

Jan-Michael Frahm
Research Assistant Professor
Computer Science Department
University of North Carolina at Chapel Hill
Campus Box 3175, Sitterson Hall
Chapel Hill, NC 27599-3175, USA
phone: (919) 962-1703
fax: (919) 962-1799
e-mail: jmf@cs.unc.edu
www: <http://www.cs.unc.edu/~jmf>

Research Interests

My Research interests are in the area of Computer Vision specifically in:

- **Structure from motion** (Estimation of the camera pose (external parameters) from images/video.)
- **Camera self-calibration** (Automatic estimation of the internal camera parameters from images/video of a general scene.)
- **Camera sensor systems** (Camera pose estimation by additionally employing external sensors like GPS, inertia sensors.)
- **Dynamic structure from motion** with pan-tilt zoom camera networks.
- **Multi-camera systems** (Camera pose estimation by employing the additional constraints of multiple rigidly coupled cameras.)
- **Multi-view stereo** (Dense depth estimation from multiple images/video.)
- **Robust estimation** (Estimation from corrupted data while simultaneously classifying the data into inlier and outlier.)
- **Fast tracking** of salient features in images and video.
- **Parallel computer vision** on commodity graphics hardware and multi-core architectures.
- **Active vision** for model improvement through view planning
- **Markerless augmented reality** (Marker free real-time camera pose estimation and scene content extraction like depth, lighting environment, ...).

Education

- July 2005: **Dr.-Ing. (doctor in engineering)** in Computer-Science, Christian-Albrechts-University of Kiel, Department Multi-Media Information Systems, Thesis: **Camera Self-Calibration with known Camera Orientation**, Advisor: Prof. Dr.-Ing. Reinhard Koch, grade: summa cum laude
- December 1999: **Diploma in Computer Science** (minor subject: medical imaging and medical information processing) at the University of Lübeck, Thesis: **“Filtering and analysis of fluoroscopic images”**, grade equivalent to summa cum laude

Awards

- ISPRS 2008 best poster award for “Image Localization in Satellite Imagery with Feature-based Indexing”
- Nvidia Professor fellowship on “Real-time Stereo for Vehicles on GPU”
- CVPR best demo award for “Real-time Urban Reconstruction”
- Best thesis of the academic year 2005/2006 of the College of Engineering of the Christian-Albrechts University Kiel

Positions

- **Research Assistant Professor at the University of North Carolina at Chapel Hill** co-heading the 3D Computer Vision group jointly with Prof. Marc Pollefeys (ETH Zurich, 25% UNC). The group consists of two postdoctoral researchers and eight Ph. D. students. (May 2007 - present)
- **Postdoctoral researcher at the University of North Carolina at Chapel Hill** in the UrbanScape project, in the Computer Vision group of Professor Marc Pollefeys. I locally managed the UrbanScape project for a team of two research staff members, four students and one additional postdoctoral researcher. (August 2005 - April 2007)
- **Research and teaching assistant** in the Department of Computer Science and Applied Mathematics of the Christian-Albrechts-University of Kiel, Multimedia Information Processing group of Professor Reinhard Koch. The main objectives of the research were structure from motion and camera self-calibration employing inertial sensors. (January 2000 - July 2005)
- **Intern at Microsoft Research Redmond** in the Interactive Visual Media Group on automatic detection and tracking of planes in image sequences for camera pose estimation (Mentor Dr. Rick Szeliski). (May 2004 - August 2004)

Professional Experience and Projects

- **Technical work package leader** for “Offline 3D-Scene Reconstruction” in EU-project MATRIS (Markerless real-time Tracking for Augmented Reality Image Synthesis www.ist-matris.org). (September 2004 - July 2005)
- **Development and design of 3D-reconstruction software** for uncalibrated structure from motion at the Christian-Albrechts-University of Kiel in the Multimedia Information Processing group. The software is now used as basic 3D-reconstruction module of the MARTIS and ARTESAS projects. (January 2003 - January 2004)
- **Project study for Daimler-Chrysler AG** about “*Monoscopic driver assistant systems*”. (January 2001 - March 2001)
- **Setup of Multimedia Laboratory** at the Christian-Albrechts-University of Kiel. The lab consists of a stereo back projection system driven by a PC-cluster based render platform. (February 2001 - January 2002)
- **Developer of the LGPL library BIAS** for image processing and multi-view geometry. (January 2002 - present)

Professional Activities

Editing/Chairing/Organizing

- Editor in Chief for Elsevier Journal of Image and Vision Computing (2010-present)
- Co-chair International Society for Photogrammetry and Remote Sensing (ISPRS) working group WG III/4 - Complex scene Analysis and 3D reconstruction
- Associate Editor of Elsevier Journal of Image and Vision Computing (2009-2010)
- Demo chair IEEE conference on Computer Vision and Pattern Recognition (CVPR) 2009
- Area chair for Asian Conference Computer Vision (ACCV) 2009
- Organizer IEEE Motion Workshop together with Pierre Georgel (UNC Chapel Hill, USA) and Nathan Jacob (University of Kentucky, USA)
- Organizer of workshop on “Computer vision on GPU’s” held in conjunction with ECCV 2010 together with Marc Pollefeys (ETH Zürich, Switzerland) and Horst Bischof (Technological University of Graz, Austria).
- Organizer of workshop on “Computer vision on GPU’s” held in conjunction with CVPR 2008 together with Marc Pollefeys (ETH Zürich, Switzerland) and Mubarak Shah (University of Central Florida, USA).
- Organizer of ICCV 2007 workshop about “Virtual Representations and Modeling of Large - scale environments (VRML)” together with Marc Pollefeys (ETH Zurich, University of North Carolina at Chapel Hill), Frank Dallaert (Georgia Tech, USA), and Jana Kosecka (George Mason University, USA).

Program Committees (selected):

- CVPR 2007-2010 (IEEE Conference on Computer Vision and Pattern Recognition)
- ICCV 2007/2009 (IEEE International Conference on Computer Vision)
- ECCV 2008/2010 (European Conference on Computer Vision)
- ACCV 2007-2010 (Asian Conference on Computer Vision)
- ACM Multimedia Technical Demos 2008
- ProCams Workshop 2007/2008
- Workshop on Dynamic Vision 2007/2008 Heidelberg, Germany
- International Symposium on 3D Data Processing, Visualization and Transmission 2006/2008/2010
- European Conference on Visual Media Production, (CVMP 2006-2008)

Journal Reviewer (selected):

- IEEE Transactions on Pattern Analysis and Machine Intelligence
- International Journal of Computer Vision
- Transactions on Image Processing

- IEEE Transactions on Visualization and Computer Graphics
- IEEE Transactions on Graphics
- IEEE Transactions on Robotics
- IEEE Transactions on Systems, Man and Cybernetics
- IEEE Transactions on Circuits and Systems for Video Technology
- Journal of the Optical Society of America
- Journal for “Photogrammetrie-Fernerkundung-Geoinformation-PFG”

Conference Reviewer (selected):

- ICPR (International Conference Pattern Recognition)
- PCV (Photogrammetric Computer Vision)
- Siggraph 2007-2008
- Eurographics 2007-2008
- Siggraph Asia 2008

Collaborators

- UNC Chapel Hill: Svetlana Lazebnik, Henry Fuchs, Greg Welch, Anselmo Lastra, Mary Whittton
- ETH Zurich: Marc Pollefeys, Friedrich Fraundorfer
- University of Bonn: Wolfgang Förstner, Falko Schindler
- UCF: Mubarak Shah
- TU Graz: Horst Bishop, Arnold Irschara
- Microsoft Research: Rick Szeliski
- Microsoft LiveLabs: David Nister
- University of Canberra, Australia: Richard Hartley
- Georgia Tech, Frank Dallaert
- George Mason University, Jana Kosecka
- Texas A&M: John Junkins, Manoranja Majji
- National Institute of Aerospace: James Hubbard, David Billingsley
- IIT, Hyderabad, India: P. J. Narayanan
- University of Kentucky: Ruigang Yang
- HITLabNZ: Raphael Grasset
- Christian-Albrechts University of Kiel: Reinhard Koch, Kevin Köser
- Nvidia: Joe Stam
- Honda Research labs: Yongwoo Lim

Teaching

Tutorials:

- **Computer Vision on GPU** at IEEE conference on Computer Vision and Pattern Recognition(CVPR 2009), June 2009, organized by myself and P. J. Narayanan, IIIT, Hyderabad, India and Joe Stam, NVidia Corp., USA
- **“Realtime Computer Vision for Augmented Reality”**, in conjunction with International Symposium Mixed and Augmented Realities, October 2006, St. Barbara, CA, USA, organized by myself and held together with Raphael Grasset from HITLabNZ
- **“Building Blocks for 3D Scene Reconstruction with Interactive Frame Rates”**, in conjunction with DAGM, September 2006, Berlin, Germany, organized by myself and held together with Reinhard Koch as well as Jan-Friso Evers-Senne from the Christian-Albrechts-University of Kiel.
- **“Visual-Geometric 3D-Scene Reconstruction from Uncalibrated Image Sequences”**, in conjunction with DAGM, September 2006, Munich, Germany, organized by Reinhard Koch and held together with me.

Courses:

- Random Thoughts, Freshman seminar (Spring 2011)
- Computer Vision, Guest lecture about tracking at ETH Zurich (2008)
- Introduction to Robotics, guest lecture for introduction into Computer Vision, University of North Carolina (2006/2008)
- 3D Urban Modeling, substitute instructor throughout the term, University of North Carolina (2006)
- 3D Scene Reconstruction from Video, substitute instructor throughout the term and instructor for exercises and assignments, Christian-Albrechts University Kiel, (2005)
- Multimedia Communications, substitute instructor throughout the term and instructor for exercises, practical exercises and assignments, Christian-Albrechts University Kiel (3 courses, 2002-2005)
- Multimedia Information Processing, substitute instructor throughout the term and instructor for exercises and assignments, Christian-Albrechts University Kiel (4 courses, 2000-2004)
- Computer Graphics, substitute instructor throughout the term and instructor for exercises and assignments, Christian-Albrechts University Kiel (3 courses, 2000-2002)
- Project course Virtual Reality, instructor, Christian-Albrechts University Kiel (2002)
- Network architectures for beginners, instructor, Christian-Albrechts University Kiel (2 courses, 2001-2002)
- Seminar Visual Modeling, instructor, Christian-Albrechts University Kiel (2002)
- Seminar Visual Reconstruction and Computer Graphics, instructor, Christian-Albrechts University Kiel (2001)

- Seminar Computer Vision and Computer Graphics, instructor, Christian-Albrechts University Kiel (2000)

Ph. D. Students (Co-)Advised

- David Gallup, *“Plane-sweeping Stereo with Multiple Directions”*
- Brian Clipp, *“Camera Pose Estimation using GPS and Inertia Sensors”*
- Changchang Wu, *Salient features for large scale recognition*
- Rahul Raguram, *“Robust estimation in computer vision”*
- Yilin Wang, *“Modeling of trees from video”*
- Jarred Heinly, *“Robust large scale registration”*
- Enliang Zheng, *“ Mobile image registration”*
- Alex Keng, *“Scalable Large-scale structure from motion”*
- Ram Krishan Kumar, *“Camera network calibration”*
- Megha Pandey, *“Dynamic scene reconstruction”*
- Timothy Johnson, *“Large scale scene reconstruction”*
- Dibyendusekhar Goswami *“Real-time image based rendering”*
- Yi-Hung Jen, *“Robot based automatic model acquisition”*
- Mingsong Dou, *“Dynamic 3D representations”*
- Ying Shi, *“Image based representations for tele-immersion”*

Collaborating

- Li Guan, *“ Dynamic structure from motion”*
- Sudipta Sinha, *“GPU based video feature tracking and matching”*
- Wilson Gavaio, *“Visual Reconstruction of Endoscopy Data for Diagnose Support”*
- Greg Coombe, *“Surface Light Fields of Real Objects Under Virtual Illumination”*
- Xiaowei Li, *“Robust Camera Pose Estimation”*
- Paul Merrel, *“Real-time 3D Scene Reconstruction”*
- Nirup-Kumar Pothireddy, *“Camera network calibration”*
- Hua Yang, *“Camera Tracking through Linearizing the Local Appearance Manifold”*
- HaohanLi, *“Modeling independently moving rigid objects”*

Postdocs

- Richard Steffen “*Motion estimation with implicit Kalman filters*” Jan. 2010 - Dec. 2010)
- Li Guan “*Dynamic Reconstruction*” (Sept. 2009 - present)
- Enrique Dunn, “*View planning for optimal scene reconstruction*” (Apr. 2008 - present)
- Seon Joo Kim, “*Gain Adaptive Real-Time Stereo Streaming*” (Sept. 2008 - Sept. 2009)
- Christopher Zach, “*Fast structure from motion*” (Jan. 2008 - Sept. 2009)

Visiting scholars

- Arnold Ischahara, “*Large-scale scene recognition from photo collections*”
- Falko Schindler, “*Precise surface representations*”
- Jae-Hak Kim, “*Scale Estimation for Multi-Camera systems*”
- Jan Bartelsen “*accurate scale invariant feature detection*”

Advised Diploma (Master) Theses:

- Christoph Schütte, “*Super-resolution for mosaics generated with a rotating camera*”
- Michael Sülzer, “*Pose estimation of a rotating camera*”
- Arne Koch, “*Registration and tracking from image region in panoramic images*”
- Volker Barthel, “*Motion based analysis of image sequences*”
- Jan-Friso Evers, “*Development of a hybrid camera orientation sensor*”
- Jan Woetzel, “*Projective 3D reconstruction from monocular cameras with adaptive correspondence search*”
- Jose Louis Gonzalez Vazquez, “*Visualization of spatiotemporal data with Java3D*”
- Artur Watkowski, “*Bundle adjustment for panoramic images*”
- Kai Petersen, “*3D-orientation estimation and self calibration of rotating cameras*”
- Oliver Kraus, “*Epipolar rectification for image pairs*”
- Christian Buck, “*Calibration of a hybrid camera orientation sensor*”
- Matthias Dunda, “*Criteria for automatic evaluation of a structure from motion system*”

Publications (refereed)

2010

- Jan-Michael Frahm, Pierre Georgel, David Gallup, Tim Johnson, Rahul Raguram, Changchang Wu, Yi-Hung Jen, Enrique Dunn, Brian Clipp, Svetlana Lazebnik, Marc Pollefeys, Building Rome on a Cloudless Day, European Conference Computer Vision (**ECCV**) 2010
- Jan-Michael Frahm, Marc Pollefeys, Svetlana Lazebnik, Christopher Zach, David Gallup, Brian Clipp, Rahul Raguram, Changchang Wu, Tim Johnson, “Fast Robust Large-scale Mapping from Video and Internet Photo Collections”, In special issue 100 years of ISPRS of the ISPRS Journal of Photogrammetry and Remote Sensing
- Jan-Michael Frahm, Marc Pollefeys, Svetlana Lazebnik, Brian Clipp, David Gallup, Rahul Raguram, Changchang Wu, “Fast Robust Reconstruction of Large Scale Environments”, CISS 2010
- Changchang Wu, Jan-Michael Frahm, Marc Pollefeys, Detecting Large Repetitive Structures with Salient Boundaries, European Conference Computer Vision (**ECCV**) 2010
- David Gallup, Jan-Michael Frahm, Marc Pollefeys, “Piecewise Planar and Non-Planar Stereo for Urban Scene Reconstruction”, IEEE Conference Computer Vision and Pattern Recognition (**CVPR**) 2010 (oral acceptance rate 4%)
- Brian Clipp, Jongwoo Lim, Jan-Michael Frahm, Marc Pollefeys, “Parallel, Real-Time Visual SLAM”, In Proceedings of International Conference on Intelligent Robots and Systems, 2010
- Marc Pollefeys, Jan-Michael Frahm, Friedrich Fraundorfer, Christopher Zach, Changchang Wu, Brian Clipp, David Gallup, “Challenges in wide-area structure-from-motion”, to appear MIRU 2010 special issues of IPSJ Transactions on Computer Vision and Applications
- David Gallup, Marc Pollefeys, Jan-Michael Frahm, “3D Reconstruction using an n-Layer Heightmap”, DAGM 2010
- David Gallup, Jan-Michael Frahm, Marc Pollefeys, “A Heightmap Model for Efficient 3D Reconstruction from Street-Level Video”, International Symposium for 3D Data Processing, Visualization and Transmission (3DPVT) 2010
- Seon Joo Kim, David Gallup, Jan-Michael Frahm, Marc Pollefeys, “Joint Radiometric Calibration and Feature Tracking System with an Application to Stereo”, Journal Computer Vision and Image Understanding, 2010
- Jan-Michael Frahm, Pierre Georgel, David Gallup, Tim Johnson, Rahul Raguram, Changchang Wu, Yi-Hung Jen, Enrique Dunn, Brian Clipp, Svetlana Lazebnik, Marc Pollefeys, “Dense Reconstructions from Millions of Images on a Single PC”, Demo at IEEE Conference Computer Vision and Pattern Recognition (**CVPR**) 2010
- Timothy Johnson, Rahul Raguram, Pierre Georgel, Jan-Michael Frahm, “Fast Organization of Large Photo Collections using CUDA”, ECCV workshop for Computer Vision on GPUs
- Richard Steffen, Jan-Michael Frahm, Wolfgang Forstner, “Trifocal Constraint based Relative Bundle Adjustment”, ECCV workshop on Reconstruction and Modeling of Large-Scale 3D Virtual Environments
- Pierre Fite-Georgel, Timothy Johnson, Jan-Michael Frahm, “City-Scale Reality Modeling from Community Photo Collection”, ISMAR 2010 workshop on Augmented Reality Super Models

2009

- Rahul Raguram, Jan-Michael Frahm, Marc Pollefeys, “Exploiting Uncertainty in Random Sample Consensus”, In Proceedings of the IEEE International Conference Computer Vision (**ICCV**) 2009
- Brian Clipp, Christopher Zach, Jan-Michael Frahm, Marc Pollefeys, “A New Minimal Solution to the Relative Pose of a Calibrated Stereo Camera with Small Field of View Overlap”, In Proceedings of the IEEE International Conference Computer Vision (**ICCV**) 2009
- Arnold Irschara, Christopher Zach, Jan-Michael Frahm, Horst Bischof, “3D Scene Summarization for Efficient View Registration”, In Proceedings of the IEEE conference Computer Vision and Pattern Recognition (**CVPR**) 2009
- S. Sinha, J.-M. Frahm, M. Pollefeys, Y. Genc, “Feature Tracking and Matching in Video Using Programmable Graphics Hardware”, Journal of Machine Vision and Application.
- Christopher Zach, Marc Niethammer, and Jan-Michael Frahm, “Continuous Maximal Flows and Wulff Shapes: Application to MRFs”, In Proceedings of the IEEE conference Computer Vision and Pattern Recognition (**CVPR**) 2009
- Enrique Dunn, Jan-Michael Frahm, “Next best view planning for active model improvement”, In Proceedings of British Machine Vision Conference, 2009
- Enrique Dunn, Jur van Berg, Jan-Michael Frahm, “Developing Visual Sensing Strategies through Next Best View Planning”, In Proceedings of International Conference on Intelligent Robots and Systems, 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”, In Proceedings of ISPRS workshop 3DARCH’09
- Hua Yang, Greg Welch, Jan-Michael Frahm, Marc Pollefeys, “3D motion segmentation using intensity trajectory”, In Proceedings of Asian Conference Computer Vision, 2009
- Brian Clipp, Christopher Zach, Jongwoo Lim, Jan-Michael Frahm and Marc Pollefeys, “Adaptive, Real-Time Visual Simultaneous Localization and Mapping”, In Proceedings of IEEE Workshop on Applications of Computer Vision (WACV), 2009
- David Gallup, Jan-Michael Frahm, Marc Pollefeys, “Real-time Depth Boundary Optimization for Local Area-based Stereo”, In Proceedings of 3D Media 2009

2008

- Rahul Raguram, Jan-Michael Frahm, Marc Pollefeys, “A Comparative Analysis of RANSAC Techniques Leading to Adaptive Real-Time Random Sample Consensus”, European Conference Computer Vision (**ECCV**) 2008
- Xiaowei Li, Changchang Wu, Christopher Zach, Svetlana Lazebnik, Jan-Michael Frahm, “Modeling and Recognition of Landmark Image Collections Using Iconic Scene Graphs”, European Conference Computer Vision (**ECCV**) 2008
- Changchang Wu, Brian Clipp, Xiaowei Li, Jan-Michael Frahm, Marc Pollefeys, “3D Model Matching with Viewpoint Invariant Patches (VIPs)”, IEEE conference Computer Vision and Pattern Recognition (**CVPR**) 2008 (oral acceptance rate 4%).

- Ram Krishan Kumar, Adrian Ilie, Jan-Michael Frahm, Marc Pollefeys, “Simple calibration of non-overlapping cameras with a mirror”, IEEE conference Computer Vision and Pattern Recognition (**CVPR**) 2008 (oral acceptance rate 4%).
- David Gallup, Jan-Michael Frahm, Philippos Mordohai, Marc Pollefeys, “Variable Baseline/Resolution Stereo”, IEEE conference Computer Vision and Pattern Recognition (**CVPR**) 2008 (oral acceptance rate 4%).
- Seon Joo Kim, Jan-Michael Frahm, Marc Pollefeys, “Radiometric Calibration with Illumination Change for Outdoor Scene Analysis”, IEEE conference Computer Vision and Pattern Recognition (**CVPR**) 2008.
- 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, H. Towles, “Detailed Real-Time Urban 3D Reconstruction From Video, International Journal of Computer Vision (**IJCV**) special issue on Modeling Large-Scale 3D Scenes”.
- Brian Clipp, Jan-Michael Frahm, Marc Pollefeys, Jae-Hak Kim, Richard Hartley, “Robust 6DOF Motion Estimation for Non-Overlapping Multi-Camera Systems”, IEEE 2008 Workshop on Application of Computer Vision.
- Changchang Wu, Jan-Michael Frahm, Friedrich Fraundorfer, and Marc Pollefeys, “Image Localization in Satellite Imagery with Feature-based Indexing”, Conference of the International Society for Photogrammetry and Remote Sensing 2008, (winner of the best poster award).
- Friedrich Fraundorfer, Changchang Wu, Jan-Michael Frahm and Marc Pollefeys, “Visual Word based Location Recognition in 3D models using Distance Augmented Weighting”, International Symposium on 3D Data Processing, Visualization and Transmission 2008.
- Greg Coombe, Jan-Michael Frahm and Anselmo Lastra, “Capturing a Surface Light Field Under Virtual Illumination”, International Symposium on 3D Data Processing, Visualization and Transmission 2008.
- Christopher Zach, David Gallup and Jan-Michael Frahm, “Fast Gain-Adaptive KLT Tracking on the GPU”, CV GPU’ 08 workshop in conjunction with IEEE conference Computer Vision and Pattern Recognition 2008.
- Changchang Wu, Friedrich Fraundorfer, Jan-Michael Frahm and Marc Pollefeys, “3D Model Search and Pose Estimation from Single Images using VIP Features”, S3D workshop in conjunction with IEEE conference Computer Vision and Pattern Recognition 2008.
- Christopher Zach, David Gallup, Jan-Michael Frahm, Marc Niethammer, “Fast Global Labeling for Real-Time Stereo Using Multiple Plane Sweeps”, Vision Modeling and Visualization, 2008, Konstanz, Germany

2007

- Paul Merrell, Amir Akbarzadeh, Liang Wang, Philippos Mordohai, Jan-Michael Frahm, Ruigang Yang, David Nister, and Marc Pollefeys, “Real-Time Visibility-Based Fusion of Depth Maps”, IEEE International Conference on Computer Vision (**ICCV**) 2007.
- Seon Joo Kim, Jan-Michael Frahm, and Marc Pollefeys, “Joint Feature Tracking and Radiometric Calibration from Auto-Exposure Video”, IEEE International Conference on Computer Vision (**ICCV**) 2007.

- D. Gallup, J.-M. Frahm, P. Mordohai, Q. Yang, M. Pollefeys, “Real-Time Plane-sweeping Stereo with Multiple Sweeping Directions”, IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**) 2007.
- Hua Yang, Marc Pollefeys, Greg Welch, Jan-Michael Frahm, and Adrian Ilie, “Differential camera tracking through linearizing the local appearance manifold”, IEEE conference Computer Vision and Pattern Recognition (**CVPR**) 2007.
- Brian Clipp, Greg Welch, Jan-Michael Frahm, and Marc Pollefeys, “Structure From Motion via a Two-Stage Pipeline of Extended Kalman Filters”, British Machine Vision Conference 2007.
- Jae-Hak Kim, Richard Hartley, Jan-Michael Frahm, and Marc Pollefeys, “Visual Odometry for Non-Overlapping Views Using Second-Order Cone Programming”, Asian Conference Computer Vision 2007.
- Paul Merrell, Philippos Mordohai, Jan-Michael Frahm and Marc Pollefeys, “Evaluation of Large Scale Scene Reconstruction”, VRML in conjunction with IEEE International Conference on Computer Vision 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, 2007
- Philippos Mordohai, Jan-Michael Frahm, Amir Akbarzadeh, Brian Clipp, Chris Engels, David Gallup, Paul Merrell, Christina Salmi, Sudipta Sinha, Brad Talton, Liang Wang, Qing-Xiong Yang Yang, Henrik Stewenius, Herman Towles, Greg Welch, Ruigang Yang, Marc Pollefeys, and David Nister, “Real-time video-based reconstruction of urban environments”, ISPRS Working Group V/4 Workshop 3D Virtual Reconstruction and Visualization of Complex Architectures, (ETH Zurich, Switzerland), July 2007.

2006

- Jan-Michael Frahm and Marc Pollefeys “RANSAC for (Quasi-)Degenerate data (QDEGSAC)”, IEEE conference Computer Vision and Pattern Recognition (**CVPR**) 2006, (oral acceptance rate 4%)
- Sudipta Sinha, Jan-Michael Frahm, Marc Pollefeys and Yakup Genc, “GPU based video feature tracking and matching”, EDGE 2006
- Jan-Michael Frahm, Greg Coombe and Anselmo Lastra, “Captureing Surface Light Fields of Real Objects with a Projector Camera System”, ProCams 2006

2005

- Jan-Michael Frahm, Kevin Köser, Daniel Grest and Reinhard Koch, “Markerless Augmented Reality with Light Source Estimation for Direct Illumination”, Conference on Visual Media Production 2005, Dec., London, UK
- Reinhard Koch, Jan-Friso Evers-Senne, Jan-Michael Frahm, Kevin Köser, “3D Reconstruction and Rendering from Image Sequences”, *WIAMIS 2005*, Switzerland, April 2005
- Jan-Michael Frahm, “Camera Self-Calibration with known Camera Orientation”, Ph.D. Thesis, Shaker Verlag, ISBN 3-8322-4153-1

2004

- Jan-Michael Frahm and Reinhard Koch, “Pose estimation for a Multi-Camera System”, DAGM (German Pattern Recognition Conference) 2004

2003

- Jan-Michael Frahm and Reinhard Koch, “Camera Calibration and 3D Scene Reconstruction from image sequence and rotation sensor data”, 8th International Workshop on Vision, Modeling, and Visualization 2003
- Daniel Grest, Jan-Michael Frahm, and Reinhard Koch, “A Color Similarity Measure for Robust Shadow Removal in Real Time”, 8th International Workshop on Vision, Modeling, and Visualization 2003
- Jan-Michael Frahm and Reinhard Koch, “Camera Calibration with known Rotation”, International Conference Computer Vision (ICCV) 2003
- Jan-Michael Frahm and Reinhard Koch, “Robust Camera Calibration from Images and Rotation Data”, DAGM (German Pattern Recognition Conference)

2002

- Jan-Friso Evers Senne, Jan-Michael Frahm, Felix Woelk, Jan Woetzel, Reinhard Koch, “Distributed Realtime Interaction and Visualization System”, 7th International Workshop on Vision, Modeling and Visualization 2002
- Reinhard Koch, Jan-Michael Frahm, Jan-Friso Evers Senne, Jan Woetzel, “Plenoptic Modeling of 3D scenes with a Sensor-augmented Multi-Camera Rig”, Tyrrhenian International Workshop on Digital Communication (IWDC 2002)
- Jan-Michael Frahm, Jan-Friso Evers-Senne, and Reinhard Koch, “Network Protocol for Interaction and Scalable Distributed Visualization”, 1st International Symposium on 3D Data Processing Visualization Transmission 2002

2001

- Reinhard Koch and Jan-Michael Frahm “Visual-Geometric Scene Reconstruction from Image Streams”, 6th International Workshop on Vision, Modeling and Visualization 2001

2000

- Claudia Mayntz, Til Aach, Dietmar Kunz and Jan-Michael Frahm “Motion blur in fluoroscopy: effects, identification, and restoration”, SPIE’s Medical Imaging 2000
- Claudia Mayntz, Jan-Michael Frahm, Til Aach, and Dietmar Kunz “Beschleunigung und Bewertung blockbasierter Bewegungsschätzmethoden für die Röntgen- fluoroskopie” DAGM (German Pattern Recognition Conference) 2000

Book Chapter

- Chapter on “Urban 3D Reconstruction” in “Intelligent Video Surveillance: Systems and Technologies”, Editors Qian and Ma, CRC Press

Invited Papers

- Brian Clipp, Rahul Raguram, Jan-Michael Frahm, Greg Welch, and Marc Pollefeys, “A Mobile 3D City Reconstruction System”, IEEE conference on Virtual Reality workshop on Cityscapes.
- A. Akbarzadeh, J.-M. Frahm, et al., P. Mordohai, C. Engels, B. Clipp, Q. Yang, S. Sinha, L. Wang, D. Gallup, R. Yang, P. Merrell, B. Talton, M. Phelps, H. Stewenius, G. Welch and H. Towles, D. Nistér, M. Pollefeys, “Towards Urban 3D Reconstruction From Video”, International Symposium on 3D Data Processing Visualization Transmission 2006
- Jan-Michael Frahm, J.-F. Evers-Senne, and R. Koch, “Distributed Interaction Processing and Visualization of 3D Scenes in Real-time”, 3rd, International Symposium on Image and Signal Processing and Analysis, 2003

Invited Talks (selected)

- “Fast Organization and Dense Reconstruction of the World from Photo Collections (Building Rome on a Cloudless Day)”, Microsoft Research, USA, 2010
- “State of the art in Computer Vision based map building”, keynote Dagstuhl seminar on *dynamic maps*, Germany 2010
- “Reconstructing the World from Photos (Building Rome on a Cloudless Day)”, Google, USA, 2010
- “Dense Models of the World from Photos”, RWTH Aachen, Germany, 2010
- “Building Rome on a Cloudless Day”, Shenzhen Institutes of Advanced Technologies, China, 2010
- “Robust Scalable Reconstruction from Video and Photos”, University of Bonn, Germany, 2010
- “Fast Reconstruction of the World from Photos and Videos”, TU Munich, Germany, 2009
- “Scalable, Robust, Real-time 3D Reconstruction”, University of Bonn, Germany, 2009
- “Image based 3D Real-time Reconstruction”, Sarnoff Corporation, NJ, USA, 2009
- “The status and future of (semi-)automatic image based reconstruction”, keynote at ISPRS Working Group V/4 Workshop 3D Virtual Reconstruction and Visualization of Complex Architectures 2009, Italy
- “Fast 3D reconstruction from video”, Lockheed Martin, VA, 2009
- “Real-Time Scene Urban Scene Reconstruction with a Single Camera”, seminar at the National Institute of Aerospace, Hampton, 2008
- “Large Scale Scene Reconstruction for videos and photo collections”, ETH Zurich, Switzerland, 2008
- Invited lecture at ETH Zurich on “Tracking and matching for Computer Vision”, ETH Zurich, Switzerland, 2008
- “Real-Time Large Scale Scene Reconstruction”, Christian-Albrechts University of Kiel, 2008
- “3D Reconstruction for Mobile Applications”, Nokia Research, Palo Alto, 2008

- “An Introduction to CUDA for Automotive Applications”, NVISION’08, San Jose, USA, 2008
- “3D Vision for Driver Assistance”, Daimler Chrysler, Esslingen, Germany, 2008
- “Fast 3D Modeling and Applications”, Max-Plank Institute, Saarbrücken, Germany, 2006
- “Fast 3D Urban Reconstruction and Applications”, Microsoft Research, Redmond, USA, 2006

Patents & Open source

- Stereo estimation on GPU in CUDA as part of NVidia’s SDK at openvidia.sourceforge.net
- GPU-KLT tracking software
- BIAS software package for computer vision
- Patent No: DE 103 400 23.0 “Verfahren zur Kamerakalibrierung mittels Rotationssensor” (camera calibration with known rotation) 2004 Germany
- Patent “Framework for Augmented Reality Applications”, Germany, US-patent in processing