

HAGEN SCHEMPF

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA

Woods Hole Oceanographic Institution, Woods Hole, MA

Ph.D. in Mechanical and Oceanographic Engineering, August 1990. Thesis entitled “*Comparative Design, Modeling, and Control Analysis of Robotic Transmissions*” involved the study of different transmission types and identified linear and nonlinear behaviors which limit system performance. In addition, the effect of transmission design on such issues as collocated vs. non-collocated sensing and actuation were analyzed analytically and experimentally. Experiments also involved the re-design of a cable-driven underwater manipulator, control software and hardware, and design and construction of an operator interface console. Thesis work carried out under the supervision of Dr. Dana Yoerger, Dr. Neville Hogan, Dr. Tom Sheridan, and Dr. Jean-Jacques Slotine.

Massachusetts Institute of Technology, Cambridge, MA

M.Sc. in Mechanical Engineering, August 1986. Thesis entitled “*Dynamics and Nonlinear Control of Underwater Vehicles*”. Project included dynamic system modeling and controller design for an underwater vehicle. Theories were tested on an underwater vehicle (BENTHOS RPV-430), and then successfully implemented in an underwater survey vehicle (JASON Jr.) used in the exploration of the TITANIC. Design guidelines for placement of actuators and dynamic control of moving manipulation platforms were drawn up and used in the design of the JASON underwater search-and-survey vehicle used to retrieve geological and archeological artifacts during the 1989 JASON PROJECT in the Mediterranean, and a naval archeology survey of the HAMILTON and SCOURGE wrecks in Lake Ontario in 1990.

Stevens Institute of Technology, Hoboken, N.J.

B.Sc. in Mechanical Engineering, Summa Cum Laude, June 1984. General curriculum in Engineering with significant exposure to Economics and Humanities. Area of concentration was in Control Systems Theory.

HONORS

R&D 100 National Design Award - wireless gas pipe inspection robot, 2006

Design News National Design Award – Innovation Award for Aurora, mono-tread steerable robot, 2001

Design News National Design Award - placed 2nd for asbestos-removal robot, 1998

Woods Hole Oceanographic Institution, Graduate Fellowship, 1984-1990

Standard Oil, Scholarship for most outstanding student in Mechanical Engineering, 1984

GRE Exam Board, Test Procedure Evaluation, Top 1% in Engineering Test, 1984

Tau Beta Pi Engineering Honor Society, Member and Secretary (1984), N. J. Chapter

Pi Tau Sigma National Honorary Mechanical Engineering Fraternity

WORK & RESEARCH EXPERIENCE

Carnegie Mellon University, The Robotics Institute, Pittsburgh, PA, July 2010 – June 2015

Director of Graduate Professional Masters in Robotic Systems Development (MRSD) Degree Program.

Continuing role of tenured Sr. Faculty Member (Principal Systems Scientist).

Carnegie Mellon University, The Robotics Institute, Pittsburgh, PA, July 2015 –May 2016

Lead Strategic Advisor, Graduate Educational Programs

ICON Consultants, Pittsburgh, PA, 2010 - Present

Co-founder and Sr. Partner, Engineering and Management Consulting Firm.

Automatika, Inc., Pittsburgh, PA, 1998 – 2010; Acquired in 2007

Co-founder, and Group Director of automation consulting and prototype development and manufacturing company. Consulting, prototyping and manufacturing for dozens of small-, medium- and Fortune 500 companies.

Acquired in 2007 by QinetiQ North America, Inc. Position of Group Director (2007-2009) and CTO (2009-2010).

Carnegie Mellon University, The Robotics Institute, Pittsburgh, PA, 1990 – 2007; Sabbatical 2008 - 2009

Tenured Senior Faculty member. Working on design, building and testing of manipulators for mobile inspection and cleanup vehicle platforms for nuclear and chemical waste remediation, inspection of space shuttle tiles, and autonomous postal service trailer robots. Sr. Systems Scientist Position.

Woods Hole Oceanographic Institution, Woods Hole, MA. 1984 - 1990

Worked on modeling, control and interfacing of underwater vehicles and manipulators. Analyzed and synthesized design guidelines used in the design and implementation of a controller for the TITANIC search vehicle JASON Jr.. Designed, built and interfaced analog controller to hydraulic manipulator. Re-designed cable-pulley transmission of novel underwater manipulator. Designed and built controller console and interface for underwater manipulator mounted on the JASON vehicle. Assisted in drawing up specs and debug of full-ocean depth brushless DC motor design and controller software. Designed and implemented novel controller structure used for manipulators mounted to moving platforms, for stable interactions with the environment. Tested and assisted in successful re-design of full-ocean depth 6-axis force/torque strain-gauge sensor.

RECENT PUBLICATIONS

1. *“Visual and NDE inspection of live gas mains using a robotic Explorer”*, International Journal of Field Robotics, pp.1-33, March 2010 Edition
2. *“Self-Rappelling Robot System for Inspection and Reconnaissance in Search and Rescue Applications”*, Advanced Robotics, Special Issues on Disaster Robotics, Robotics Society of Japan, Vol. 23, No.9, July 2009, pp. 1 - 32
3. *“Wearable Control and Communications System for use with UAVs, UGVs and UGSs”*, AUVSI 2008, June 10-12, 2008, San Diego, CA
4. *“SPIDAR: SPinneret for Inspection and Reconnaissance in Search and Rescue Applications”*, 2007 Safety, Security and Rescue Robotics Workshop, Sep. 27-29 2007, Rome, Italy
5. *“Explorer: Gas Pipeline Robot Design, Field Test Results and Future Developments”*, 2006 American Nuclear Society Conference, Feb. 12-15, Salt Lake City, UT
6. *“GasNet™: Sensing and communications network system for low- and high-pressure distribution gas mains”*, Natural Gas Technologies III Conference - NGT'05, Orlando, FL, Jan. 30 - Feb. 1, 2005
7. *“Explorer: Live Distribution Gas Main Inspection Robot”*, 2004 International Gas Research Conference, Nov. 1-4, 2004, Vancouver, BC

8. "*GasNetTM: In-situ real-time data-gathering and communications network for distribution gas pipe networks*", Natural Gas Technologies II Conference - GTI'04, Phoenix, AZ, Feb. 9-11, 2004
9. "*Trenchless Underground Gas Pipeline Robotics Inspection System*", 20th International Symposium on Automation and Robotics in Construction - ISARC'03, TU Eindhoven, Netherlands, Sept. 21-24, 2003
10. "*Ultra-rugged Soldier-Robot for Urban Conflict Missions*", Unmanned Systems 2003 Conference - AUVSI 30th Annual Symposium and Exhibition, Baltimore, MD, July 15-17, 2003
11. "*GRISLEE: Gasmain Repair & Inspection System for Live Entry Environments*", CLAWAR'01 Special Issue of the International Journal of Robotics Research, March-April, 2003, Vol. 22, Nos 3 and 4.
12. "*Explorer: Untethered Real-time Gas Main Assessment Robot System*", 1st International Workshop on Advances in Service Robotics, ASER'03, Bardolino, Italy, March 13-15, 2003
13. "*AURORA – Minimalist Design for Tracked Locomotion*", Schempf, H., In: Jarvis, R.A., Zelinsky, A. (eds) Robotics Research. Springer Tracts in Advanced Robotics, vol 6. Springer Verlag, Berlin, Heidelberg, Jan. 2003; https://doi.org/10.1007/3-540-36460-9_30
14. "*Junior: A robot for outdoor container nurseries*", Schempf, H., IEEE/RSJ Int. Conference on Intelligent Robots and Systems (IROS 2002), Lausanne, Switzerland, Sept.30-Oct.4, 2002
15. "*PipeTaz: Automated Pipe Asbestos Insulation Removal System Development for DoE Site Remediation*", Conway, N., Schempf, H., SPECTRUM 2002, Reno, NV, Aug. 4-8, 2002
16. "*Less is More: AURORA - an example of minimalistic design for tracked locomotion*", Schempf, H., ISSR 2001, Lorne, Australia, November 2001
17. "*Robotic Repair System for Live Distribution Gasmain*", Schempf et al, IFSR 2001, Helsinki, FI, June 2001
18. "*Automated container handling system for container production nurseries*", Schempf et al, IEEE Int. Conference on Robotics & Automation, Seoul, KO, May 2001
19. "*Evolution of Urban Robotic Systems Developments*", Schempf et al, IEEE/ASME Int. Conference on Advanced Intelligent Mechatronics, September 19-22, Atlanta, GA, 1999
20. "*Cyclops: Miniature Robotics Reconnaissance System*", Schempf et al, IEEE ICRA'99, May 10-15, Detroit, MI, 1999
21. "*Pandora: Autonomous Urban Robotic Reconnaissance System*", Schempf et al, IEEE ICRA'99, May 10-15, Detroit, MI, 1999
22. "*RoboCon: Operator Interface for Robotic & Remote Applications*", Schempf et al, ANS 8th International Topical Mtg. on Robotics & Remote Systems, April 25-29, Pittsburgh, PA, 1999
23. "*A Robotic Pipe-Asbestos Insulation Removal System*", Schempf et al, Industrial Robot - An International Journal, MCB University Press, Bradford, England, Vol. 25, Issue 3, 1998
24. "Handbook of Industrial Robotics - 2nd Ed: Mobile Robots and Walking Machines.", John Wiley & Sons, New York, NY, to be published in late 1998
25. "*BOA & PipeTaz: Robotic Pipe-Asbestos Insulation Removal Robots*", Schempf et al, IEEE ICRA'97, April 22 -24, Albuquerque, NM, 1997
26. "*Mobile robot for automatic installation of floor tiles*", Apostolopoulos, Schempf & West, Proceedings of IEEE International Conference on Robotics & Automation, Minneapolis, MN, Apr. 1996
27. "*Houdini: In-Tank Mobile Cleanup Robot*", Schempf, H., ASCE '94 Proceedings of the 4th International Conference on Robotics for Challenging Environments, Albuquerque, NM, Feb. 26 - Mar. 3, 1994
28. "*Mobile robot system for ground servicing operations on the space shuttle*", Dowling, Schempf et al., Proceedings Vol. 1829, Cooperative Intelligent Robotics in Space III, Applications in Optical Science and Engineering, Boston, (1992)

PATENTS

“Robot Surveillance System and Method”, US Patent # 8,738,198

“Stair climbing tread hardware for a robot”, US Patent Application - Filed Mar. 2009, US-2009-0266628

“Gas main robotic inspection system”, Canadian Pat# 2,440,344; EP Pat# EP 1373783; U.S. Pat# 6,917,176; AU Pat.# AU2002306844;

“Pipe Inspection and Repair System”, U.S. Pat# 6,820,653; WO Pat.# WO2000061988A3

“Conduit Network System”, U.S. Patent # 6,778,100

“Method and system for moving equipment into and through an underground well”, U.S. Pat# 6,675,888; EP Pat# EP1086294,

“Robotic systems for handling objects”, U.S. Patents Pending, App.# 20020182046

“Dynamically Steerable Mono Belt Apparatus”, US Pat.# 6,517,457; Canadian Pat.# 2,339,444

“Method and System for moving equipment into and through a conduit”, U.S. Pat.# 6,454,011; MX Pat.# MXPA00012036A; GC Pat.# GC0000072A;

“Method and system for measuring data in a fluid transportation conduit”, U.S. Pat.# 6,241,028; GC Pat.# GC0000071A; NO Pat.# NO20006278D0; MX Pat.# MXPA00011805A;

“Collapsible mobile vehicle”, Pat.# 5,451,135

“Reconfigurable mobile vehicle with magnetic tracks”, Pat. # 5,363,935, CIP Pat. # 5,435,405; WO Pat.# WO1995029089

CONSULTING

Engineering and IP/Patenting consulting on multiple robotic systems; technical evaluations, safety-and certification, and system designs for Government Agencies, large and small companies, and universities.

CITIZENSHIP

United States of America

Germany

LANGUAGES

Fluent in written and spoken German, English, Spanish, and French. Conversational Italian proficiency.

BACKGROUND

Raised in several countries: India, West Germany, Spain, France, Venezuela.

Volunteer Firefighter, Fox Chapel – Rank of Lieutenant. (att. 2010)

USCG Captain’s License; OUPV 100 tons & Master’s Inland License, 50 tons

OTHER

- Expert Witness (for *Kilpatrick Townsend & Stockton*) on behalf of Zodiac Pool Systems LLC and Zodiac Pool Care Europe vs. Wybotics, Co., LTD (f/k/a Tianjin Wangyuan Environmental Protection and Technology Co., Ltd.) related to alleged infringement of Zodiac patents in the Eastern District of Texas (Case

No. 2:25-cv-582) and Beatbot Technology (USA) Co. Ltd. et al. vs. Zodiac Pool Systems LLC related to alleged non-infringement of various Zodiac patents in the Southern District of California (Case No.: 3:25-cv-01946) – Ongoing engagement

- Expert Witness (for *Todd & Weld LLP*) on behalf of Onvio LLC (ONV) vs. Boston Dynamics Inc. (BD) and Schäffler Group USA Inc. (SG) and JP Morgan Chase & Co. and JP Morgan Chase Bank N.A. (JPM) in the matter of alleged conspiracy to misappropriate confidential and proprietary trade secrets concerning robotic technology in front of the Commonwealth of Massachusetts Superior Court Middlesex (Civil Action Case Docket No. 2481CV02673), Nov. 6, 2024 – Engagement concluded Apr. 2025
- Expert Witness (for *Bartlit Beck LLP*) on behalf of Northwestern University (NWU) vs. Yaskawa/Fanuc/Kuka/Reis/Universal-Robots in the matter of alleged Patent Infringement related to COBOTS in front of: The United States District Court, District of Delaware (Case. No.: 1:21-cv-00149-CFC), June 17, 2021; The United States District Court, Northern District of Illinois (Case. No.: 1:21-cv-00603; Case. No.: 1:21-cv-00607; Case. No.: 1:21-cv-00599; Case. No.: 1:21-cv-00596), Feb. 2, 2021. All cases but Universal-Robots (USDC-DE Trial – April 2024) settled in favor of NWU. Jury found NWU's asserted patents to be valid and Universal Robots (Teradyne parent company) to have infringed all asserted patents with a \$6.6M monetary award in favor of NWU; Oct. 19, 2024
- Expert Witness (for *Maier & Maier PLLC, Alexandria, VA*) on behalf of Vernier Software & Technology, LLC vs. PASCO Scientific in the matter of alleged Patent Infringement in front of The United States District Court, District of Oregon, Division of Portland (Case. No.: 3:21-cv-01523), Nov. 2022; Case settled out of court by all parties with prejudice; Mar. 2023
- Expert Witness (for *Morgan, Lewis & Bockius LLP* et al) on behalf of Hoover Inc. et al in the matter of CERTAIN ROBOTIC VACUUM-CLEANING DEVICES AND COMPONENTS THEREOF SUCH AS SPARE PARTS (Inv. No. 337-TA-1057) in front of the U.S. International Trade Commission, Washington, DC, Feb. 2018. Outcome (Jun. 2019): SETTLED (with: Black & Decker, MicroStar, Shenzhen Zhiji, Bissell-Matsutek) & WIN (over: Shenzhen Silver Star, bObsweep, Hoover); ITC Pub. 4979
- National Science Foundation (NSF) National Robotics Initiative (NRI) 2.0 Proposal Review Team, May 2017
- Patent Review Expert (for *Jones Day*) on behalf of Nidec Corporation in the matter relating to Hard-Drive Spindlemotors (US 6914358), Pittsburgh, PA, Nov. 2010
- Expert Witness (for *Westerman, Hattori, Daniels & Adrian, LLP*, Washington, DC and *Jones Day*, Cleveland, OH) on behalf of Yaskawa/Motoman vs. FANUC North America in the Matter of CERTAIN ELECTRIC ROBOTS AND COMPONENTS THEREOF (Inv. No. 337-TA-530) in front of the International Trade Commission; ITC closed the case with a finding of no infringement and invalidity against FANUC and its asserted patent(s).