

## Kostas Daniilidis

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## Education

- 1992 PhD in Computer Science, University of Karlsruhe  
Advisor: Hans-Hellmut Nagel
- 1989 MSE in Computer Science, University of Karlsruhe.
- 1986 Diploma in Electrical Engineering, National Technical University of Athens.

## Positions held

- 2009 - **Professor**
- 2008 - **Director** of the GRASP Laboratory
- 2003 - 2009 **Associate Professor**
- 1998 - 2003 **Assistant Professor**  
Department of Computer and Information Science, University of Pennsylvania.
- 1997 Service at the Greek Army (Mechanized Infantry)
- 1993 - 1997 **Assistant Professor** (non-tenure-track),  
Computer Science Institute, Kiel University.
- 1992 - 1993 **Research Associate** ,  
Fraunhofer-Institute (IITB), Karlsruhe.
- 1989 - 1992 **Graduate Research/Teaching Assistant**,  
Department of Computer Science, University of Karlsruhe.

## Research interests

My research field is computer vision and robotics. Since 1990, I have been studying multiple view geometry, image matching, stereo vision, recognition, and camera design. applications.

- Shape-based recognition: Recognizing and segmenting objects in clutter based on their boundary shape is necessary for robotic manipulation but also challenging when objects in clutter. We introduced a powerful shape descriptor, the chordigram, and formulated the problem as a binary quadratic optimization where the unknowns are the selected object segments in an oversegmented image (CVPR 2009, 2010).
- Image matching: Using harmonic analysis on groups we have been able to convert a voting scheme for matching without any feature correspondence into a filtering problem, assuming only a consistent scene geometry (PAMI 2003, IJCV 2007, CVPR 2003, 2005, ICCV 2007). We extended our results to range imaging, by finding a procedure for aligning point clouds based on the similarity of their orientation histograms (CVPR 2006). We introduced a new matching score that rewards a simultaneous intra-image segmentation and inter-image correspondence between co-salient regions, and optimized it spectrally in a joint graph (CVPR 2007).
- Visual odometry and topological maps: Using only omnidirectional cameras and exploiting proximal as well as distal landmarks we have been able to reconstruct one of the longest

outdoor maps, a result that attracted immediate attention regarding application in GPS-denied environments (IROS 2008). We invented a new similarity score for location images that allows us to efficiently solve the loop closing problem (NIPS 2009).

- Vision based formation control: We established the first framework for consensus of a formation of robots using only the lines of sight to neighbors. We proved that this is feasible using only bearing and the time to collision, giving thus a justification to biological evidence that many species flock without having any range sensors (RSS 2005, 2008, Transactions on Robotics). When an agent can play the role of leader, we proved that the formation can act as a collective observer (ICRA 2007)
- Fundamentals of panoramic vision: We established the first theory that unifies all catadioptric unique viewpoint systems and provides the differential geometric foundations for their multiple view geometry (IJCV 2001, PAMI 2002, CVPR 2001, 2003).
- Tele-immersion and real-time stereo: In collaboration with UNC, Chapel Hill, we demonstrated the first real-time tele-immersion system, featuring real-time multi-view stereo, 3D transmission, and free-viewpoint 3D display (ECCV 2000, ICPR 2000, IJCV 2002).

## Research Grants

| Period      | Agency | Title  | Penn's budget | Total amount   |
|-------------|--------|--|---------------|----------------|
| 2010 - 2012 | ARO    | R-MASTIF (Robotic Mobile Autonomous System for Threat Interrogation and Object Fetch)  | \$ 380,000.00 | unknown        |
| 2010 - 2015 | NSF    | IGERT: Complex Scene Perception; PI  | \$2.4M/5yrs   | same           |
| 2010 - 2014 | NSF    | CDI-Type II: Collaborative Research: Perception of Scene Layout by Machines and Visually Impaired Users; single PI from Penn                   | \$325K/4yrs   | same           |
| 2010 - 2015 | ARL    | Robotics Collaborative Technology Alliance; PI leading a team of 12 Penn coPIs   | \$9.8M/5yrs   | \$63M/5yrs     |
| 2009 - 2013 | NSF    | CDI-Type II: Cyber enhancement of spatial cognition for the visually impaired; single PI from Penn (lead);                                     | \$112,500/yr  | \$1,450,000/yr |
| 2009 - 2010 | DARPA  | STTR: Labeling buildings by video activities; single PI, sub to A. Hoogs (Kitware)   | \$40,000/yr   | \$100,000/yr   |
| 2007 - 2009 | ARL    | Navigation based on a snapshot graph; single PI  | \$150,000/yr  | same           |
| 2007 - 2010 | NSF    | Bio-inspired visual navigation; single PI  | \$75,000/yr   | same           |
| 2004 - 2007 | NSF    | SEIII: Computing and Retrieving 3D-Archaeological Structures from Sub-surface Surveying, PI with J. Shi and G. Biros; F. Limp (U. of Arkansas) | \$350,000/yr  | same           |

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|-----------|----------|---|---------------|--------------|
| 2003-2008 | NSF      | ITR: Multirobot Emergency Response; Penn PI with G. Pappas; N. Papanikolopoulos (U. Minnesota, lead), J. Burdick (Caltech)                  | \$110,000/yr  | \$560,000/yr |
| 2001-2004 | NSF      | ITR:Real-time long distance terascale computation for full bandwidth tele-immersion, single Penn PI with H. Fuchs and G. Waelch (lead, UNC) | \$310,000/yr  | \$950,000/yr |
| 2001-2002 | DARPA    | 3D-Tele-immersion for the Next Generation Internet, single Penn PI with H. Fuchs (lead, UNC).   | \$146,000/yr  | unknown      |
| 2001-2002 | NSF      | Advanced Surgical Training with High-Fidelity Tele-immersion, single Penn PI with H. Fuchs (lead, UNC)                                      | \$430,988/yr  | unknown      |
| 2000-2003 | NSF      | Omnidirectional Vision, single PI   | \$90,000 /yr  | same         |
| 2000-2001 | Penn RF  | Adding the Sense of Touch to Telepresence, PI   | \$15,000 /yr  | same         |
| 1999-2000 | ANS Inc. | Scene acquisition for teleimmersion, PI   | \$200,000 /yr | same         |
| 1999-2000 | Penn RF  | Augmented Reality Goes Outdoors, PI   | \$15,000 /yr  | same         |

**As Co-principal investigator:**

| Period      | Agency | Title  | Penn's budget  |         |
|-------------|--------|--|----------------|---------|
| 2010 - 2011 | DARPA  | Autonomous Robotic Manipulation ; co-PI with Vijay Kumar   |                |         |
| 2008 - 2013 | ARL    | MAST CTA Autonomous multifunctional mobile microsystems; co-PI with Vijay Kumar (PI) among 17 coPIs from six institutions                            | \$2,200,000/yr | unknown |
| 2007 - 2008 | NSF    | I/UCRC Safety, Security and Rescue research Center; coPI with Vijay Kumar (PI) and U. of Minnesota coPIs   | \$70,000/yr    | same    |
| 2007-2008   | DARPA  | Object Recognition via Brain-Inspired Technology ; coPI with Taskar as PI and Shi as coPI, sub to Lockheed Martin ATL                                | \$520,000/yr   | unknown |
| 2004 - 2005 | NSF    | RR:MACNet: Mobile Ad-hoc Camera Networks; co-PI with J. Shi (PI) and V. Kumar coPI   | \$ 200,000/yr  | same    |
| 2002-2005   | ARO    | ACCLIMATE: Adaptive Coordinated Control of Intelligent Multi-Agent Teams, co-PI with V. Kumar (site PI) and S. Sastry (UC Berkeley, lead PI), et al. | \$275,000/yr   | unknown |

|           |       |   |               |         |
|-----------|-------|---|---------------|---------|
| 1998-2000 | ARO   | Algorithmics of motion, co-PI with V. Kumar (PI) and five more from Penn; Latombe from Stanford     | \$500,000 /yr | unknown |
| 1998-1999 | DARPA | Omnidirectional Vision for Surveillance, Tracking, and Navigation, co-PI with V. Kumar (PI), et al. | \$450,000 /yr | same    |

## Publications

### Refereed Journal Articles

- [1] A. Makadia and K. Daniilidis. Spherical correlation of visual representations for 3d model retrieval. *International Journal of Computer Vision*, 2010
- [2] G.L. Mariottini, F. Morbidi, D. Prattichizzo, N. Vander Val, N. Michael, G.J. Pappas, and K. Daniilidis. Vision-based localization of leader-follower formations. *IEEE Trans. Robotics and Automation*, 2009
- [3] N. Moshtagh, N. Michael, A. Jadbabaie, and K. Daniilidis. Vision-based, distributed control laws for motion coordination of nonholonomic robots. *IEEE Transactions on Robotics*, 2009
- [4] A. Makadia, C. Geyer, and K. Daniilidis. Correspondenceless structure from motion. *International Journal of Computer Vision*, 75:311–327, 2007.
- [5] R.A. Hicks, M. Millstone, and K. Daniilidis. Realizing any central projection with a folded catadioptric sensor. *Applied Optics*, 45:7205–7210, 2006.
- [6] A. Makadia and K. Daniilidis. Rotation estimation from spherical images. *IEEE Trans. Pattern Analysis and Machine Intelligence*, 28:1170–1175, 2006.
- [7] W. Yu, G. Sommer, K. Daniilidis, and J. S. Duncan. Using skew gabor filter in source signal separation and local spectral orientation analysis. *Image and Vision Computing*, 23:377–392, 2005.
- [8] I.V. Isler, S. Kannan, K. Daniilidis, and P. Valtr. VC-dimension of exterior visibility. *IEEE Trans. Pattern Analysis and Machine Intelligence*, 26:667–671, 2004.
- [9] A. Ansar and K. Daniilidis. Linear pose estimation from points and lines. *IEEE Trans. Pattern Analysis and Machine Intelligence*, 25:578–589, 2003.
- [10] J. Mulligan, N. Kelshikar, X. Zabulis, and K. Daniilidis. Stereo-based environment scanning for immersive telepresence. *IEEE Trans. Circuits and Systems for Video Technology*, 14:304–320, 2004.
- [11] W. Yu, G. Sommer, and K. Daniilidis. 3d-orientation signatures with conic kernel filtering for multiple motion analysis. *Image and Vision Computing*, 21:447–458, 2003.
- [12] C. Geyer and K. Daniilidis. Omnidirectional video. *Visual Computer*, 19:405–416, 2003.
- [13] W. Yu, G. Sommer, and K. Daniilidis. Multiple motion analysis: in spatial domain or in spectral domain? *Computer Vision and Image Understanding*, 90:129–152, 2003.
- [14] C. Geyer and K. Daniilidis. Para-cata-dioptric calibration. *IEEE Trans. Pattern Analysis and Machine Intelligence*, 24:687–695, 2002.

- [15] J. Mulligan, V. Isler, and K. Daniilidis. Trinocular stereo: A new algorithm and its evaluation. *International Journal of Computer Vision*, 47:51–61, 2002.
- [16] W. Yu, G. Sommer, S. Beauchemin, and K. Daniilidis. Oriented structure of the occlusion distortion: Is it reliable? *IEEE Trans. Pattern Analysis and Machine Intelligence*, 24:1286–1290, 2002.
- [17] C. Geyer and K. Daniilidis. Catadioptric projective geometry. *International Journal of Computer Vision*, 43:223–243, 2001.
- [18] A. Ansar, D. Rodrigues, J.P. Desai, K. Daniilidis, V. Kumar, and M.F.M. Campos. Visual and haptic collaborative tele-presence. *Computers and Graphics*, 25:789–798, 2001.
- [19] W. Yu, K. Daniilidis, G. Sommer. Approximate orientation steerability based on angular gaussians. *IEEE Trans. Image Processing*, 10:193–205, 2001
- [20] R.A. Hicks, D. Pettey, K. Daniilidis, and R. Bajcsy. Complex analysis for reconstruction of controlled motion. *Journal of Mathematical Imaging and Vision*, 13:57–70, 2000.
- [21] E. Bayro-Corrochano, K. Daniilidis, and G. Sommer. Motor-algebra for 3d kinematics. *Journal of Mathematical Imaging and Vision*, pages 79–100, 2000
- [22] K. Daniilidis. Hand-eye calibration using dual quaternions. *International Journal of Robotics Research*, 18:286–298, 1999.
- [23] K. Daniilidis, Ch. Krauss, M. Hansen, and G. Sommer. Real-time tracking of moving objects with an active camera. *Journal of Real Time Imaging*, 4:3–20, 1998.
- [24] K. Daniilidis. Fixation simplifies 3d motion estimation. *Computer Vision and Image Understanding*, 68:158–169, 1997.
- [25] K. Daniilidis and J. Ernst. Active intrinsic calibration using vanishing points. *Pattern Recognition Letters*, 17:1179–1189, 1996.
- [26] K. Daniilidis. Attentive visual motion processing: computations in the log-polar plane. *Computing*, 11:1–20, 1996. Special Issue on Theoretical Foundations of Computer Vision.
- [27] D. Koller, K. Daniilidis, and H.-H. Nagel. Model-based object tracking in monocular image sequences of road-traffic scenes. *International Journal of Computer Vision*, 10:257–281, 1993.
- [28] K. Daniilidis and H.-H. Nagel. Analytical results on error sensitivity of motion estimation from two views. *Image and Vision Computing*, 8:297–303, 1990.

**Articles in ICCV, CVPR, ECCV, RSS (Refereed Conferences with less than 33% Acceptance Rate)**

- [1] A. Toshev, B. Taskar, and K. Daniilidis. Object detection via boundary structure segmentation. In *IEEE Comp. Vision Pattern Recognition*, 2010
- [2] R. Anati and K. Daniilidis. Constructing topological maps using markov random fields and loop-closure detection. In *Neural Information Processing Systems (NIPS) Conference*, 2009

- [3] A. Toshev, A. Makadia, and K. Daniilidis. Shape-based detection of moving objects in videos. In *IEEE Comp. Vision Pattern Recognition*, 2009
- [4] A. Patterson, P. Mordohai, and K. Daniilidis. Object detection from large-scale 3d datasets using bottom-up and top-down descriptors. In *The 10th European Conference on Computer Vision*, 2008
- [5] N. Moshtagh, N. Michael, A. Jadbabaie, and K. Daniilidis. Distributed, bearing-only control laws for circular formations of ground robots. In *Robotics: Science and Systems*. MIT Press, 2008
- [6] A. Toshev, J. Shi, and K. Daniilidis. Image matching via salient region correspondence. In *IEEE Conf. Computer Vision Pattern Recognition*, 2007. **Oral Presentation, Top 4.8%**
- [7] P. Hansen, P. Corke, W. Boles, and K. Daniilidis. Scale-invariant features on the sphere. In *IEEE Int. Conf. Computer Vision*, 2007
- [8] A. Makadia, A. Patterson, and K. Daniilidis. Fully automatic registration of 3d point clouds. In *IEEE Conf. Computer Vision and Pattern Recognition*, New York, NY, June 18-20, 2006. **Oral Presentation Top 4.8%**.
- [9] R. Carceroni, A. Kumar, and K. Daniilidis. Structure from motion with known camera positions. In *IEEE Conf. Computer Vision and Pattern Recognition*, New York, NY, June 18-20, 2006. **Oral Presentation Top 4.8%**.
- [10] J.P. Barreto and K. Daniilidis. Epipolar geometry of central projection systems using veronese maps. In *IEEE Conf. Computer Vision and Pattern Recognition*, New York, NY, June 18-20, 2006
- [11] J.P. Barreto and K. Daniilidis. Fundamental matrix for cameras with radial distortion. In *Proc. Int. Conf. on Computer Vision*, 2005.
- [12] A. Makadia, C. Geyer, S. Sastry, and K. Daniilidis. Radon-based structure from motion without correspondences. In *IEEE Conf. Computer Vision and Pattern Recognition*, San Diego, CA, June 20-22, 2005. **Oral Presentation Top 6.5%**.
- [13] N Moshtagh, A. Jadbabaie, and K. Daniilidis. Vision-based distributed coordination of multi-agent systems. In S. Thrun, G. Sukhatme S. Schaal, and O. Brock, editors, *Robotics: Science and Systems I*, pages 41–48. MIT Press, 2005.
- [14] L. Sorigi and K. Daniilidis. Normalized cross-correlation for spherical images. In *Proc. Eighth European Conference on Computer Vision*, pages 542–552, Prague, Czech Rep., 2004
- [15] A. Makadia, L. Sorigi, and K. Daniilidis. Rotation estimation from spherical images. In *Proceedings of the 17th International Conference on Pattern Recognition*, volume 3, pages 590–593, 2004
- [16] C. Geyer and K. Daniilidis. Mirrors in motion: Epipolar geometry and motion estimation. In *International Conference on Computer Vision*, pages 766–773, Nice, France, Oct. 13-16, 2003. **Oral Presentation Top 4.4%**.
- [17] A. Makadia and K. Daniilidis. Direct 3d-rotation estimation from spherical images via a generalized shift theorem. In *IEEE Conf. Computer Vision and Pattern Recognition*, Wisconsin, June 16-22, 2003. **Oral Presentation Top 6.6%**.

- [18] C. Geyer and K. Daniilidis. Properties of the catadioptric fundamental matrix. In *Proc. Seventh European Conference on Computer Vision*, pages 140–154, Copenhagen, Denmark, 2002.
- [19] A. Ansar and K. Daniilidis. Linear pose estimation from points or lines. In *Proc. Seventh European Conference on Computer Vision*, pages 282–296, Copenhagen, Denmark, 2002
- [20] C. Geyer and K. Daniilidis. Structure and motion from uncalibrated catadioptric views. In *IEEE Conf. Computer Vision and Pattern Recognition*, pages 279–286, Hawaii, Dec. 11-13, 2001. **Oral Presentation Top 8.5%.**
- [21] E. Angelopoulou, R. Molana, and K. Daniilidis. Multispectral skin color modelling. In *IEEE Conf. Computer Vision and Pattern Recognition*, pages 635–642, Hawaii, Dec. 11-13, 2001.
- [22] W. Yu, G. Sommer, and K. Daniilidis. 3d-orientation signatures with conic kernel filtering for multiple motion analysis. In *IEEE Conf. Computer Vision and Pattern Recognition*, pages 299–306, Hawaii, Dec. 11-13, 2001. **Oral Presentation Top 8.5%**
- [23] J. Mulligan, V. Isler, and K. Daniilidis. Performance evaluation of stereo for tele-presence. In *Proc. Int. Conf. on Computer Vision*, Vancouver, Canada, Jul. 9-12, 2001. 558-565
- [24] J. Mulligan and K. Daniilidis. Predicting disparity windows for real-time stereo. In *Proc. Sixth European Conference on Computer Vision*, pages 220–235, Dublin, Ireland, 2000
- [25] C. Geyer and K. Daniilidis. A unifying theory for central panoramic systems. In *Proc. Sixth European Conference on Computer Vision*, pages 445–462, Dublin, Ireland, 2000
- [26] C. Geyer and K. Daniilidis. Catadioptric camera calibration. In *Proc. Int. Conf. on Computer Vision*, pages 398–404, Kerkyra, Greece, Sep. 20-23, 1999.
- [27] J. Mendelsohn and K. Daniilidis. Constrained self-calibration. In *IEEE Conf. Computer Vision and Pattern Recognition*, pages 581–588, Fort Collins, CO, June 23-25, 1999
- [28] W. Yu, K. Daniilidis, S. Beauchemin, and G. Sommer. Detection and classification of points of multiple motion. In *IEEE Conf. Computer Vision and Pattern Recognition*, pages 171–177, Fort Collins, CO, June 23-25, 1999
- [29] W. Yu, K. Daniilidis, and G. Sommer. Rotated wedge averaging filters for junction characterization. In *IEEE Conf. Computer Vision and Pattern Recognition*, pages 390–395, Santa Barbara, CA, June 23-25, 1998
- [30] K. Daniilidis and I. Thomas. Decoupling the 3d motion space by fixation. In *Proc. Fourth European Conference on Computer Vision*, pages 685–696. Cambridge, UK, April 14-18, B. Buxton (Ed.), Springer LNCS 1064, 1996
- [31] K. Daniilidis and J. Ernst. Active intrinsic calibration using vanishing points. In *IEEE Conf. Computer Vision and Pattern Recognition*, pages 708–713. San Francisco, CA, June 18-20, 1996
- [32] K. Daniilidis and H.-H. Nagel. The coupling of rotation and translation in motion estimation of planar surfaces. In *IEEE Conf. on Computer Vision and Pattern Recognition 1993*, pages 188–193, New York, NY, June 15-17, 1993
- [33] D. Koller, K. Daniilidis, T. Thorhallsson, and H.-H. Nagel. Model-based object tracking in traffic scenes. In *Proc. Second European Conference on Computer Vision*, pages 437–452, Santa Margherita, Italy, May 23-26, 1992

- [34] K. Daniilidis and H.-H. Nagel. Analytical results on error sensitivity of motion estimation from two views. In *Proc. First European Conference on Computer Vision*, pages 199–208. Antibes, France, Apr. 23-26, 1990

### Articles in Other Refereed Conferences and Workshops

- [1] O. Naroditsky, A. Patterson, and K. Daniilidis. Automatic alignment of a camera with a line scan lidar system. In *IEEE Int. Conf. Robotics and Automations*, 2011
- [2] J.P. Tardif, Y. Pavlidis, and K. Daniilidis. Monocular visual odometry in urban environments using an omnidirectional camera. In *IEEE International Conference on Intelligent Robots and Systems*, 2008.
- [3] A. Kumar, J.P. Tardif, R. Anati, and K. Daniilidis. Experiments on loop closing. In *IEEE Workshop on Visual Localization*, 2008
- [4] Y. Ling, I. Cheng, and K. Daniilidis. A curvature-driven probabilistic strategy for transmission of arbitrary 3d meshes over unreliable networks. In *IEEE Symposium on 3D Data Processing, Visualization, and Transmission*, 2008
- [5] G.L. Mariottini, F. Morbidi, D. Prattichizzo, G.J. Pappas, and K. Daniilidis. Leader-follower formations: Uncalibrated vision-based localization and control. In *IEEE Int. Conf. Robotics and Automation*, 2007
- [6] N Moshtagh, A. Jadbabaie, and K. Daniilidis. Distributed coordination control of rigid body formations. In *IEEE Conference on Decision and Control*, 2007
- [7] P. Hansen, P. Corke, W. Boles, and K. Daniilidis. Scale-invariant features on wide-angle images. In *IEEE Int. Robotics Symposium*, 2007
- [8] R. Molana and K. Daniilidis. A single-perspective novel panoramic view from radially distorted non-central images. In *British Machine Vision Conference*, 2007
- [9] N Moshtagh, A. Jadbabaie, and K. Daniilidis. Vision-based control laws for distributed flocking of nonholonomic agents. In *Proc. IEEE Int. Conf. on Robotics and Automation*, 2006.
- [10] N Moshtagh, A. Jadbabaie, and K. Daniilidis. Distributed geodesic control laws for flocking of multi-agent systems. In *44th IEEE Conference on Decision and Control*, 2005.
- [11] G.L. Mariottini, G.J. Pappas, D. Prattichizzo, and K. Daniilidis. Vision-based localization of leader-follower formations. In *44th IEEE Conference on Decision and Control*, 2005.
- [12] X. Zabulis, A. Patterson, and K. Daniilidis. Digitizing archaeological excavations from multiple monocular views. In *5th International Conference on 3-D Digital Imaging and Modeling*, 2005.
- [13] A. Makadia and K. Daniilidis. Correspondenceless ego-motion estimation using an imu. In *Proc. IEEE Int. Conf. on Robotics and Automation*, 2005.
- [14] A. Makadia and K. Daniilidis. Planar ego-motion without correspondences. In *IEEE Workshop on Motion and Video Computing*, 2005.

- [15] J.P. Barreto and K. Daniilidis. Unifying image plane liftings for central catadioptric and dioptric cameras. In *Workshop on Omnidirectional Vision and Camera Networks*, Prague, Czech rep., 2004.
- [16] J.P. Barreto and K. Daniilidis. Wide area multiple camera calibration and estimation of radial distortion. In *Workshop on Omnidirectional Vision and Camera Networks*, Prague, Czech rep., 2004.
- [17] V. Isler, S. Kannan, and K. Daniilidis. Sampling based sensor-network deployment. In *Proceedings of IEEE/RSJ International Conference on Intelligent Robots and Systems IROS*, 2004.
- [18] V. Isler, K. Daniilidis, G. J. Pappas, and C. Belta. Hybrid control for visibility-based pursuit-evasion games. In *Proceedings of IEEE/RSJ International Conference on Intelligent Robots and Systems IROS*, 2004
- [19] D. Gupta, A. Kumar, and K. Daniilidis. Using omnidirectional structure from motion for registration of range images of minimal overlap. In *2nd International Symposium on 3D Data Processing, Visualization and Transmission*, pages 333 – 340, 2004
- [20] X. Zabulis and K. Daniilidis. Multi-camera reconstruction based on surface normal estimation and best viewpoint selection. In *2nd International Symposium on 3D Data Processing, Visualization and Transmission*, pages 733–740, 2004.
- [21] O. Naroditsky and K. Daniilidis. 3d scanning using spatiotemporal orientation. In *Proceedings of the 17th International Conference on Pattern Recognition*, volume 1, pages 5–9, 2004
- [22] D. Gupta and K. Daniilidis. Planar motion of a parabolic catadioptric camera. In *Proceedings of the 17th International Conference on Pattern Recognition*, volume 4, pages 68–71, 2004
- [23] V. Isler, S. Kannan, and K. Daniilidis. Local exploration algorithms: Competitive analysis and probabilistic framework. In *Proc. IEEE Int. Conf. on Robotics and Automation*, Taipei, Taiwan, May 12-17, 2003.
- [24] K. Daniilidis, C. Geyer, V. Isler, and A. Makadia. Omnidirectional sensing for robot control. In *Control Problems in Robotics*, pages 183–196, Workshop Proceedings, A. Bicchi, H. Christensen, D. Prattichizzo (Eds.), Springer Tracts in Advanced Robotics, 2002
- [25] H. Towles, W.-C. Chen, R. Yang, S.-U. Kum, H. Fuchs, N. Kelshikar, J. Mulligan, K. Daniilidis, L. Bolden, B. Zelesnik, A. Sadagic, and J. Lanier. 3d tele-collaboration over internet2. In *International Workshop on Immersive Telepresence, Juan-les-Pins, France, 06 Dec, 2002*
- [26] W. Yu, G. Sommer, and K. Daniilidis. Skewness of gabor wavelets and source signal separation. In *Int. Conf. Wavelet Analysis and Applications*, Hong-Kong, Dec 18-22, 2001
- [27] A. Ansar and K. Daniilidis. Linear solutions for visual augmented reality registration. In *Int. Symp. on Augmented Reality, Oct. 6-7, New York, NY*, pages 183–184, 2001
- [28] A. Ansar and K. Daniilidis. Linear pose estimation for augmented reality. In *Int. Conf. on Computer Analysis of Images and Patterns*, 2001. 101-117
- [29] J. Mulligan and K. Daniilidis. Real time trinocular stereo for tele-immersion. In *IEEE Int. Conf. on Image Processing*, 2001. 959-962

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- [32] C. Geyer and K. Daniilidis. Equivalence of catadioptric projections and mappings of the sphere. In *IEEE Workshop on Omnidirectional Vision*, pages 91–96, Hilton Head Island, June 12, 2000
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- [35] W. Yu, K. Daniilidis, G. Sommer. Eliminating outliers in motion occlusion analysis. In *DAGM Symposium on Pattern Recognition*, pages 373–381, 2000
- [36] V. Kruger, R. Herpers, K. Daniilidis, and G. Sommer. Teleconferencing using an attentive camera system. In *Second International Conference on Audio- and Video-Based Biometric Person Authentication*, Washington D.C., March 22-23, 1999
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- [38] S. Beauchemin, K. Daniilidis, and R. Bajcsy. Computing multiple image motions. In *Vision Interface (VI99), Trois-Rivieres, Canada, May 18-21*, pages 544–551, 1999
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- [40] W. Yu, K. Daniilidis, and G. Sommer. Junction characterization using a polar pyramid. In *20. DAGM Symposium on Pattern Recognition, Stuttgart, Germany, Sep. 29 -Oct. 1, 1998*
- [41] J. Mendelsohn, K. Daniilidis, and R. Bajcsy. Constrained self-calibration for augmented reality. In *Augmented Reality: Placing Artificial Objects in Real Scenes*, pages 201–208, Proc. of the 1st Int. Workshop, San Francisco, CA, Nov. 1, 1998
- [42] R.A. Hicks, D. Pettey, K. Daniilidis, and R. Bajcsy. Global signatures for robot control and reconstruction. In *ICRA Workshop on Robust Vision for Vision-based Control of Motion*, pages 127–136, 1998
- [43] E. Bayro-Corrochano, K. Daniilidis, and G. Sommer. Hand-eye calibration in terms of motion of lines. In M. Pietikinen, editor, *Proc. 10th Scandinavian Conference on Image Analysis, Lappeenranta, Finland, June 9-11, 1997*
- [44] M. Hansen, K. Daniilidis, and G. Sommer. Optimization of disparity estimation using the instantaneous frequency. In *Proc. 7th Int. Conf. Computer Analysis of Images and Patterns CAIP, Kiel*, pages 321–328, 1997

- [45] K. Daniilidis, M. Hansen, and G. Sommer. Real time pursuit and vergence control with an active binocular head. In *Autonome Mobile Systeme*, pages 78–87, Munich, Oct. 14-15, 1996
- [46] K. Daniilidis and E. Bayro-Corrochano. The dual quaternion approach to hand-eye calibration. In *Proc. Int. Conf. on Pattern Recognition*, pages 318–322, Vienna, Austria, Aug. 25-30, 1996.
- [47] K. Daniilidis and V. Krüger. Optical flow computation in the log-polar plane. In *Proc. ISPRS Workshop From Pixels to Sequences*, pages 214–219, Zürich, March 22-24, ISPRS, Vol. 30, 1995
- [48] K. Daniilidis. Computation of 3d-motion parameters using the log-polar transform. In V. Hlavac et al. (Ed.), *Proc. Int. Conf. Computer Analysis of Images and Patterns CAIP, Prag*, pages 82–89, 1995
- [49] K. Daniilidis and V. Krüger. Optical flow computation in the log-polar plane. In V. Hlavac et al. (Ed.), *Proc. Int. Conf. Computer Analysis of Images and Patterns CAIP, Prag*, pages 65–72, 1995
- [50] K. Daniilidis, M. Hansen, Ch. Krauss, and G. Sommer. Auf dem weg zum künstlichen aktiven sehen: Modellfreie bewegungsverfolgung durch kameranachführung. In *Proc. DAGM-Symposium Mustererkennung*, pages 277–284, Bielefeld, Sept. 13-15, 1995
- [51] K. Daniilidis. Rekursive schätzung der relativen bewegung einer ebene aus längeren monokularen bildfolgen. In *Proc. DAGM-Symposium Mustererkennung*, pages 35–42, 1993

### Invited Conference Papers

- [1] C. Geyer and K. Daniilidis. Omnidirectional visual servoing. In *Allerton Conference in Control, Communication, and Computing*, 2002
- [2] K. Daniilidis, A. Makadia, and T. Bülow. Image processing in catadioptric planes: Spatiotemporal derivatives and optical flow computation. In *IEEE Workshop on Omnidirectional Vision, Copenhagen, June 22*, pages 3–12, 2002.
- [3] K. Daniilidis and C. Geyer. Omnidirectional vision: Theory and algorithms. In *Proc. Int. Conf. on Pattern Recognition*, pages 89–96, Barcelona, Spain, Sep. 1-3, 2000
- [4] C. Geyer and K. Daniilidis. Omnidirectional vision and catadioptric mappings. In *Vision Interface*, 2001
- [5] C. Geyer and K. Daniilidis. Struture from motion from omnidirectional views. In *ICAR Workshop on Omnidirectional Vision*, 2001

### Book Chapters

- [1] K. Daniilidis and J.-O. Eklundh. 3d vision and recognition. In O. Khatib and B. Siciliano, editors, *Handbook of Robotics*. Springer Verlag, 2008
- [2] K. Daniilidis. Using the algebra of dual quaternions for motion alignment. In *Geometric Algebra*, pages 498–510. Springer-Verlag, New-York at al., 2001

- [3] K. Daniilidis, J. Mulligan, R. McKendall, G. Kamberova, D. Schmid, and R. Bajcsy. Real-time 3d tele-immersion. In A. Leonardis et al., editor, *The Confluence of Vision and Graphics*, pages 253–266. Kluwer Academic Publishers, 2000.
- [4] K. Daniilidis. Dual quaternions for absolute orientation and hand-eye calibration. In F. Solina et al., editor, *Advances in Computer Vision*, pages 231–240. Springer Wien New York, 1997
- [5] K. Daniilidis and M. Spetsakis. Understanding noise sensitivity in structure from motion. In Y. Aloimonos, editor, *Visual Navigation*, pages 61–88. Lawrence Erlbaum Associates, Hillsdale, NJ, 1996.

### **Books and Special Issues**

- [1] K. Daniilidis and R. Klette, editors. *Imaging Beyond the Pinhole Model*. Kluwer Academic Publishers, 2006
- [2] K. Daniilidis and N. Papanikolopoulos. Special issue on panoramic robotics. *IEEE Robotics and Automation magazine*, Dec. 2004
- [3] G. Sommer, K. Daniilidis, and J. Pauli, editors. *Computer Analysis of Images and Patterns, 7th Int. Conf.*, Lecture Notes Computer Science, 1296. Springer-Verlag, 1997

## Teaching

### Undergraduate Courses at the University of Pennsylvania

CSE 121 Introduction to Programming Languages, Spring 2007, Spring 2008, Fall 2008, Fall 2009, Fall 2010.

CSE 399 Computer Vision, Spring 2005.

CSE 390 Robotics, Fall 2004, Fall 2003, Fall 2002, Spring 2002.

CSE 240 Introduction to Computer Architecture, Fall 2000, Fall 1999, Fall 1998.

### Graduate Courses at the University of Pennsylvania

CIS 580 Machine Perception, Fall 2006, Fall 2007, Spring 2009, Spring 2010, Spring 2011.

EMTM 695 Robotics and Automation, Fall 2007, Fall 2008, Fall 2009, Winter 2010.

CIS 700 Special Topics in Machine Perception (with J. Gallier), Spring 2004.

CIS 680 Advanced Topics in Machine Perception, Spring 2003.

CIS 700 Special Topics in Machine Perception, Spring 2001.

CIS 680 Advanced Topics in Machine Perception, Spring 2000, Spring 1999.

### Undergraduate Courses at the University of Kiel

Computer Science I, Winter 1997, 1996.

Computer Science II, Spring 1997

Image Sequence Analysis, Spring 1996, Winter 1994, Winter 1993.

Computer Vision Seminar, Spring 1993, Spring 1994, Spring 1995, 1996.

## **Research supervision**

### **Current PhD students**

1. Alexander Patterson (2004-)
2. Roy Anati (2006-)
3. Oleg Naroditsky (2008-)
4. Cody Phillips (2009-)
5. Mayank Bansall (2010-)
6. Mathieu Lecce (2010-)

### **Graduated PhD students at Penn**

1. Adnan Ansar, 2001, since then with NASA/JPL.
2. Christopher Geyer, 2002, since 2008 with iRobot.
3. Volkan Isler (co-advised with Sampath Kannan), 2004, since 2008 faculty at University of Minnesota.
4. Ameesh Makadia, 2006, since then with Google Research, NYC.
5. Nima Moshtagh, (co-advised with Ali Jadbabaie), 2008, now with Scientific Systems.
6. Ankita Kumar, 2008, since then with Oracle.
7. Alexander Toshev (2005-2010), Google Research, Mountain View

### **Graduated PhD students in Germany**

1. Weichuan Yu (co-advised with G. Sommer at U.of Kiel), 2000, since 2006 faculty at Hong-Kong UST.

### **PhD Thesis Committees**

1. Elena Bernardis, Finding Dots in Microscopic Images, 2011.
2. Praveen Srinivasan, Holistic Shape-Based Object Recognition Using Bottom-up Image Structures, 2011.
3. Qihui Zhu, Shape Detection by Packing Contours and Regions, 2010.
4. Timothee Cour, Weakly Supervised Learning from Multiple Modalities: Exploiting Video, Audio and Text for Video Understanding, 2009.
5. Sujit Kuthirummal, Flexible Imaging for Capturing Depth and Controlling Field of View and Depth of Field, 2009.
6. Arvindh Bhusnurmath, Optimization methods in computer vision, 2008.

7. Albert Montillo, Automated volumetric model construction and dynamic segmentation of the heart ventricles in tagged MRI, 2004.
8. Aaron Bloomfield, TRACE: Tactor Reach Access and Constraint Environment, 2004.
9. Koji Ashida, Adaptive Isosurfacing with Unorganized Oriented Points, April 2003.
10. Shih-Schon Lin, True central omnidirectional cone shaped mirror camera, April 2003.
11. Diana Xu, Incremental Algorithms for the Design of Triangular Spline-Based Surfaces, November 2002.
12. David Jelinek, Novel View Synthesis Using Quasi-Sparse Depth Maps, November 2001.
13. Geoffrey Egnal, View Synthesis Using Stereo Vision and Silhouettes, June 2002.
14. Jangwoo Shin, State-Space Tool: Understanding Concurrent Programs Through State-Space, November 2001.

### **Postdoctoral research supervision**

1. Davide Scaramuzza (2011-)
2. Konstantinos Derpanis (2010-)
3. Jean-Philippe Tardif (2007-2008), now Researcher at NREC, Carnegie Mellon University.
4. Philippos Mordohai, co-advised with Taskar and Shi (2007-2008), now faculty at Stevens Institute of Technology.
5. Irene Cheng (2006-2008), now faculty at University of Alberta.
6. Gian-Luca Mariottini (2007), now faculty at UT Alington.
7. Rodrigo Carceroni (2005-), now at Google, Mountain View.
8. Thomas Buelow (2000-2002), now at Philips Research.
9. Xenophon Zampoulis (2002-2003), now Senior Researcher at FORTH, Greece.
10. Joao Pedro Barreto (2003), now faculty at University of Coimbra, Portugal.
11. Jane Mulligan (1998-2001), now Research Assistant Professor at the University of Colorado at Boulder.

### **Research associates' supervision**

1. Nikhil Kelshikar, (2001-2003), now at Cisco.

### **Masters' Research Supervision in US**

1. Jason Liu (2009), Visual localization.
2. Allison Mathis (2008), Detection of doors and floors for indoor navigation.

3. Ming-Hsieng Yang (2003-2004) Surface reconstruction from multiple scans by combining segmentation with RBF-approximation.
4. Ting-Chung Hung (2003-2004) Reconstructing texture mapped 3D models from laser scanned range images.
5. Dinkar Gupta (2002-2004) Planar ego-motion from omnidirectional images.
6. Rana Molana (2000-2003), Geometry of non-central cameras.
7. Oleg Naroditski (2000-2003), Spatiotemporal Orientation Simplifies 3D Reconstruction, now at Sarnoff Labs.
8. Daniel Rudoy (2001-2002), Integral Transforms on the Sphere, now at MIT Lincoln Laboratories.
9. Andrew Trister (2001-2002), Structured Light Reconstruction, now MD/PhD student at the University of Pennsylvania.

### **Masters Thesis Supervision in Germany**

1. T. Torhalsson, Dynamic model fitting in monocular image sequences, 1992.
2. M. Hirt, Systematic analysis of optical flow computation methods, 1993.
3. U. Garbe, Design of steerable filters in the spatiotemporal volume, 1994.
4. V. Krüger, Optical flow estimation in the complex logarithmic plane, 1995.
5. Ch. Krauss, Video-rate detection of moving objects with an active camera and implementation on a pipeline-architecture, 1996.
6. J. Ernst, Intrinsic parameter calibration of an active camera, 1996.
7. D. Buck, Projective depth representation recovery from partially calibrated stereo, 1996.
8. W. Yu, Implementation of a 3D-steerability approach for optical flow estimation, 1997.
9. S. Willemsen, Multiresolution methods for the detection and tracking of fast articulated movements in sports image sequences, 1997.

### **Senior Design - Independent Study - Intern Undergraduate Students**

Three of my students, **Christopher Geyer**, 1999. **Daniel Rudoy**, 2002, and **David Siegel**, 2008 received the Atwater Kent Prize in Electrical Engineering, awarded each year to that member of the senior class in the Moore School who, during his or her junior and senior year has, in the opinion of the faculty of the Moore School, shown the greatest progress in judgement and in the general grasp of the broad principles of electrical engineering and development in personality and who shows the greatest promise of success in this field.

Daniel Araujo and Jorge Trujillo won the Grand Prize for the 2003 school-wide best Senior Design Project on Real Time Facial Tracking.

Zereyacob Girma, Nii Ayite, and Aung Naing won the best Senior Design in Electrical Engineering Prize in 2005.

1. Christopher Geyer on Calibration of a fish-eye camera
2. David Schmid on the Real-time stereo for teleimmersion
3. Jenni Marquiss on Demonstration of catadioptric transformations
4. Bjorn Lindgren on Quicktime-VR interface for a catadioptric camera
5. Evan Witt on VRML-modelling of stereo reconstructions
6. Laura Hornbeck on Audio-based speaker localization
7. Juan Ahues on Real-time low-level image processing for tele-immersion
8. Oleg Naroditski on Tracking in omnidirectional video
9. Raj Arya on Stereoscopic Tele-immersion Displays
10. Desiree Kilburn on Modeling of Head Tracking in Immersive Environments
11. Andrew Trister on Calibration for optical head tracking for teleimmersion
12. Kalpesh Vakharia on Optotrak interface for Teleimmersion
13. Adam Lee on TCP/IP vs UDP in Tele-Immersion
14. Daniel Rudoy on Real-time Background Subtraction
15. Andrew Ganim on Calibration of Camera Clusters and Large Environment Reconstruction
16. Christi Electris on Panoramic Stereo.
17. Daniel Rudoy on Local Spherical Harmonic Representation
18. Ravi Goyal on Local Spherical Harmonic Representation
19. Vernon Balanza on Interfaces for Calibration in Archaeology
20. Theo Paulakis on Pocket-PC Omnidirectional Vision.
21. Jonathan Gouler, NSF-SUNFEST program.
22. Daniel Araujo and Jorge Trujillo, Real Time Facial Tracking
23. Zereyacob Girma, Nii Ayite, and Aung Naing, Double Vision Television
24. Imo Oudome, Kevin Quach, Oye Adetoyese, Structured Light Shape Recovery.
25. Michelle Alleonge, Visual place recognition.
26. David Siegel, GnomeDo.
27. Eugene Yarovoi, Dynamic Programming for Stereo.
28. Avantika Agrawal, Blending images with 3D earth models.
29. Kevin Xu, Stereo on the GPU.

30. Victor Jamney, *Tracking in Biology*.

### **Visiting Scholars**

1. Luis Puig, University of Zaragoza, 2009 and 2011.
2. Yannis Pavlidis, Aristotle University of Thessaloniki, 2008.
3. Peter Hansen, CSIRO, 2008.
4. Gian-Luca Mariottini, University of Sienna, 2005.
5. Lorenzo Sorgi, University of Rome III, 2002.
6. Mark Menem, Ecole Polytechnique, 2002.
7. Cidy Sisse, Ecole Polytechnique, 2002.
8. Geraud de Bonnafos, Ecole Polytechnique, 2001.
9. Alexandre Chibane, Ecole Polytechnique, 2001.
10. Markus Middendorf, University of Karlsruhe, 1998.

## Administrative Responsibilities

- 2008- Director of the Robotics Masters Program (4 graduated, 30 currently enrolled)
- 2008- GRASP Laboratory Director
- 2008-2010 Engineering Honors Committee
- 2007 Department Chair Search Committee
- 2007-2008 CIS Graduate Admission Chair
- 2001 SEAS Committee on Academic Performance

## Professional Activities

- |             |   |
|-------------|---|
| 2010        | Program Cochair of ECCV 2010  |
| 2008        | Short Courses Organizer for IEEE CVPR 2007  |
| 2003 - 2007 | <b>Associate Editor of the IEEE Transaction on Pattern Analysis and Machine Intelligence</b>  |
| 2006        | with Marc Pollefeys, Conference Chair of 3rd International Symposium on 3D Data Processing, Visualization, and Transmission, IEEE Press |
| 2000 - 2006 | Co-Chair of the Computer and Robot Vision TC of the IEEE Robotics and Automation Society  |
| 2000        | Chair of the First IEEE Workshop on Omnidirectional Vision  |

### Guest Editorships

- |      |  |
|------|--|
| 2004 | IEEE Robotics and Automation Magazine (December 2004)<br>Special Issue on Panoramic Robotics |
|------|--|

### Tutorials

- |      |   |
|------|---|
| 2003 | 3D modeling and reconstruction of dynamic visual scenes at IEEE ICRA, with S. Soatto, J. Kosecka, Y. Ma, and S. Sastry, International Conference on Robotics and Automation |
| 1999 | Penn Undergraduate Workshop in Cognitive Science  |
| 2002 | Penn Undergraduate Workshop in Cognitive Science  |
| 2000 | Tutorial for Structure from Motion at IEEE ICRA with Y. Ma, C. Tomasi, CJ Taylor, S. Sastry, J. Kosecka, International Conference on Robotics and Automation.               |

### Area Chair at a Conference

- |      |  |
|------|--|
| 2011 | Area Chair at IEEE Int. Conf. on Computer Vision       |
| 2007 | Area Chair at IEEE Int. Conf. on Computer Vision       |
| 2006 | Area Chair at IEEE Computer Vision Pattern Recognition |
| 2005 | Area Chair at IEEE Computer Vision Pattern Recognition |
| 2004 | Area Chair at European Conf. on Computer Vision        |
| 2004 | Area Chair at IEEE Computer Vision Pattern Recognition |

### **Program Committee or Reviewer at a Conference**

2009            Robotics Science and Systems  
2006-2008    IEEE Robotics and Automation  
2000-2008    European Conf. on Computer Vision  
1998-2002    Int. Symposium on Augmented and Mixed Reality  
2001-2009    IEEE Comp. Vision Pattern Recognition  
2003-2009    IEEE Int. Conf. on Computer Vision  
2002, 2006    SIGGRAPH

### **Proposal or Project Reviewer**

2002 -        European Commission  
2000 -        National Science Foundation  
2001         National Institutes of Health  
2002, 2010   Israel Science Foundation  
1997-1999   Greek Ministry of Education

### **Journal Reviewer**

IEEE Trans. Pattern Analysis Machine Intelligence  
IEEE Trans. Robotics and Automation  
IEEE Trans. Image Processing  
Int. Journal of Computer Vision  
Int. Journal of Robotics Research  
Journal of the Optical Society of America  
Computer Vision and Image Understanding  
Biological Cybernetics  
Pattern Recognition Letters  
Graphical Models and Image Processing  
Image and Vision Computing  
Robotics and Autonomous Systems  
Machine Vision and Applications

## Invited Presentations

### Invited talks at conferences and workshops

1. From appearance to geometry: Place and 3D object recognition, Workshop in honor of Professor Eklundh's 70th birthday, July 2009.
2. Pure vision based SLAM in large urban environments, ARL Vehicle Directorate Review Meeting, June 3, 2008.
3. Pure vision based SLAM in large urban environments, ARL/NSF Workshop on Future directions for visual navigation, Pasadena, May 19, 2008.
4. Pure visual metric and topological mapping, ARL CTA Colloquium, March 9, 2008
5. Visual Navigation for Humanoids, Invited presentation at the Workshop for Active Vision for Humanoids, November 29, 2007.
6. Visual registration without matching, ERCIM Spring Meetings, Memorial session for Stelios Orphanoudakis, Budapest, May 30, 2006.
7. Structure from motion without correspondence, Computer Vision and Pattern Recognition Colloquium, Technical University of Prague, April 6, 2006.
8. Localization without correspondence, Post-AC meeting, Courant Institute, NYU, Feb 27, 2006.
9. Localization as a Filtering Problem, York Symposium on Computational Vision, York University, June 18, 2005.
10. Geometry and Signal Analysis Beyond the Projective Plane, Colloquium, Technical University of Prague, January 14, 2004.
11. Navigation without correspondence, IROS Workshop on Visual Servoing, Sept. 30, 2004.
12. Visual navigation based on filtering instead of correspondences, ICRA 2004 - Workshop, Multi-robot Search and Rescue: Current Challenges and Future Directions, April 27, 2004.
13. Immersive Sensing, Visualization and Visual Modeling Workshop VMV 2002, Erlangen, November 22, 2002.
14. Structure from Motion from Omnidirectional Views, ICAR-Workshop on Omnidirectional Vision, Budapest, August 22, 2001.
15. Catadioptric mappings, *Workshop on shape and surface geometry, American Mathematical Society Meeting*, April 28, 2001.
16. A Unifying Theory of Imaging Systems, *Workshop on Theoretical Foundations of Computer Vision*, Schloß Dagstuhl, Mar. 18, 2000.
17. Ego-motion perception and disortion of perceptual space, Symposium Gehirn und Gestalt, Institute for Advanced Studies, Delmenhorst, June 3, 1999.
18. Attentive visual motion processing, *Workshop on Preattentive and Attentive Visual Processing, PAP*, MPI fuer biophysikalische Chemie, Göttingen, Oct. 5, 1994.

19. Issues on attentive visual motion processing, *Workshop on Theoretical Foundations of Computer Vision*, Schloss Dahstuhl, Mar. 13, 1994.
20. Modeling 3D-transformations with dual quaternions: The case of hand-eye calibration, *Workshop on Theoretical Foundations of Computer Vision*, Schloß Dagstuhl, Mar. 18, 1996.
21. Ortsvariantes Bewegungssehen, *Workshop Kognitive Robotik*, Zentrum für Kognitionswissenschaften, Universität Bremen, Mar. 2, 1995.
22. On the relation between instability in motion estimation and critical surfaces, *ESPRIT BRA Insight Meeting*, Nice, France, June 19-21, 1991.
23. On error sensitivity of motion estimation from two views, *The 1989 Stockholm Workshop on Computational Vision*, Stockholm, Sweden, Aug. 7-10, 1989.

### Colloquia and Seminars

1. 3D Object Recognition in Images and Videos, Engineering Colloquium, Harvard University, October 15, 2010
2. Shape-based recognition in point clouds, video, and single pictures, Georgia Tech RIM Colloquium, April 4, 2010.
3. Shape-based recognition in point clouds, video, and single pictures, Departmental Colloquium, Temple University, February 26, 2010.
4. 3D object recognition, CS Seminar, University of Illinois at Chicago, November 2, 2009.
5. Image Matching: Appearance, Geometry, Shape, Computer Vision Seminar, Columbia University, January 13, 2009.
6. Image Matching: Harmonic Analysis and Graph Spectral Techniques, RPI Computer Science Seminar, September 28, 2007.
7. Image Matching: Harmonic Analysis and Graph Spectral Techniques, UCLA Computer Science Colloquium, April 23, 2007.
8. Image Matching, Drexel Math Colloquium, March 20, 2007.
9. Image Mathing Beyond Correspondence, Johns Hopkins Center for Imaging, February 13, 2007.
10. Visual localization and registration without matching, Institute of Computer Science, FORTH, Heraclion, Crete, May 11, 2006.
11. 3D beyond graphics, Athens Institute of Technology, April 28, 2006.
12. Localization as a Filtering Problem, University of Delaware, November 29, 2004.
13. Geometry and Signal Analysis Beyond the Projective Plane, Computer Science Department, Aristotle University of Thessaloniki, September 9, 2003.
14. Geometry and Signal Analysis Beyond the Projective Plane, Center for Automation Research, University of Maryland at College Park, February 14, 2003.

15. Signal Analysis and Geometry of Immersive Sensing, Computer Science Colloquium, Johns Hopkins University, October 24, 2002.
16. Signal Analysis and Geometry of Immersive Sensing, AI-Robotics-Vision Seminar, UC Berkeley, September 26, 2002.
17. The Geometry of Omnidirectional Views, ECE Graduate Colloquium, University of Illinois at Urbana-Champaign, September 5, 2002.
18. Multiple Omnidirectional Views, University of Washington, Graphics Seminar, February 10, 2002.
19. The Geometry of Omnidirectional Views, Columbia University, November 28, 2001.
20. Catadioptric Mappings, Stevens Institute of Technology, November 7, 2001.
21. Image Processing in the Catadioptric Plane, Third Workshop on Omnidirectional Vision, Copenhagen, June 3, 2001.
22. Omnidirectional Vision and Catadioptric Mappings, Vision Interface Conference, Ottawa, June 7, 2001.
23. Omnidirectional Vision: Theory and Algorithms, International Conference for Pattern Recognition, Barcelona, Spain, Sep. 1, 2000.
24. Omnidirectional Vision and Tele-presence, *Department of Computer Science, University of Erlangen*, October 6, 2000.
25. Omnidirectional Vision for Immersive Environments, *School of Computing, University of Utah*, July 6, 2000.
26. Omnidirectional Vision for Immersive Environments, *Center for Automation Research Seminar, University of Maryland at College Park*, May 19, 2000.
27. View-independent Scene Acquisition for Tele-immersion, *NTII-Day, Graphics Laboratory, Computer Science Department, University of North Carolina*, May 9, 2000.
28. Omnidirectional Vision for Immersive Environments, *CMU Robotics Institute Seminar*, April 21, 2000.
29. Omnidirectional Vision for Immersive Environments, *MIT AI Lab Colloquium*, April 20, 2000.
30. Catadioptric Geometry, Vision Seminar, EECS Department UC Berkeley, Aug. 16, 1999
31. Autocalibration and 3D-Reconstruction for Augmented Reality and Teleimmersion, IEEE Signal Processing Society, Philadelphia Section, June 21, 1999
32. Autocalibration and 3D-Reconstruction for Augmented Reality and Teleimmersion, Joint Heidelberg-Mannheim Vision Seminar, University of Mannheim, June 1, 1999
33. Catadioptric Visual Systems, Informatics-Colloquium, Kiel University, May 28, 1999
34. Minimally Calibrated Reconstruction for Augmented Reality, Vision Lunch Series, Computer Science Department, Yale University, Jan. 22, 1999.

35. Minimally Calibrated Reconstruction for Teleimmersion and Augmented Reality, Siemens Research Corporation, Sep. 03, 1998.
36. Dual Quaternions for Hand-Eye Calibration, Robotics Group Seminar, Computer Science Department, Stanford University, Aug. 19, 1998
37. Efficient Representations for Calibration Tasks, Robotics Seminar, EECS Department UC Berkeley, Aug. 17, 1998.
38. We move, therefore we see, Neuroinformatik-Kolloquium, Universität Ulm, Jan. 8, 1998.
39. Active visual motion analysis, Colloquium of the Computer Science Institute, FORTH, Heraklion, Crete, Jul. 22, 1997
40. Ortsvariantes aktives Bewegungssehen, Daimler-Benz, Forschungszentrum Ulm, Apr. 22, 1997.
41. We move, therefore we see, Colloquium, Department of Computer and Information Science, University of Pennsylvania, Mar. 4, 1997
42. 3D-motion estimation with active and space-variant systems, CVAP and Center for Autonomous Systems Seminars, KTH, Stockholm, Nov. 19, 1996
43. Advantages of active and space-variant sensing with respect to motion estimation, Workshop for Alternative Camera Technology ALCATECH96, Sjaellands Odde, Denmark, July 25, 1996
44. A new solution for the hand-eye calibration problem, INRIA Rocquencourt, June 28, 1996.
45. Neuere Entwicklungen in der Berechnung der 3D-Bewegung aus monokularen Bildfolgen, Fachbereich Mathematik und Informatik der Friedrich-Schiller-Universität Jena, May 15, 1996
46. Berechnung des optischen Flusses und der 3D-Bewegung in der komplex-logarithmischen Ebene, Freitagsskolloquium, Max-Planck Instituts für Biologische Kybernetik, June 9, 1995.
47. Motion computations on the log-polar plane, *Computer Science Colloquium*, Computer and Information Science Department, University of Pennsylvania, Oct. 25, 1994.
48. Motion computations on the log-polar plane, *Computer Vision Laboratory Seminar*, University of Maryland at College Park, Oct. 21, 1994.
49. On error sensitivity and ambiguity of motion estimation from monocular image sequences, *Colloquium of the Computer Science Department, Technical University of Berlin*, Berlin, Germany, Jan. 19, 1993.
50. Three-dimensional motion estimation from monocular image sequences, *Colloquium of the Research Institute for Applied Knowledge Based Systems (FAW)*, Ulm, Germany, Dec. 17, 1992.

## Patents

- US Patent 6,982,743: K. Daniilidis, E. Angelopoulou, V. Kumar, Multispectral Omnidirectional Sensor.

## Media Coverage

I appeared in the Discovery Channel feature “Debunked”, premiered on June 17, 2004.

My research on tele-immersion or archaeology reconstruction has been featured in the following media:

### Periodicals

- Scientific American (04/01),
- Pennsylvania Current (02/15/01),
- IEEE Computer (01/01),
- Computer Graphics World (01/01),
- Washington Post (11/27/00),
- New Scientist (10/21/00), and
- MIT Technology Review (8/00).

### Newspapers

- Daily Pennsylvanian (01/22/01),
- Clarin (01/27/01),
- The Inquirer (01/01/01),

### Web News

- PennNews (01/06/05),
- Science Daily and PennNews, (11/02)
- HPCwire (01/05/01),
- PennNews (12/14/00),
- Navigator Online (11/00),

### Radio Channels

- AAAS Science Update NPR (01/25/01),
- All things considered, NPR/WHYY (01/09/01),