



Christopher R. Wagner

Contact

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Ware, United Kingdom

Education

Ph.D. in Engineering Sciences, Harvard University, Cambridge, MA. 2006.

Division of Engineering and Applied Sciences. Robotics, biomedical engineering emphases.

S.M. in Engineering Sciences, Harvard University, Cambridge, MA. 2003.

Division of Engineering and Applied Sciences. Control theory and human systems modeling coursework.

B.S. in Electrical Engineering and Computer Science, University of California, Berkeley. 2000.

Graduated with high honors. Honors program emphasis in psychology.

Work History

OrthoImagingSolutions, Ltd., United Kingdom

CEO and Co-Founder, 2011-present

Founded company to commercialize orthopaedic visualization and analysis software and services. Developed medical image analysis architecture, combining open source data and visualization tools (Python, C++, VTK, GDCM), with novel multimodal renderer allowing real time simultaneous volume rendering of high resolution CT and SPECT (C++, OpenGL). Authored business plan for delivering orthopaedic surgeon targeted software to the orthopaedic market. Interfaced directly with orthopaedic surgeon customers to guide product development. Successfully managed development of 3D SPECT/CT-based measurement software from concept demonstrator to initial market prototype.

Orthorun, Ltd., United Kingdom

CEO and Founder, 2010-2012

Founded company to deliver high end software consulting and 3D data analysis services for the orthopaedic community. Projects included: implementing wear patch analysis software for orthopaedic implants (Matlab), developing software to streamline orientation reports from CT scans (Python, VTK), collaborating with researchers to develop a platform for rapid segmentation of medical images (C++, CUDA, FLTK), and helping to develop rapid prototyped bone and implant models for demonstration, and implementing 3D registration techniques for pre- vs. post-op evaluation of joint replacement implants (Python, ITK, VTK). In collaboration with Dr.med. Hirschmann of Kantosspital Bruderholz, developed IntroSPECT visualization software for orthopaedic analysis of 3D SPECT/CT images.

Revolute Biomedical, LLC, Concord, NH

Research Scientist and Co-Founder, 2009 to 2010

Authored research grants to NIH for 3D medical image processing techniques for orthopaedics applications. Developed proof-of-concept multimodal visualization software in Python for orthopaedic analysis using open source toolkits (VTK, ITK and GDCM).

The Acrobot Company Ltd., London, UK (acquired by Stanmore Implants Worldwide Ltd.)

Senior Mechatronics Engineer, 2008 to 2009

Led hardware development team for next-generation active constraint robot for orthopaedic surgery. Designed specification (including low inertia, low friction back-drivable transmission), developed mechanical designs in Solidworks, designed electronic interfaces (PCB layout in KiCAD), wrote kinematics and calibration software.

Cybernet Systems Corporation, Ann Arbor, MI

Research Engineer, 2007

Authored research grants to DoD, NASA, NIH for robotic, medical, and machine vision applications. Managed engineering team on several Phase I and Phase II projects, including a project to develop intelligent message translation algorithms (implemented in C++) for modular robotic agents. Served as Principal Investigator to develop novel vibrotactile display technology for helicopter pilots (Tactile Situational Awareness System).

Intelligent Prosthetic Systems, Ann Arbor, MI

Research Engineer, Fall 2006

Co-authored research grants to NIH, NSF to use accelerometer-based inertial measurement units to track gait outside of a laboratory. Implemented low-cost, wide field-of-view virtual environment system

using real-time lens distortion in OpenGL, standard LCD projector and curved screen.

Boston University Intelligent Mechatronics Laboratory, Boston, MA

Research Engineer, Summer 2006

Developed 3D stereo vision system to validate the configuration of a steerable surgical needle. Designed novel machine vision algorithm for automatic segmentation of 3D lines using dynamic contours (snakes).

Harvard University Biorobotics Laboratory, Cambridge, MA

Research Assistant, 2000-2006

Demonstrated benefits of force feedback in surgical robotics by constructing force reflecting telemanipulators, implementing haptic (sense of touch) interfaces, running human factors experiments. Developed force sensing grippers for minimally invasive surgical robots using shape deposition manufacturing (SDM). Developed robust tactile shape display using RC servomotors; supervised undergraduate students in optimal tactile display design research. Implemented haptic interface for atomic force microscope (10 million times force scaling).

Lockheed Martin Corporation, Advanced Software Technologies Lab, Sunnyvale, CA

Intern, Summer 2000

Created augmented reality software (C++, OpenGL, VRML, ARTToolkit) allowing multiple users to simultaneously update a three-dimensional terrain map using wireless PDAs.

UC Berkeley Robotics & Intelligent Machines Laboratory, Berkeley, CA

Research Assistant, 1999-2000

Designed FPGA circuit to simultaneously control 25 pneumatic valves at 300 Hz, implemented pneumatic low-pass filters for use with compliant (silicone rubber based) tactile display.

Lawrence Berkeley National Laboratories, Berkeley, CA

1998-1999

Intern, Imaging & Distributed Computing Group - Tested efficacy of multicast network communications protocol by implementing distributed control of a microscope over the internet using Java (client-side) and C server-side).

Student Programming Assistant, Center for X-Ray Optics - Implemented C++ objects, LabView UI that controlled the interface between a VXI crate and motors, stages, and slits to operate the X-Ray Microprobe Beamline at the Advanced Light Source.

Awards and Honors

- Finalist, Best Paper, Haptics Symposium, 2006
- Finalist, Best Student Paper, World Haptics Symposium, 2005
- National Science Foundation Graduate Research Fellowship, 2001-2004
- Harvard University Certificate Of Distinction in Teaching, 2002
- George Epstein Scholarship (awarded by the Society of Plastics Engineers), 1999, 2000, 2001
- University Of California Alumni Emerging Leadership Scholarship, 1999, 2000
- Electrical Engineering & Computer Science Undergraduate Research Poster Contest Winner, 2000
- Electrical Engineering & Computer Science Honor Degree Program Member, 1999-2000
- Electrical Engineering & Computer Science Internship Program, 2000
- Eta Kappa Nu (national electrical engineering honor society), 1999

Patents

Cable Driven Tactor US 8028644

Rapid Prototyping and Machine Vision for Reconfigurable Interfaces Pending.

Publications

Journal Articles

Hirschmann, M.T., Wagner, C.R., Rasch, H., Henckel, J.

[Standardized volumetric 3D-analysis of SPECT/CT imaging in orthopaedics: overcoming the limitations of qualitative 2D analysis \[PDF\]](#) BMC Medical Imaging 12 (1), 5. 2012.

Hirschmann, M.T., Mathis, D., Afifi, F.K., Rasch, H., Henckel, J., Amsler, F., Wagner, C.R., Friederich, N.F., Arnold, M.P.

[Single Photon Emission Computerized Tomography and Conventional Computerized Tomography](#)

(SPECT/CT) for Evaluation of Patients After Anterior Cruciate Ligament Reconstruction: a Novel Standardized Algorithm Combining Mechanical and Metabolic Information. *Knee Surgery, Sports Traumatology, Arthroscopy* (June 13, 2012).

Wagner, C.R., Howe, R.D.

[Force Feedback Benefit Depends on Experience in Multiple Degree of Freedom Robotic Surgery Task](#), *IEEE Transactions on Robotics* 23(6), 2007.

Wagner, C.R., Stylopoulos, N., Jackson, P. G., Howe, R.D.

[The Benefit of Force Feedback in Surgery: Examination of Blunt Dissection](#), *Presence: Teleoperators & Virtual Environments* June 2007, Vol. 16, No. 3: 252-262

Wagner, C.R., Lederman, S.L., Howe, R.D.

[Design and Performance of a Tactile Shape Display Using RC Servomotors](#) (short paper), *Haptics-e: The Electronic Journal Of Haptics Research*, Vol. 3, No. 4, Aug 6, 2004. (www.haptics-e.org)

Peer Reviewed Conference Articles

Beasley, R.A., Wagner, C.R.

[Intuition in Medical Image Segmentation: Visualizing Graph Edge Weights](#), *International Conference BioMedical Visualization*, 2011.

Wagner, C.R., Perrin, D.P.

Efficient curvature estimations for real-time (25Hz) segmentation of volumetric ultrasound data (peer reviewed abstract), *SPIE Medical Imaging: Image Processing*, 2008

Wagner, C.R., Christiana, A.L.

Cable-Driven Tactor for Tactile Situational Awareness Systems (short paper), *16th International Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems*, Reno, NV, 2008

Wagner, C.R., Vasilyev, N., Perrin, D.P., del Nido, P.J., Howe, R.D.

[Force Feedback in a Three-Dimensional Ultrasound-Guided Surgical Task](#), *14th International Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems*, Washington, D.C., 2006

Dollar, A.M., Wagner, C.R., Howe, R.D.

[Sensors for Biomimetic Robots via Shape Deposition Manufacturing](#), *IEEE/RAS-EMBS International Conference on Biomedical Robotics and Biomechatronics (BioRob2006)*, Pisa, Italy, 2006

Wagner, C.R., Howe, R.D.

[Mechanisms of Performance Enhancement With Force Feedback](#), *First Joint EuroHaptics Conference and Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems*, Pisa, Italy, March 2005

Wagner, C.R., Clatz, O., Perrin, D.P., Feller, R.L., Delingette, H., Ayache, N., Howe, R.D.

[Integrating Tactile and Force Feedback with Finite Element Models](#), *2005 IEEE International Conference on Robotics and Automation*, Barcelona, Spain, 2005

Feller, R.L., Lau, C.K.L., Wagner, C.R., Perrin, D.P., Howe, R.D.

[The Effect of Force Feedback on Remote Palpation](#), *2004 IEEE International Conference on Robotics and Automation*, New Orleans, 2004

Lau, C.K.L., Wagner, C.R., Howe, R.D.

[Algorithms for Tactile Rendering in Compliant Environments](#), *12th International Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems*, Chicago, 2004

Lee, J.M., Wagner, C.R., Lederman, S.J., Howe, R.D.

[Choosing a Spatial Low Pass Filter for Pin Actuated Tactile Displays](#), *11th International Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems*, Los Angeles, March 22-23, 2003

Wagner, C.R., Stylopoulos, N., Howe, R.D.

[The Role of Force Feedback in Surgery: Analysis of Blunt Dissection](#), *10th International Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems*, Orlando, March 24-25, 2002

Wagner, C.R., Lederman, S.J., Howe, R.D.

[A Tactile Shape Display Using RC Servomotors](#), *10th International Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems*, Orlando, March 24-25, 2002

Moy, G., Wagner, C.R., Fearing, R.S.

A Compliant Tactile Display for Teletaction, *2000 IEEE International Conference on Robotics and Automation*, San Francisco, CA, 2000

Posters and Movies

Underwood, R., Cann, P., Hart, A., Ilo, K., Skinner, J., Wagner, C.R.

Development of Protocol for Measuring Wear in Explanted Hip Joints Using Roundness Machine (poster). 56th Annual Meeting of the Orthopaedic Research Society, New Orleans, USA, 2010

Wagner, C.R., Howe, R.D.

[Embedded Strain Gage Force Sensor For Robotic Surgery](#) (poster), First Joint EuroHaptics Conference and Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems, Pisa, Italy, March 2005

Perrin, D.P., Wagner, C.R., Geisse, N., Howe, R.D., Parker, K.K.

[Haptic Interface for Cardiac Cell Exploration Using AFM](#) (poster), First Joint EuroHaptics Conference and Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems, Pisa, Italy, March 2005

Feller, R.L., Lau, C.K.L., Wagner, C.R., Perrin, D.P., Howe, R.D.

[Tactile Feedback in Telem Manipulation](#) (video), 2004 IEEE International Conference on Robotics and Automation, New Orleans, 2004

Book Chapters

Wagner, C.R., Beasley, R.A.

The Benefit Of Orthopaedic Specific Imaging Software. The unhappy total knee replacement - a comprehensive review and management guide. Hirschmann, MT, ed. Nova Science Publishers, Inc. 2013 (pending publication)

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