

Prof. Dr.-Ing.

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Career

- now- 2005 Associate Professor (W2)
Department of Informatics, Technische Universität München, München, Germany
Head of the Machine Vision and Perception Group (MVP),
<http://mvp.visual-navigation.com>
Joint appointment with the Institute for Robotics and Mechatronics,
German Aerospace Center, Germany
- work on 3D modelling with hand-scanner devices and flying robots
- 2005-2003 Assistant Research Professor
Department of Computer Science
Johns Hopkins University, Baltimore, USA
- 2003-1999 Assistant Research Scientist
Computational Interaction and Robotics Lab
Johns Hopkins University, Baltimore, USA
- 1999-1999 Postdoctoral Associate
Center for Computational Vision and Control
Yale University, New Haven, USA

Education

- 1998 Doctor of Engineering degree Department of Electrical Engineering, Technische Universität München, München, Germany; Doctoral Thesis: "Vision-based Exploration of Indoor Environments with a Binocular Stereo System"
- 1992 Dipl.-Ing. degree from Department of Electrical Engineering, Technische Universität München, München, Germany; Thesis: "Model-based Prediction of Sensor Data for Active Sensors at an Example of the Microwave Radar Sensor"

Research Interests

My principle areas of research are sensors for mobile systems and Human Computer Interfaces. The focus of my research is on vision-based navigation and three-dimensional reconstruction from sensor data.

Honours

- Best paper award from Intelligent Vehicles Conference 2010
- Best paper finalist at Conference IROS 2009
- Best paper award from the MICCAI 2005

Activities/Competence

- Member of the Conference Editorial Board (ICRA)
- Research Area Coordinator for Perception in the Cluster of Excellence CoTeSys
- Organizer of the Workshop “Advanced Sensing and Sensor Integration in Medical Robotics” in combination with ICRA 2009
<http://irca09.visual-navigation.com>
- Co-Organizer of the PhD Exchange Program with Johns Hopkins University within the IREE NSF program
- Co-Organizer of the Dagstuhl Seminar *From Form to Function*, 2010
- Area Chair RSS 2006
- Committee member of the IAPR *Special Hardware and Software Environments*
- Editor Special Issue on “Special Hardware and Software Environments” Journal, 2005
- Organizer of the tutorial *Principles and practice of real-time tracking on consumer hardware* at Virtual Reality Conference, VR 2003 in Los Angeles.
- Reviewer for Computer Vision and Pattern Recognition (CVPR), European Conference on Computer Vision (ECCV), IEEE International Conference on Robotics and Automation (ICRA), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), Transactions on Robotics (T-RO).
- Committee Member for Best Paper Award IEEE International Conference on Robotics and Automation (ICRA 2001)
- Committee Member for Best ICRA Vision Paper Award 2003, 2006
- Member of IEEE, since 1999

Publications

Journal articles, books and book chapters:

1. Elmar Mair, Klaus H. Strobl, Tim Bodenmuller, Michael Suppa, Darius Burschka. Real-time Image-based Localization for Hand-held 3D-modeling. KI - Künstliche Intelligenz Journal, Volume 24 / 2010.
2. Elmar Mair and Darius Burschka. Z_{inf} - Monocular Localization Algorithm with Uncertainty Analysis for Outdoor Applications. Bookchapter in Mobile Robot Navigation, ISBN 978-953-307-076-6, Publisher: INTECH, Publishing date: March 2010.

3. Darius Burschka, Heiner Deubel, Danica Kragic, Markus Vincze. From Form to Function. Dagstuhl Seminar Proceedings 09431, 2009
4. Thomas Abmayr, Franz Härtl, Gerd Hirzinger, Darius Burschka, Christoph Fröhlich. A correlation based target finder for terrestrial laser scanning. *Journal of Applied Geodesy*, vol.2 issue 3, pages 131–137, 2008.
5. Darius Burschka, and Gregory Hager. Image Based Mapping. *Encyclopedia of Complexity and Systems Science* Springer-Verlag.
6. J. J. Corso, G. Ye, D. Burschka, and G. D. Hager. A Practical Paradigm and Platform for Video-Based Human-Computer Interaction. *IEEE Computer*, 42(5):48-55, 2008.
7. Darius Burschka. Vision-Based Navigation Strategies. Bookchapter in "Unifying Perspectives in Computational and Robot Vision". *Lecture Notes in Electrical Engineering* (Kragic & Kyrki Eds), 2008.
8. C. E. Reiley, T. Akinbiyi, D. Burschka, A. M. Okamura, C. Hasser, D. Yuh, Evaluation of Surgical Tasks using Sensory Substitution in Robot-Assisted Surgical Systems. *The Journal of Thoracic and Cardiovascular Surgery*, pages 197-202, January 2008.
9. Darius Burschka and Ming Li and Russell Taylor and Gregory D. Hager and Masaru Ishii. Scale-Invariant Registration of Monocular Endoscopic Images to CT-Scans for Sinus Surgery. *Medical Image Analysis*, 9(5):413-439, October 2005. Best Paper Award at MICCAI 2005.
10. Darius Burschka, Jason J. Corso, Maneesh Dewan, William Lau, Ming Li, Henry Lin, Panadda Marayong, Nicholas Ramey, Gregory D. Hager, Christopher Hasser, Brian Hoffman, and David Larkin. Navigating Inner Space: 3-D Assistance for Minimally Invasive Surgery. *In Robotics and Autonomous Systems Journal*, October 2005.
11. Guangqi Ye, Jason J. Corso, Darius Burschka, and Gregory D. Hager. Vics: A modular HCI framework using spatio-temporal dynamics. *Machine Vision and Applications*, Volume 16 , Issue 1, pages: 13-20, 2004.
12. Myron Z. Brown, Darius Burschka, and Gregory D. Hager. Advances in Computational Stereo. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 25(8):993-1008, 2003.
13. D. Burschka, C. Eberst, C. Robl, and G. Färber. Vision-Based Exploration of Indoor Environments. In M. Vincze and G. D. Hager, editors, *Robust Vision for Vision-Based Control of Motion*, IEEE press, pages 77-95, 2000.
14. D. Burschka Videobasierte Exploration von Innenräumen am Beispiel eines binokularen Stereo-Kamerasystems (engl. Vision-Based Exploration of Indoor Environments at an Example of a Binocular Stereo-System). Reihe 10 Informatik/Kommunikationstechnik, Nr.573, VDI-Verlag 1999, ISBN 3-18-357310-5.
15. G. Magin, A. Ruß, D. Burschka, and G. Färber. A Dynamic 3D Environmental Model with Real-Time Access Functions for Use in Autonomous Mobile Robots. *Robotics and Autonomous Systems*, 14 pp. 119-131, 1995.

Chronological listing of Selected Recent Peer Reviewed Conference Articles

1. Elmar Mair, Gregory Hager, Michael Suppa and Darius Burschka. Adaptive and Generic Corner Detection Based on the Accelerated Segment Test. *European Conference on Computer Vision ECCV 2010*, Crete Greece, to appear.

2. K.A. Gaschler, D. Burschka and G. Hager. Epipolar-Based Stereo Tracking without Explicit 3D Reconstruction. International Conference on Pattern Recognition (ICPR 2010), Istanbul, to appear.
3. Wolfgang Stuerzl, Darius Burschka, Michael Suppa. Monocular Ego-motion Estimation with a Compact Omnidirectional Camera. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2010), to appear
4. Sami Haddadin, Holger Urbanek, Sven Parusel, Darius Burschka, Juergen Rossmann, Alin Albu-Schäffer, Gerd Hirzinger. Realtime Reactive Motion Generation Based on Variable Attractor Dynamics and Shaped Velocities. IEEE/RSJ International Conference on Intelligent Robots and Systems IROS 2010, to appear
5. Oliver Ruepp, Robert Bauernschmit, and Darius Burschka. Towards On-Line Intensity-Based Surface Recovery from Monocular Images, British Machine Vision Conference, BMVC 2010, to appear.
6. Florian Homm, Nico Kaempchen, Jeff Ota and Darius Burschka. Efficient Occupancy Grid Computation on the GPU with Lidar and Radar for Road Boundary Detection. IEEE Intelligent Vehicles Symposium (IV 2010), San Diego, 2010.
7. Susanne Petsch and Darius Burschka. Estimation of Spatio-Temporal Object Properties for Manipulation Tasks from Observation of Humans. IEEE International Conference on Robotics and Automation (ICRA 2010), Anchorage, 2010.
8. Werner Maier, Fengqing Bao, Elmar Mair, Eckehard Steinbach and Darius Burschka. Illumination-Invariant Image-Based Novelty Detection in a Cognitive Mobile Robot's Environment. IEEE International Conference on Robotics and Automation (ICRA 2010), Anchorage, 2010.
9. Chavdar Papazov and Darius Burschka. Stochastic optimization for rigid point set registration. In Advances in Visual Computing, 5th International Symposium, ISVC 2009, Las Vegas, NV, USA, November 30 - December 2, 2009, Proceedings, Part I, volume 5875 of Lecture Notes in Computer Science, pages 1043-1054. Springer, 2009.
10. Werner Maier, Elmar Mair, Darius Burschka, and Eckehard Steinbach. Visual homing and surprise detection for cognitive mobile robots using image-based environment representations. In Proceedings of the IEEE International Conference on Robotics and Automation 2009, May 2009.
11. Helmuth Radrich, Nicolas Padoy, Ahmad Ahmadi, Hubertus Feussner, Greg Hager, Darius Burschka, and Alois Knoll. Synchronized multimodal recording system for laparoscopic minimally invasive surgeries. In MICCAI-2009 Workshop on Modeling and Monitoring of Computer Assisted Interventions (M2CAI), September 2009
12. Klaus H. Strobl, Elmar Mair, Tim Bodenmiller, Simon Kielhöfer, Wolfgang Sepp, Michael Suppa, Darius Burschka, and Gerd Hirzinger. The self-referenced dlr 3d-modeler. In Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems 2009, October 2009 (Best Paper Finalist)
13. Elmar Mair, Klaus H. Strobl, Michael Suppa, and Darius Burschka. Efficient camera-based pose estimation for real-time applications. In Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems 2009, October 2009
14. Darius Burschka. Collaborative Exploration with Dynamically Configurable Sensing Agents, European Conference on Computer Vision, ECCV Workshop on Vision in Action: Efficient strategies for cognitive agents in complex environments, 2008.

15. Dominik Steinhauser, Oliver Ruepp, and Darius Burschka. Motion segmentation and scene classification from 3D LIDAR data. IEEE Intelligent Vehicles Symposium, pages 398-403, June 2008
16. Hermann Mayer, Darius Burschka, Alois Knoll, Eva U. Braun, Rüdiger Lange, and Robert Bauernschmitt. Human-machine skill transfer extended by a scaffolding framework. In Proceedings of the IEEE International Conference on Robotics and Automation, pages 2866-2871, May 2008.
17. Darius Burschka and Elmar Mair, Direct Pose Estimation with a Monocular Camera, Robot Vision 2008, Lecture Notes in Computer Science Volume 4931/2008, Auckland, New Zealand, pages 440-453, 2008
18. Darius Burschka and Elmar Mair. Biologically motivated optical flow-based navigation. In Workshop on Biological Models in Spatial Cognition 2008, 2008.
19. Oliver Ruepp and Darius Burschka. A geometrically inspired approach to active view planning. In Proceedings of the Workshop on Vision in Action: Efficient strategies for cognitive agents in complex environments. ECCV workshop, 2008
20. Darius Burschka: "Towards Robust Vision-Based Navigation Systems", Invited paper to Workshop: From features to actions - Unifying perspectives in computational and robot vision, IEEE International Conference on Robotics and Automation ICRA 2007.
21. Rui Liu, Michael Suppa, Gerd Hirzinger, and Darius Burschka. Modeling the World in Real-Time. In: Proceedings . 8th Conference on Optical 3D Measurement Techniques , Zurich, 2007
22. Riu Liu, Darius Burschka, Gerd Hirzinger, and Bernhard Strackebroek. Real-Time Fully Automatic 3D-Modeling of HRSC Landscape Data. In: Proceedings . 8th Conference on Optical 3D Measurement Techniques , Zurich, 2007.
23. Liu, Rui and Burschka, Darius and Hirzinger, Gerd (2007) On the Way to Water-tight Mesh. In: Proceedings of 3D-ARCH 2007 , Zürich, 2007
24. Rui Liu, Darius Burschka, and Gerd Hirzinger, A Novel Approach to Automatic Registration of Point Clouds. In: Proceedings . IEEE . International Geoscience and Remote Sensing Symposium, IGARSS , 2007-07-23 - 2007-07-27 , Barcelona,
25. T. Akinbiyi, C. E. Reiley, S. Saha, D. Burschka, C. J. Hasser, D. D. Yuh, and A. M. Okamura. Dynamic Augmented Reality for Sensory Substitution in Robot-Assisted Surgical Systems. 28th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, New York City, NY, pages 567-570, September 2006.
26. D. Burschka. Robust Feature Correspondences for Vision-Based Navigation with Slow Frame-Rate Cameras. Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), pages 947-952, Oktober 2006.
27. D. Burschka and G.D. Hager. Vision-based Inspection of Structural Changes respective to Pre-operative CT-Scans with Monocular Endoscope Cameras. Jahrestagung der Deutschen Gesellschaft für Computer- und Roboterassistierte Chirurgie CURAC, 2005.
28. D. Burschka and Gregory D. Hager. Vision-Based 3D Scene Analysis for Driver Assistance, pages 812-818. In IEEE International Conference on Robotics and Automation (ICRA 2005), Barcelona, 2005

29. Joshua Leven and Darius Burschka and Rajesh Kumar and Gary Zhang and Steve Blumenkranz and Xiangtian (Donald) Dai and Mike Awad and Gregory D. Hager and Mike Marohn and Mike Choti and Christopher J. Hasser and Russell H. Taylor. DaVinci Canvas: A Telerobotic Surgical System with Integrated, Robot-Assisted, Laparoscopic Ultrasound Capability. In MICCAI, pages 811-818, 2005.
30. Darius Burschka, Jason J. Corso, Maneesh Dewan, Gregory D. Hager, William Lau, Ming Li, Henry Lin, Panadda Marayong, and Nicholas Ramey. Navigating Inner Space: 3-D Assistance for Minimally Invasive Surgery . In Workshop on Advances in Robot Vision - From Domestic Environments to Medical Application, (D. Kragic and H. Christensen, eds.), IEEE/RSJ International Conference on Intelligent Robots and Systems, IROS 2004, Sendai, Japan, 2004.
31. Darius Burschka and Gregory D. Hager. Principle and Practice of Real-Time Visual Tracking for Navigation and Mapping. In IEEE Workshop on Robotic Sensing: Robotics in the Automotive Industry, ROSE, 2004.
32. Darius Burschka and Gregory D. Hager. V-GPS - Image-Based Control for 3D Guidance Systems. In Proc. of IROS, pages 1789-1795, October 2003.
33. D. Burschka, and G.D. Hager. Principles and practice of real time tracking on consumer hardware. In *Principles and practice of real time tracking on consumer hardware* tutorial at Virtual Reality VR2003 in Los Angeles (co-organizer of the tutorial).
34. Darius Burschka and Gregory D. Hager. V-GPS(SLAM): - Vision-Based Inertial System for Mobile Robots. In Proc. of ICRA, pages 409-415, April 2004.
35. D. Burschka, M. Li, R.H. Taylor, and G.D. Hager. Scale-Invariant Registration of Monocular Endoscope Images to CT-Scans For Sinus Surgery. In Proceedings of Seventh International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI), volume 2, pages 413-421, 2004.
36. Nicholas A. Ramey, Jason J. Corso, William W. Lau, Darius Burschka, and Gregory D. Hager. Real Time 3D Surface Tracking and Its Applications. In Proceedings of Workshop on Real-time 3D Sensors and Their Use (at CVPR 2004), 2004.
37. Darius Burschka, Ming Li, Russell Taylor, and Gregory D. Hager. Scale-Invariant Registration of Monocular Stereo Images to 3D Surface Models. In Proceedings of IROS, pages 2581-2586, 2004.
38. Darius Burschka and Gregory D. Hager. V-GPS - Image-Based Control for 3D Guidance Systems. In Proc. of IROS, pages 1789-1795, October 2003.
39. Darius Burschka, Jeremy Geiman, and Gregory D. Hager. Optimal Feature Configuration for Vision-Based Control of Mobile Robots. In Proc. of International Conference on Robotics and Automation (ICRA), pages 3917-3922, September 2003.
40. Jason Corso, Darius Burschka, and Gregory D. Hager. Direct Plane Tracking in Stereo Images for Mobile Navigation. In Proc. of International Conference on Robotics and Automation (ICRA), pages 875-880, 2003.
41. Guangqi Ye, Jason Corso, Darius Burschka, Gregory D. Hager. VICs: A Modular Vision-Based HCI Framework. In Proceedings of ICVS pages 257-267, 2003, Graz.

42. Izzet Pambeci, Henrik Nilsson, Darius Burschka, John Peterson, and Gregory D. Hager. Functional reactive robotics: An exercise in principled integration of domain-specific languages. In *Proc. PPDP*, October 2002.
43. D. Burschka and G. Hager. Scene Classification from Dense Disparity Maps in Indoor Environments. In *Proceedings of ICPR 2002*, Quebec.
44. D. Burschka and G. Hager. Stereo-Based Obstacle Avoidance in Indoor Environments with Active Sensor Re-Calibration. In *Proceedings of ICRA2002*, Washington, D.C., pages 2066-2072.
45. D. Burschka and G. Hager. Dynamic composition of tracking primitives for interactive vision-guided navigation. In *SPIE's Intelligent Systems for Advanced Manufacturing*, November 2001, Boston.
46. D. Burschka and G. Hager. Vision-Based Control of Mobile Robots. In *Proc. IEEE Int. Conf. on Robotics and Automation (ICRA2001)*, May 2001, pages 1707-1713.
47. P. Leven, S. Hutchinson, D. Burschka, and G. Färber. Perception-based motion planning for indoor exploration. In *Proc. IEEE Int. Conf. on Robotics and Automation (ICRA'99)*, pages 695–701, May 1999.
48. D. Burschka and G. Hager. Laser-based Position Tracking and Map Generation. In *Proceedings of RA 2000*, August 2000, Hawaii, pages 149–155.
49. D. Burschka, C. Eberst, C. Robl, and G. Färber. Environmental Modelling and Secure Motion in Unknown Indoor Environments Using Video Sensors. In *Modelling and Planning for Sensor Based Intelligent Robot Systems, Lecturer Notes on Artificial Intelligence, Springer*, 1999.
50. D. Burschka, C. Eberst, C. Robl, and G. Färber. Vision-Based Exploration of Indoor Environments. *Workshop on Robust Vision for Vision-Based Control of Motion at the IEEE International Conference on Robotics and Automation*, WS2, May 1998.
51. Stefan Blum, Darius Burschka, Christof Eberst, Tobias Einsele, Alexa Hauck, Norbert O. Stöffler, and Georg Färber. Autonome Exploration von Innenräumen mit der Multisensorik-Plattform MARVIN. In *Autonome Mobile Systeme, Informatik aktuell*, pages 138–147. Springer-Verlag, 1998.
52. D. Burschka and S. Blum. Identification of 3d Reference Structures for Video-Based Localization. In *Proc. 3rd Asian Conf. on Computer Vision (ACCV'98)*, volume 1, pages 128–135, 1998.
53. D. Burschka and G. Färber. Active Controlled Exploration of 3D Environmental Models Based on a Binocular Stereo System. In *ICAR97*, pages 971–977, Monterey, California, USA, July 1997.
54. D. Burschka, C. Eberst, and C. Robl. Vision Based Model Generation for Indoor Environments. In *ICRA97*, pages 1940–1945, 1997.
55. C. Eberst, D. Burschka, A. Hauck, G. Magin, N. O. Stöffler, and G. Färber. A System Architecture Supporting Multiple Perception Tasks on an Autonomous Mobile Robot. In *4th Int. Symp. on Intelligent Robotic Systems (SIRS'96)*, pages 1–8, 1996.
56. D. Burschka, C. Eberst, A. Hauck, and N. O. Stöffler. Hierarchische Umgebungsmodellierung für Lokalisation, Exploration und Objektidentifikation. In R. Dillmann, U. Rembold, and T. Lüth, editors, *Autonome Mobile Systeme, Informatik aktuell*, pages 132–141. Springer-Verlag, 1995. (engl. Hierarchical Environmental Modeling for Localization, Exploration and Object Identification Purposes.)

57. D. Burschka and C. Eberst. Exploration of Unknown or Partially Known Environments. In *Proc. 2nd Asian Conf. on Computer Vision (ACCV'95)*, volume 2, pages 727–731, 1995.