William J. Beksi

Contact Information

Department of Computer Science and Engineering
University of Minnesota
4-192 Keller Hall
200 Union Street SE
Minneapolis, MN 55455, USA

Email: beksi@cs.umn.edu
Web: cs.umn.edu/~beksi001
GitHub: github.com/wjbeksi

Citizenship

USA

Research Interests

Robotic vision, networked and cloud robotics, artificial intelligence, computer vision, image processing, computational geometry and topology, algorithms, parallel computing, big data, machine learning, optimization

Education

The University of Minnesota, Twin Cities, Minneapolis, MN

Ph.D., Computer Science, 2018

- Adviser: Professor Nikolaos Papanikolopoulos
- Areas of Study: Robotics and Computer Vision
- Minor in Mathematics

M.S., Computer Science, 2016

National Taiwan Normal University, Taipei, Taiwan

Chinese Language and Cultural Studies, Mandarin Training Center

Stevens Institute of Technology, Hoboken, NJ

B.S., Mathematics and Computer Science

Journal Publications

[1] W.J. Beksi and N. Papanikolopoulos. **A Fast Algorithm for Computing Topologically Persistent 1-Cycles with Application to 3D Hole Boundary Point Detection**, (in preparation).

[2] W.J. Beksi and N. Papanikolopoulos. **A Topology-based Descriptor for 3D Point Cloud Modeling: Theory and Experiments**, *Image and Vision Computing*, (under review).

[3] D. Fehr, W.J. Beksi, D. Zermas and N. Papanikolopoulos. **Covariance Based Point Cloud Descriptors for Object Detection and Recognition**, *Computer Vision and Image Understanding*, 142, pp. 80-93, 2016.
doi:10.1016/j.cviu.2015.06.008

Conference Publications

[4] W.J. Beksi and N. Papanikolopoulos. **Signature of Topologically Persistent Points for 3D Point Cloud Description**, *IEEE International Conference on Robotics and Automation (ICRA)*, Brisbane, Australia, pp. 3229-3234, 2018.
doi:10.1109/ICRA.2018.8460605

[5] W.J. Beksi and N. Papanikolopoulos. **3D Region Segmentation Using Topological Persistence**, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Daejeon, Korea, pp. 1079-1084, 2016.
doi:10.1109/IROS.2016.7759183

[6] W.J. Beksi and N. Papanikolopoulos. **3D Point Cloud Segmentation Using Topological Persistence**, *IEEE International Conference on Robotics and Automation (ICRA)*, Stockholm, Sweden, pp. 5046-5051, 2016.
doi:10.1109/ICRA.2016.7487710

[7] W.J. Beksi, J. Spruth and N. Papanikolopoulos. **CORE: A Cloud-based Object Recognition Engine for Robotics**, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Hamburg, Germany, pp. 4512-4517, 2015. doi:10.1109/IROS.2015.7354018

[8] W.J. Beksi and N. Papanikolopoulos. **Object Classification Using Dictionary Learning and RGB-D Covariance Descriptors**, *IEEE International Conference on Robotics and Automation (ICRA)*, Seattle, USA, pp. 1880-1885, 2015. doi:10.1109/ICRA.2015.7139443

[9] W.J. Beksi and N. Papanikolopoulos. **Point Cloud Culling for Robot Vision Tasks Under Communication Constraints**, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Chicago, USA, pp. 3747-3752, 2014. doi:10.1109/IROS.2014.6943088

[10] D. Fehr, W.J. Beksi, D. Zermas and N. Papanikolopoulos. **Occlusion Alleviation through Motion Using a Mobile Robot**, *IEEE International Conference on Robotics and Automation (ICRA)*, Hong Kong, China, pp. 3179-3184, 2014. doi:10.1109/ICRA.2014.6907316

[11] D. Fehr, W.J. Beksi, D. Zermas and N. Papanikolopoulos. **RGB-D Object Classification Using Covariance Descriptors**, *IEEE International Conference on Robotics and Automation (ICRA)*, Hong Kong, China, pp. 5467-5472, 2014. doi:10.1109/ICRA.2014.6907663

[12] W.J. Beksi, **A Web-based Approach To Chinese Word Segmentation**, *The 14th International Conference on the Processing of East Asian Languages (ICPEAL)*, Nagoya, Japan, 2012.

Technical Reports

[13] W.J. Beksi, K. Choi, D. Canelon and N. Papanikolopoulos. *The Microvision Robot and its Capabilities*, Technical Report TR 15-003, University of Minnesota, Department of Computer Science and Engineering, 2015.

Workshops

[14] W.J. Beksi and N. Papanikolopoulos, *3D Point Cloud Segmentation Using Topological Persistence*, ICRA 2016 Workshop on Emerging Topological Techniques in Robotics, Stockholm, Sweden, 2016.

[15] W.J. Beksi and N. Papanikolopoulos, *Cloud Robotics: Experiments and Requirements*, NSFCloud Workshop on Experimental Support for Cloud Computing, Arlington, VA, 2014.

Talks

3D Point Cloud Processing Using Topological Data Analysis

- iRobot, Technology Organization, August 2017

3D Point Cloud Segmentation Using Topological Persistence

- Workshop on Emerging Topological Techniques in Robotics, May 2016

AWARDS

University of Minnesota
- 2018 UMII MnDRIVE PhD Fellowship

National Science Foundation
- Travel Grant, 2018 IEEE International Conference on Robotics and Automation
- Travel Grant, 2016 IEEE/RSJ International Conference on Intelligent Robots and Systems
- Travel Grant, 2015 IEEE/RSJ International Conference on Intelligent Robots and Systems
- Travel Grant, 2015 IEEE International Conference on Robotics and Automation
- Travel Grant, 2014 IEEE/RSJ International Conference on Intelligent Robots and Systems
- Travel Grant, 2014 IEEE International Conference on Robotics and Automation

RESEARCH EXPERIENCE

Center for Distributed Robotics, Minneapolis, MN

Research Assistant **January 2012-Present**

- Algorithm and data structure design for fundamental problems in robotic vision such as 3D reconstruction, segmentation, and object detection and classification
- Developed perception architecture and algorithms for cloud robotics
- Extensive software development experience deploying aerial and ground robots
- Coordinate and conduct experiments to validate theoretical findings
- Mentor undergraduate research assistants

TEACHING EXPERIENCE

The University of Minnesota, Minneapolis, MN

Teaching Assistant **Fall 2013 - Fall 2016**

- CSCI 4141: Algorithms and Data Structures
- CSCI 4141H: Honors Algorithms and Data Structures
- CSCI 4511W: Artificial Intelligence
- CSCI 5511: Artificial Intelligence I
- CSCI 5551: Introduction to Intelligent Robotic Systems
- CSCI 5561: Computer Vision
  - Graded homework/exams and prepared solution keys
  - Conducted office hours to help students understand the course material
  - Developed teaching experience by covering lectures as a substitute instructor

PROFESSIONAL EXPERIENCE

iRobot, Technology Organization, Bedford, MA

Robotics Engineer **Summer 2017**

- Spearheaded a project to generate synthetic 3D scenes suitable for training data-driven large-scale machine learning algorithms such as deep learning

Projected Image Planogram System (PIPS), Wayzata, MN

Consulting Software Engineer **2016 - Present**

- Software development for automating the setting of planograms in retail

Index Engines, Holmdel, NJ

Software Engineer **2006 - 2010**

- Software development for indexing data in a backup stream

Setabox Technology, Taipei, Taiwan

Research and Development Engineer **2003 - 2006**

- Linux device driver and VoIP development for an IP set-top box

Referee Service

- *IEEE Transactions on Robotics*
- *IEEE International Conference on Computer Vision*
- *IEEE Conference on Computer Vision and Pattern Recognition*
- *IEEE International Conference on Robotics and Automation*
- *IEEE/RSJ International Conference on Intelligent Robots and Systems*
- *IEEE Transactions on Intelligent Transportation Systems*
- *Computer Vision and Image Understanding*
- *Image and Vision Computing*
- *Robotics and Autonomous Systems*

Professional Memberships

- Institute of Electrical and Electronics Engineers (IEEE)

Hardware and Software Skills

Computer Programming:

- C, C++, Python, Java, Javascript, UNIX shell scripting, GNU Make and CMake, SQL

Embedded Systems:

- Software development with several SoC platforms (Arduino, Gumstix, Raspberry Pi) and cameras

High Performance and Parallel Computing:

- CUDA, OpenMP, MPI, Pthreads

Numerical Analysis:

- MATLAB, Octave

Software Frameworks and Libraries:

- Blender, Boost, CVX, OpenCV, OpenGL, OpenStack, Point Cloud Library (PCL), Robot Operating System (ROS)

Software Version Control:

- Git, Mercurial, Subversion

Productivity Software:

- GIMP, Google Docs, InkScape, LibreOffice, OpenOffice, TEX (LATEX, BIBTEX), Vim

Operating Systems:

- GNU/Linux, BSD and other UNIX variants, Android, Microsoft Windows