David Gallup 1

Ph.D. Candidate and Research Assistant
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Education

- *(Current)* Ph.D., Computer Science, University of North Carolina. May 2005-Present
  Advisors: Prof. Marc Pollefeys, Prof. Jan-Michael Frahm.
- M.S., Computer Science, University of North Carolina. May 2008
  Advisors: Prof. Marc Pollefeys, Prof. Jan-Michael Frahm.
- B.S. Honors, Computer Science, University of Utah. May 2005
  Honors Advisor: Prof. Peter Shirley.

Research Interests

My research interests are in Computer Vision, specifically:

- **Two-View and Multi-View Stereo:** Dense depth estimation from two or more images.
- **Urban 3D Reconstruction:** 3D modeling of entire cities from photographs and video.
- **3D from Internet Photo Collections:** Reconstructing 3D models of tourist sites from images downloaded from the web.
- **3D Face Tracking:** Tracking head pose and face expression from video and range data.
- **GPU Processing for Computer Vision:** Designing algorithms favorable to parallel processing using commodity graphics hardware.

Professional Experience

Research Assistant May 2005-Present
Computer Science Department, University of North Carolina Chapel Hill, NC, USA
Advisors: Prof. Marc Pollefeys, Prof. Jan-Michael Frahm

- **Depthmap Fusion for 3D Reconstruction**
  - Published a novel depthmap fusion method for 3D reconstruction of urban scenes.
  - Used method for 3D reconstruction from video and from internet photo collections.
- **Real-Time Stereo Using GPU and CUDA**
  - Collaborated with NVIDIA to develop the first CUDA stereo implementation.
  - Open Source code has thousands of downloads.
- **Real-Time 3D Reconstruction from Video**
  - Part of the development team for a DARPA sponsored system for 3D reconstruction of urban environments from street-level video.
  - Developed novel multi-view stereo methods that take advantage of urban scene structure and guarantee constant depth resolution and minimal computation.
  - The technology has been licensed to Lockheed Martin for commercialization.

Research Intern June-August 2009
Microsoft Research Redmond, WA, USA
Mentor: Cha Zhang

- Researched 3D head pose and face expression tracking using a depth camera.

Visiting Researcher and Lecturer September-December 2008
Eidgenössische Technische Hochschule (ETH) Zürich Zürich, Switzerland
Advisor: Prof. Marc Pollefeys

- Researched a piecewise-planar stereo method which also handles non-planar objects based on learned planar surface appearance.
- Co-taught course on Computer Vision.

Undergraduate Research Assistant May 2004-May 2005
Computer Science Department, University of Utah Salt Lake City, UT, USA
Advisor: Prof. Peter Shirley

- Explored terrain visualization using non-photorealistic rendering.

Undergraduate Research Assistant September 2004-March 2005
Computer Science Department, University of Utah Salt Lake City, UT, USA
Advisor: Prof. John Regehr

- Tested stack overflow detection software for embedded systems.

Software Engineer January 2002-September 2004
Information Access Technology Salt Lake City, UT, USA
Manager: Randy Cooper

- Developed telephony server technology and graphical user interfaces in C/C++ and Windows.

Honors and Awards

- Best Demo Award, "Real Time 3D Reconstruction of Urban Environments", CVPR 2007, (with collaborators)
- Graduation Honors, May 2005
- Honors at Entrance Scholarship, University of Utah, May 2002
- National Merit Semifinalist, 1998

Technical

- **Programming Languages:** C/C++, MATLAB, Java
- **GPU Programming:** CUDA, Cg, HLSL, OpenGL, DirectX
- **Environments:** Visual Studio, CMake, CVS, SVN
- **Operating Systems:** Windows, Linux

Teaching

"3D Computer Vision", Lecturer for laboratory session and guest lecturer for main session. ETH Zürich, Switzerland, September-December 2008.

Publications

2010

- **David Gallup**, Jan-Michael Frahm, Marc Pollefeys, *"Piecewise Planar and Non-Planar Stereo for Urban Scene Reconstruction",* Computer Vision and Pattern Recognition (CVPR) 2010. (Oral, acceptance rate 5%)
- **David Gallup**, Jan-Michael Frahm, Marc Pollefeys, *"A Heightmap Model for Efficient 3D Reconstruction from Street-Level Video",* International Symposium on 3D Data Processing, Visualization and Transmission (3DPVT) 2010.
- Seon Joo Kim, **David Gallup**, Jan-Michael Frahm, Marc Pollefeys, *"Joint Radiometric Calibration and Feature Tracking for an Adaptive Stereo System"*, Computer Vision and Image Understanding (CVIU) 2010.

2009

- **David Gallup**, Jan-Michael Frahm, Marc Pollefeys, *"Real-Time Depth Boundary Optimization for Local Area-Based Stereo",* 3D Stereo MEDIA 2009.
- Jan-Michael Frahm, Marc Pollefeys, Brian Clipp, **David Gallup**, Rahul Raguram, ChangChang Wu, and Christopher Zach, *"3D Reconstruction of Architectural Scenes from Uncalibrated Video Sequences"*, 3D-ARCH 2009.

2008

- **David Gallup**, Jan-Michael Frahm, Philippos Mordohai, Marc Pollefeys, *"Variable Baseline/Resolution Stereo"*, Computer Vision and Pattern Recognition (CVPR) 2008. (Oral, acceptance rate 4%)
- Christopher Zach, **David Gallup**, Jan-Michael Frahm and Marc Niethammer, *"Fast Global Labeling for Real-Time Stereo Using Multiple Plane Sweeps"*, Vision, Modeling, and Visualization (VMV) 2008.
- Christopher Zach, **David Gallup**, and Jan-Michael Frahm, *"Fast Gain-Adaptive KLT Tracking on the GPU"*, CVGPU '08 workshop in conjunction with CVPR 2008.
- M. Pollefeys, D. Nistér, 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. Stewénius, R. Yang, G. Welch, H. Towles, *"Detailed Real-Time Urban 3D Reconstruction From Video"*, International Journal of Computer Vision (IJCV) special issue on "Modeling Large-Scale 3D Scenes" (accepted in 2008).

2007

- **David Gallup**, Jan-Michael Frahm, Philippos Mordohai, Qingxiong Yang, Marc Pollefeys, *"Real-time Planesweeping Stereo with Multiple Sweeping Directions"*, Computer Vision and Pattern Recognition (CVPR) 2007.
- S.J. Kim, **D. Gallup**, J.M. Frahm, A. Akbarzadeh, Q. Yang, R. Yang, D. Nister, M. Pollefeys, *"Gain Adaptive Real-Time Stereo Streaming",* International Conference on Computer Vision Systems (ICVS) 2007.
- P. Mordohai, J.-M. Frahm, A. Akbarzadeh, B. Clipp, C. Engles, **D. Gallup**, P. Merrell, S. Salmi, S. Sinha, B. Talton, L. Wang, Q. Yang, H. Stewenius, H. Towles, G. Welch, R. Yang,M. Pollefeys and D. Nister, *"Real-Time Video-Based Reconstruction of Urban Environments"*, 3D Architecture (3D-ARCH) 2007.

2006

- A. Akbarzadeh, P. Mordohai, B. Clipp, C. Engles, **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, *"Towards Urban 3D Reconstruction from Video",* Invited Paper, International Symposium on 3D Data Processing, Visualization and Transmission (3DPVT) 2006.

2004

- Peter Shirley, William Thompson, Sean Curtis, and **David Gallup**. "*Stylized Browsing in Space and Time"*, VAST2004: The 5th International Symposium on Virtual Reality, Archaeology and Cultural Heritage, December 2004.

Service

Reviewer

- ISPRS Journal of Photogrammetry and Remote Sensing 2009-Present
- Image and Vision Computing Journal (IMAVIS) 2009-Present
- 3DTV Conference (3DTV-CON) 2009-Present
- Machine Vision and Applications (MVAP) 2009-Present
- (secondary) Computer Vision and Pattern Recognition (CVPR) 2007-Present
- (secondary) European Conference on Computer Vision (ECCV) 2007-Present

Organizer

- UNC Computer Science "Image Lunch" – weekly meeting for computer vision and medical image analysis researchers. Jan 2008-Oct 2009