Tenth International Symposium*, John M. Hollerbach and Daniel E. Koditschek (eds.), London, New York, Springer.
11. Sinha, R., Paredis, C.J.J., and Khosla, P., "Kinematics Support for Design and Simulation of Mechatronic Systems," *From Knowledge Intensive CAD to Knowledge Intensive Engineering*, Umberto Cugini and Michael J. Wozny (eds.), Kluwer Academic Publishers, Boston, ISBN 0-7923-7619-6, 264 pp., November 2001.
12. Soto, A. and Khosla, P., "Adaptive Agent Based System for State Estimation Using Dynamic Multidimensional Information Sources," Self-Adaptive Software IWSAS 2001, *Springer Lecture Notes in Computer Science*, Robert Laddaga, Paul Robertson and Gabor Karsai (eds.), Berlin New York, Springer, 2001.
13. Unsal, C., Kiliccote, H., Patton M., and Khosla, P. K., Motion Planning for a Modular Self Reconfigurable Robotic System, *Distributed Autonomous Robotic Systems Vol. 4*, ed L. E. Parker, G. Bekey, J. Barhen, Springer, October 2000, pp 165-178.
14. Tangmachit, P., Dolan, J. M., and Khosla, P. K., Learning-based Task Allocation in Decentralized Robot System, *Distributed Autonomous Robotic Systems Vol. 4*, ed L. E. Parker, G. Bekey, J. Barhen, Springer, October 2000, pp 381-390.
15. Tangmachit, P., Dolan, J. M., and Khosla, P. K., A simple structure for Multirobot System, *Distributed Autonomous Robotic Systems Vol. 4*, ed L. E. Parker, G. Bekey, J. Barhen, Springer, October 2000, pp 483-484.
16. J. Salido-Tercero, C.J.J. Paredis, P.K. Khosla "Continuous Probabilistic Mapping by Autonomous Robots," *Experimental Robotics VI*, ed. Peter Corke and James Trevelyan, *Lecture Notes in Control and Information Sciences* Servis, Springer, March 2000. (Proceedings of the International Symposium of Experimental Robotics, Sydney, Australia, April 1999)
17. B. J. Nelson, and Khosla, P. K., Feedback Control with Force and Visual Sensor Fusion, *Control in Robotics and Automation: Sensor-Based Integration*, ed. B. K. Ghosh, Ning Xi, and T. J. Tarn, Academic Press, San Diego CA., 1998.
18. B.J. Nelson and P.K. Khosla, "Task-Oriented Model-Driven Visually Servoed Agents," *Experimental Robotics IV: The Fourth International Symposium*, eds. O. Khatib and J.K. Salisbury, Springer-Verlag London Ltd., London, 1996.
19. C. J. J. Paredis and P. K. Khosla, "Design of Modular Fault Tolerant Manipulators," *Algorithmic Foundations of Robotics*, (eds. K. Goldberg et al.), A. K. Peters Publishers, Boston, MA., pp. 371-383, 1995.

20. Raju Mattikalli, Pradeep Khosla, and Yangsheng Xu, Generating Assembly Plans from 3-D Solid Modeler, Intelligent Systems in Design and Manufacturing, edited by Cihan Dagli and Andrew Kusiak, ASME Press, 1994. pp 293-317.
21. R. Volpe and P. Khosla. "The Equivalence of Second Order Impedance Control and Proportional Gain Explicit Force Control: Theory and Experiments." In Experimental Robotics II, eds. R. Chatila and G. Hirzinger, Springer-Verlag, London, 1993, pp. 3-24.
22. Papanikolopoulos, N. and Khosla, P. K., Real-Time LQG Visual Robotic Tracking, In S. Tzafestas (editor) Robotic Systems: Advanced Techniques and Applications, pp 305-312, Kluwer Academic Publishers, 1992.
23. Nelson, B.J. and Khosla, P.K., Integrating Sensor Placement and Visual Tracking Strategies, in Experimental Robotics III: The Third International Symposium, Kyoto, Oct 1993, Yoshikawa T., and Miyazaki, F. (eds), Springer-Verlag, pp 169-181. (also in Proc. 1994 IEEE Int. Conf. on Robotics and Automation, San Diego, CA, May 8-13, 1994.)
24. Papanikolopoulos, N., and Khosla, P. K., Controlled Active Vision, In Perceptual Robotics, T. Venkataraman (editor), Springer-Verlag. December, 1993.
25. Nelson, B., Papanikolopoulos, N., and Khosla, P. K., Visual Servoing for Robotic Assembly, In Visual-Servoing-Automatic Control of Mechanical Systems with Visual Feedback Hashimoto, K. (editor), World Scientific Series in Robotics and Automated Systems, September, 1993. pp 139-164.
26. Stewart, D., and Khosla, P. K., Real-Time Scheduling of Sensor-Based Control Systems, In Real-Time Programming, W. Halang and K. Ramaritham (editors), Pergamon Press, 1992. pp139-144.
27. Carriker, W., Khosla, P. K., and Krogh, B. H., Dynamics Sensing and Multi-Task Performance with a Mobile Manipulator System, In Schmidt, G. (editor), Information Processing in Intelligent Robots, Springer-Verlag, Pages 45-59, April, 1991.
28. Khosla, P. K., Recent Advances in Experimental Robot Control, In Taylor, G. (editor), Kinematic and Dynamic Issues in Sensor-Based Robot Control, Springer-Verlag, Pages 161-178, January 1990.
29. Volpe, R. and Khosla, P. K., Potential Function Based Formulation for Obstacle Avoidance and Approach, In H. Miura (editor), Proceedings of the Fifth International Symposium on Robotics Research, MIT Press, August 1989.
30. Berger, A. and Khosla, P. K., A Methodology for Using a Tactile Sensor for Dynamic Feature Tracking, In V. Hayward and O. Khatib (editors), Lecture Notes in Control and Information Sciences, Experimental Robotics I, Springer-Verlag, March 1990, Pages 474-496.
31. Khosla, P. K., Effect of Sampling Rates on the Performance of Model-Based Manipulator Control Schemes, In G. Schweitzer (editor), Dynamics of Controlled Mechanical Systems, Springer-Verlag, Pages 271-284, August 1988.
32. Neuman, C. P. and Khosla, P. K., Identification of Robot Dynamics: An Application of Recursive Estimation. In Narendra, K. S. (editor), Adaptive and Learning Systems: Theory and Applications, Pages 175-196, Plenum Publishing, New York, June 1986.

## Journal Articles

33. Y. Rachlin, R. Negi, and P. Khosla, "The sensing capacity of sensor networks," IEEE Transactions on Information Theory, Vol 57, No 3, pp 1675-1691, March 2011.
34. Wei Tech Ang, Khosla, P. K., and Riviere, C. N., Feedforward controller with inverse rate dependent model for piezoelectric actuators in trajectory tracking applications, IEEE/ASME Transactions on Mechatronics, Vol 12, No 2, pp 134-142, April 2007.
35. Wei Tech Ang, Khosla, P. K., and Riviere, C. N., Nonlinear Regression Model of a Low "g" MEMS Accelerometer, IEEE Sensors Journal, Vol 7, No 1, pp 81-88, January 2007.
36. Q. He, D. Wu, and P. Khosla, A Secure Incentive Architecture for Ad-hoc Networks," *Wireless Communications & Mobile Computing*, Special Issue on Wireless Networks Security, no. 6, pp. 333-346, 2006.
37. Seshadri, A., Luk, M., Perrig, A., van Doorn, L., and Khosla, P. K., Externally Verifiable Code Execution, Communications of the ACM, Vol 49, No 9, September 2006, pp 45-49.
38. Iba, S., Paredis, C., and Khosla, P. K., Multimodal Robot Programming, International Journal of Robotics Research, Vol 24, No 1, pp 83-104, 2005.
39. Dixon, K. R., Dolan, J., and Khosla, P. K., Predictive Robot Programming: Theoretical and Experimental Analysis, International Journal of Robotics Research, Vol 23, No 9, September, 2004.
40. Kiran S. Bhat, Steven Seitz, Jessica Hodgins and Pradeep K. Khosla. Flow-based Video Synthesis and Editing, ACM Transactions on Graphics, Vol 23, No 3, August 2004. (also published in SIGGRAPH, 2004.)
41. He, Qi, Wu, Dapeng, and Khosla, Pradeep, "Quest for Personal Control over Mobile Location Privacy," IEEE Communications Magazine, May, 2004.



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