

Ph.D. Candidate and Research Assistant
Department of Computer Science
The University of North Carolina at Chapel Hill
201 S. Columbia Street
Sitterson Hall, Campus Box 3175
Chapel Hill, NC 27599

Office: (919) 843-7416
Mobile: (919) 816-6692
Fax: (919) 962-1799
bclipp@cs.unc.edu
<http://www.cs.unc.edu/~bclipp>

Education

- Ph.D. Computer Science, The University of North Carolina at Chapel Hill, Aug. 2010
 - Adviser: Marc Pollefeys, co-advised by Jan-Michael Frahm
- M.S. Computer Science, The University of North Carolina at Chapel Hill, Aug. 2008
 - Adviser: Marc Pollefeys co-advised by Jan-Michael Frahm
- B.S. Computer Engineering, Clemson University, May 2004
 - *Magna Cum Laude*, General and Departmental Honors

Research Interests

- **Computer Vision and Robotics**
 - **Real-time structure from motion/ Simultaneous localization and mapping(SLAM)** (Estimation of robot position/orientation and 3D scene geometry from images or video.)
 - **Multiple camera systems** (Estimation of the pose of systems of many, rigidly-coupled cameras using constraints derived for the total system)
 - **Multiple sensor fusion** (Estimation of robot or camera pose and geometric scene structure using vision and other sensors such as GPS, gyros and accelerometers)

Professional Experience

University of North Carolina at Chapel Hill
Research Assistant to Marc Pollfeys and
Jan-Michael Frahm

Chapel Hill, NC
2005-Present

- **Real-Time Visual SLAM**
 - Developed a parallel, real-time visual simultaneous localization and mapping system for Honda's Asimo robot utilizing CPU multi-threading and GPU programs.
 - Implemented a sparse scene flow (an extension of KLT to 3D) module in CUDA that operates at 70 frames per second on 1024x768 stereo video as part of the system.
 - System is also being used on a DOD funded project to create 3D reconstructions of improvised explosive devices in real time as an aid to safe explosive ordinance disposal.

- **Multiple Camera System 3D Geometry**

- Published the first minimal solution method for six degree of freedom motion estimation from images taken by a rigidly coupled two camera system with no overlap in the cameras' fields of view.

- **Real-Time 3D Scene Reconstruction from Video**

- Part of the development team for a DARPA sponsored real-time system for processing video into textured 3D models of urban environments.
- Created a real-time vehicle pose estimation system fusing measurements from a GPS/inertial navigation system with optical flow data from multiple cameras on the vehicle (sponsors: DARPA, IARPA).
- Real-time 3D scene reconstruction system is currently in the early stages of commercialization.

Eidgenössische Technische Hochschule Zürich
Visiting Researcher and Lecturer

Zürich, Switzerland
Feb-June 2009

- Researched six degree of freedom relative motion estimation for camera systems with slightly overlapping fields of view.
- Lectured on computational photography (see teaching below).

Honda Research Institute, USA
Research Intern

Mountain View, CA
Sept-Oct 2008

- Developed calibration method for wide angle cameras mounted on the Asimo humanoid robot.
- Began development of a real-time, visual simultaneous localization and mapping (SLAM) system for Asimo.

Naval Surface Warfare Center
Systems Engineer

Dahlgren, VA
2004-2005

- Software engineer for Tomahawk Missile program using C++ and X windows.
- Aided in systems engineering for the next generation aircraft carrier.

Cryovac, Sealed Air Corporation
Computer Engineering Co-Op

Duncan, SC
2004-2005

- Developed a system to measure irregularly shaped products on a moving production line using a multi-camera system.

Clemson University
Research Assistant

Clemson, SC
2003-2004

- Studied effect of transmission power variation on throughput and latency in a time division multiple access ad-hoc wireless network with Dr. Harlan Russell as part of departmental honors requirement.

Schlumberger Electricity Inc. West Union, SC
(now Itron Inc.)
Computer Engineering Co-Op 2001-2003

- Worked on the development of a commercial/industrial electricity meter. Tested the metrology functions of the meter and developed new computer controlled testing equipment to facilitate meter validation in National Instruments LabView.

Honors and Awards

- Best Demonstration at IEEE Computer Vision and Pattern Recognition 2007 for "Real Time 3D Reconstruction of Urban Scenes from Video"
- Calhoun Honors College General and Departmental Honors, Clemson University, 2004
- Tau Beta Pi Engineering Honor Society, 2003
- Eta Kappa Nu Electrical and Computer Engineering Honor Society 2002

Technical

- **Languages:** C++, C, Java, Matlab, NI LabView
- **Parallel Programming:** CUDA, OpenMP, multi-threaded systems
- **Programming Environments:** Visual Studio
- **Operating Systems:** Windows, Unix, Linux

Teaching

"Computational Photography", Lecturer for laboratory session. ETH Zürich, Zürich Switzerland February-May 2009.

Publications

Brian Clipp, Christopher Zach, Jan-Michael Frahm and Marc Pollefeys, "*A New Minimal Solution to the Relative Pose of a Calibrated Stereo Camera with Small Field of View Overlap*", International Conference on Computer Vision 2009

Brian Clipp, Christopher Zach, Jongwoo Lim, Jan-Michael Frahm and Marc Pollefeys, "*Adaptive, Real-Time Visual Simultaneous Localization and Mapping*", IEEE Workshop on Applications of Computer Vision 2009

Changchang Wu, **Brian Clipp**, Xiaowei Li, Jan-Michael Frahm and Marc Pollefeys, "*3D Model Matching with Viewpoint Invariant Patches (VIPs)*", IEEE Conference on Computer Vision and Pattern Recognition, 2008 (podium presentation, acceptance rate 4%).

Brian Clipp, Jan-Michael Frahm, Marc Pollefeys, Jae-Hak Kim and Richard Hartley, "*Robust 6DOF Motion Estimation for Non-Overlapping Multi-Camera Systems*", IEEE Workshop on Applications of Computer Vision, 2008.

Brian Clipp, Rahul Raguram, Jan-Michael Frahm, Greg Welch, and Marc Pollefeys, "*A Mobile 3D City Reconstruction System*", IEEE VR Workshop on Cityscapes

Brian Clipp, Gregory Welch, Jan-Michael Frahm and Marc Pollefeys, "*Structure from Motion via A Two-Stage Pipeline of Extended Kalman Filters*", British Machine Vision Conference, September, 2007.

M. Pollefeys, D. Nister, J.-M. Frahm, A. Akbarzadeh, P. Mordohai, **B. Clipp**, C. Engels, D. Gallup, S.-J. Kim, P. Merrell, C. Salmi, S. Sinha, B. Talton, L. Wang, Q. Yang, H. Stewenius, R. Yang, G. Welch and H. Towles, "*Detailed Real-Time Urban 3D Reconstruction From Video*", International Journal of Computer Vision Special Issue on Modeling Large-Scale 3D Scenes, 2008

P. Mordohai, J.-M. Frahm, A. Akbarzadeh, **B. Clipp**, C. Engels, D. Gallup, P. Merrell, S. Slami, S. Sinha, B. Talton, L. Wnag, Q. Yang, H. Stewenius, H. Towles, G. Welch, R. Yang, M. Pollefeys and D. Nister, "*Real-Time Video-Baed Reconstruction of Urban Environments*", 3D Architecture, July, 2007.

A. Akbarzadeh, P. Mordohai, **B. Clipp**, C. Engels, D.Gallup, P. Merrell, M. Phelps, S. Sinha, B. Talton, L. Wang, Q. Yang, H. Stewenius, R. Yang, G. Welch, H. Towles, D. Nister, and M. Pollefeys, "*Toward Urban 3D Reconstruction from Video*", Invited Paper, 3DPVT 2006.

Presentations

- "Tracking for AR Tracking Researchers", Co-presented tutorial at the International Symposium on Mixed and Augmented Reality 2009.
- "Simultaneous Localization and Mapping," UNC Chapel Hill robotics class voted best student lecture, October 2006.
- "An Introduction to LIDAR Reconstruction of Urban Scenes, the Global Positioning System and Inertial Navigation," UNC Chapel Hill, September 2006.
- "An Introduction to Kalman Filtering and its Application to Computer Vision," UNC Chapel Hill, March 2006.

Associations

- Member IEEE Computer Society
- Member IEEE Robotics and Automation Society

Service

- Reviewer, Journal Image and Vision Computing 2009-Present
- Reviewer, IEEE Conference on Computer Vision and Pattern Recognition 2007-Present
- Reviewer, International Conference on Computer Vision 2007-Present
- Reviewer, International Conference on Pattern Recognition 2006
- President, Eta Kappa Nu Honor Society, Clemson University 2003-2004
- Treasurer, Eta Kappa Nu, Clemson University 2003-2004
- Treasurer, Tau Beta Pi, Clemson University 2003-2004

Security Clearance

- Previously held Department of Defense secret clearance. Clearance was granted in August 2004 while working at the Naval Surface Warfare Center, Dahlgren, VA.
- United States Citizen

References

- Available upon request