John Kua

Email: john<at> kua <dot> fm

Specialties Robotic perception, with emphasis on laser and vision based algorithms for navigation, modeling, and recognition, particularly in mobile settings

Education

May 2008 Robotics Institute / Carnegie Mellon University Pittsburgh, PA
Master of Science, Robotics *(3.89 GPA)*
Thesis: "Pose Estimation Using Starfield Occlusion"
Advisor: Professor William "Red" Whittaker

May 2006 Rensselaer Polytechnic Institute Troy, NY
Bachelor of Science, Electrical Engineering
Graduated summa cum laude (3.98 GPA)

Publications

T. Liu, M. Carlberg, G. Chen, J. Chen, J. Kua, A. Zakhor, "Indoor Localization and Visualization Using a Human-Operated Backpack System," *International Conference on Indoor Positioning and Indoor Navigation (IPIN)*, Zurich, Switzerland, September 2010.

G. Chen, J. Kua, S. Shum, N. Naikal, M. Carlberg, and A. Zakhor, "Indoor Localization Algorithms for a Human-Operated Backpack System", *3D Data Processing, Visualization, and Transmission (3DPVT)*, Paris, France, May 2010.

N. Naikal, J. Kua, G. Chen, and A. Zakhor, "Image Augmented Laser Scan Matching for Indoor Dead Reckoning," *International Conference on Intelligent RObots and Systems (IROS)*, St. Louis, MO, October 2009.

J. Kua, "Pose Estimation Using Starfield Occlusion," *Master's Thesis*, Carnegie Mellon University, May 2008.

Research Experience

2008 – present University of California, Berkeley Berkeley, CA
Research Scientist (Assistant Specialist, Step III)

- Indoor Modeling Project – Developed a multi-sensor system (cameras, lidars, IMU) for building 3D models of building interiors from a human-borne backpack platform. Responsible for the mechanical and electrical design of the system. Developed the data collection software, including sensor interfacing and synchronization.
- Hindsight Project – Redesigned the Indoor Modeling project's backpack system for a rover platform. Lead engineer in the development of software for navigation as well as lidar point cloud reconstruction and analysis. Work performed for Army Research Labs' Vehicle Technology Directorate.
- Assisted in the writing of grant proposals and statements of work.

2008 – present Signetron, Inc. Berkeley, CA
Consulting

- DARPA VisiBuilding Project – Developed a multi-sensor system (cameras, lidar, GPS) for building 3D models of building exteriors and detecting apertures from a vehicle platform. Responsible for the development of the aperture detection software, which integrated information from all sensors. System was tested, evaluated, and refined with field tests at multiple military sites. Work performed for SRI International.
- JIEDDO Project – Led the development of software to reconstruct and analyze point clouds from vehicle-borne lidar in real time for Lawrence Livermore National Labs.
- Also developed software to perform surface triangulation of aerial lidar data.

2006 – 2008 Field Robotics Center / Carnegie Mellon Pittsburgh, PA

Graduate Research Assistant

- Developed a novel method for localizing a rover within a crater using starfield occlusion (PI: Red Whittaker)
  - Performed small-scale experiments to demonstrate the basic functionality of the concept
  - Explored the theoretical limits of the method in simulation and developed methods to increase localization precision
- Developed a multi-laser light striper range sensor for the Penn State Electro-Optics Center (PI: Sanjiv Singh)
  - Created simulation software to explore various laser configurations
  - Ran field trials to test the sensor in outdoor settings and integrated with GPS navigation information to build terrain maps
  - Performed system calibration and component calibration
  - Performed bench tests of optical components
- Worked on the team designing Scarab, a proof-of-concept lunar rover for NASA (PI: Red Whittaker, David Wettergreen)
  - Developed a sensor plan, including sensor selection and mounting strategies

Work Experience

2000 – 2003 Capella Microsystems, Inc. San Jose, CA

IT Manager/Engineering Support

- Tested and evaluated PDICs (photodiode ICs), including building test jigs and writing test control software
- Maintained a network of 25+ PCs and printers
- Coordinated two relocations of the LAN, Internet, PBX/telco services
- Provided system support for Windows 2000 Professional and Windows 9x
- Created and updated product datasheets

1998 – 2000 Accel Power/Addonics Communications Fremont, CA

Design Engineer

- Designed, prototyped and debugged
  - Motherboard for a Windows-based Terminal – ART2000
  - Single-board industrial PC for a custom vending machine application
  - A number of controller boards for military computer applications
- Troubleshooter – was sent to identify problems on field units and determine if engineering changes were necessary

Eng. Tools

MATLAB, C/C++, OpenCV, Caltech Camera Calibration Toolbox, Visual Studio, Linux, SVN, LaTeX, LabView, OrCAD Capture, PADS PowerPCB, CAM350, SolidWorks

Skills

Board-level electronics prototyping, Basic mechanical prototyping, Machine shop certification (basic skills: mill, lathe, bandsaw). Trained in the operation of Leica/Z+F HDS laser survey scanners and Applanix POS-LS inertial navigation systems. Familiar with the interfacing of Hokuyo laser range finders and Point Grey cameras.

Awards/ Honors

- 2006 Ricketts Prize Recipient – Rensselaer Polytechnic Institute
- Member of the Tau Beta Pi Engineering Honors Society
- Member of the Eta Kappa Nu Electrical & Computer Engineering Honors Society

Societies

Member of the Institute of Electrical and Electronics Engineers (IEEE)

References

Prof. Avideh Zakhor, Professor of Electrical Engineering
University of California, Berkeley

Prof. William "Red" Whittaker, University Professor and Fredkin Professor of Robotics
The Robotics Institute, Carnegie Mellon University

Prof. Sanjiv Singh, Research Professor of Robotics
The Robotics Institute, Carnegie Mellon University