Çağatay Demiralp

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Research Overview

I am interested in developing mathematical and computational models, algorithms, and interactive tools to explore, understand, and characterize patterns and structures in data. This interest is exemplified in my PhD research. The focus of my thesis work has been *computational brain connectivity*, where I model, visualize, and analyze structural brain connectivity at the scale provided by diffusion imaging.

Education

Ph.D., Computer Science, Brown University, Providence, RI (2006 - present)
Thesis Title: *Computational Brain Connectivity using Diffusion MRI*
Advisor: *David H. Laidlaw*
Committee: *John F. Hughes and David B. Mumford*

Sc.M., Computer Science, Brown University, Providence, RI (2004)

B.Sc., Computer Engineering, Ege University, İzmir, Turkey (2000)

Research Experience

Research Intern, Machine Learning and Perception Group at Microsoft Research Cambridge (Fall 2011)

Graduate Research Assistant, Computer Science Dept, Brown University (2006-present)

Graduate Research Fellow, NLM at the National Institutes of Health (Nov - Dec 2004)

Visiting Research Fellow, Centre for Neuroimaging Sciences, King's College London (Summer 2004)

Graduate Research Assistant, Computer Science Dept, Brown University (2002-2004)

Staff Researcher, Computer Science Dept, Brown University (2000-2002)

Visiting Ugrad Research Assistant, Computer Science Dept, Brown University (May - Sep 1999)

Ugrad Research Intern, Fraunhofer Center for Research in Computer Graphics (Nov 1998 - May 1999)

Awards & Honors

Best Poster Award at IEEE Visualization Conference (2010)

Travel Award to attend Machine Learning Summer School/Workshop at the University of Chicago (2009)

Brain Science Graduate Research Award (2008)

Best Scientific Content and Best Layout and Presentation awards at the American Society for Surgery of the Hand 56th Annual Meeting (2001)

Book Chapters

1. Exploring Brain Connectivity with Two-dimensional Maps. **Ç. Demiralp**, R. Jianu, and D. H. Laidlaw. *New Developments in the Visualization and Processing of Tensor Fields*. LNCS-Springer, 2012.

Journal Publications

6. Exploring Brain Connectivity with Two-dimensional Neural Maps. R. Jianu, **Ç. Demiralp**, and D. H. Laidlaw. *IEEE Trans. Vis. Comput. Graphics*, 2011.
5. Coloring 3D Line Fields Using Boy's Real Projective Plane Immersion. **Ç. Demiralp**, J. F. Hughes, and D. H. Laidlaw. *IEEE Trans. Vis. Comput. Graphics (Proc. IEEE Visualization)*, 2009.
4. Exploring 3D DTI Fiber-tracts with Linked 2D Representations. R. Jianu, **Ç. Demiralp**, and D. H. Laidlaw. *IEEE Trans. Vis. Comput. Graphics (Proc. IEEE Visualization)*, 2009.
3. A Qualitative and Quantitative Comparison of CAVE and Fishtank Virtual-Reality Displays. **Ç. Demiralp**, C. D. Jackson, D. B. Karelitz, S. Zhang, and D. H. Laidlaw. *IEEE Trans. Vis. Comput. Graphics*, 2006.

2. In-vivo Measurement of Contact Areas and Ligament Lengths in the Distal Radioulnar Joint. G. E. Marai, D. H. Laidlaw, **Ç. Demiralp**, S. Andrews, C. M. Grimm, and J. J. Crisco. *IEEE Trans. Biomed. Eng.*, 2004.
1. Visualizing Diffusion Tensor MR Images Using Streamtubes and Streamsurfaces. S. Zhang, **Ç. Demiralp**, and D. H. Laidlaw. *IEEE Trans. Vis. Comput. Graphics*, 2003.

CONFERENCE PUBLICATIONS

8. Generalizing Diffusion Tensor Model Using Probabilistic Inference in Markov Random Fields. **Ç. Demiralp** and David H. Laidlaw. *Proc. Med. Image. Comput. Comput. Assist. Interv. (MICCAI) Workshop on Computational Diffusion MRI*, 2011.
7. Tract-based Probability Densities of Diffusivity Measures in DT-MRI. **Ç. Demiralp** and D. H. Laidlaw. *Proc. Med. Image. Comput. Comput. Assist. Interv. (MICCAI)*, 2010.
6. Surface Deformations Driven by Vector-Valued 1-Forms. G. Taubin and **Ç. Demiralp**. *Proc. Shape Modeling International*, 2010.
5. Similarity Coloring of DTI Fiber Tracts. **Ç. Demiralp** and D. H. Laidlaw. *Proc. Med. Image. Comput. Comput. Assist. Interv. (MICCAI) Workshop on Diffusion Modeling and the Fibre Cup*, 2009.
4. Slicing-based Coherence Measure for Refining Clusters of 3D curves. **Ç. Demiralp**, G. Shakhnarovich, S. Zhang, and D. H. Laidlaw. *Proc. Med. Image. Comput. Comput. Assist. Interv. (MICCAI)*, 2008.
3. Connectivity-aware Sectional Visualization of 3D DTI Volumes Using Perceptual Flat-Torus Coloring and Edge Rendering. **Ç. Demiralp**, S. Zhang, D. F. Tate, S. Correia, D. H. Laidlaw. *Eurographics*, 2006.
2. An Immersive Virtual Environment for DT-MRI Volume Visualization Applications: A Case Study. S. Zhang, **Ç. Demiralp**, D. F. Keefe, M. J. da Silva, D. H. Laidlaw, B. D. Greenberg, P. J. Basser, E. A. Chiocca, C. Pierpaoli T. S. Deisboeck. *Proc. IEEE Visualization*, 2001.
1. Application of Virtual Reality to Visualization of DT-MRI Volumes. S. Zhang, **Ç. Demiralp**, D. F. Keefe, M. J. da Silva, D. H. Laidlaw, B. D. Greenberg, P. J. Basser, E. A. Chiocca,C. Pierpaoli, T. S. Deisboeck. *Proc. Med. Image. Comput. Comput. Assist. Interv. (MICCAI)*, 2001.

CONFERENCE ABSTRACTS & POSTERS

13. Generalizing Diffusion Tensor Model Using Probabilistic Inference in Markov Random Fields. **Ç. Demiralp** and David H. Laidlaw. *Proc. Intl. Soc. Mag. Reson. Med. (ISMRM)*, 2011.
12. Exploring Brain Connectivity with Two-Dimensional Neural Maps. R. Jianu, **Ç. Demiralp**, and D. H. Laidlaw. *Poster Compendium IEEE Visualization* (***Best Poster Award***), 2010.
11. Visualizing and Exploring Tractograms via Two-Dimensional Connectivity Maps. R. Jianu, **Ç. Demiralp**, and D. H. Laidlaw. *Proc. Intl. Soc. Mag. Reson. Med. (ISMRM)*, 2010.
10. Quantitative Tractography Metrics of White Matter Integrity in Diffusion-Tensor MRI Using Diffusivity Scalars. E. Halilaj, **Ç. Demiralp**, S. Correia, and D. H. Laidlaw. *Proc. Intl. Soc. Mag. Reson. Med. (ISMRM)*, 2009.
9. Using Boy's Real Projective Plane Immersion for Coloring DT-MRI Slices. **Ç. Demiralp**, J. F. Hughes and D. H. Laidlaw. *Proc. Intl. Soc. Mag. Reson. Med. (ISMRM)*, 2008.
8. Visualizing Spatial Relations Between 3D-DTI Integral Curves Using Texture Patterns. D. Jianu, W. Zhou, **Ç. Demiralp**, and D. H. Laidlaw. *Poster Compendium IEEE Visualization*, 2007.
7. JointViewer – An Interactive System for Exploring Orthopedic Data. G. E. Marai, **Ç. Demiralp**, S. Andrews, D. H. Laidlaw. *Poster Compendium IEEE Visualization*, 2004.
6. Subjective Usefulness of CAVE and Fishtank VR Display Systems for a Scientific Visualization Application. **Ç. Demiralp**, D. H. Laidlaw, C. Jackson, D. Keefe, and S. Zhang. *Poster Compendium IEEE Visualization*, 2003.
5. Contact Areas and Ligament Lengths are Abnormal in Patients with Malunited Distal Radius Fracture Despite Normal Radioulnar Kinematics. G. E. Marai, D. H. Laidlaw, **Ç. Demiralp**, C. Grimm, J. J. Crisco, D. C. Moore, and E. Akelman. *Proc. 4th World Congress of Biomechanics*, 2002.

4. Visualizing the Differences Between Diffusion Tensor Volume Images. M. J. da Silva, S. Zhang, **Ç. Demiralp**, and D. H. Laidlaw. *Proc. Intl. Soc. Mag. Reson. Med. (ISMRM) Workshop on Diffusion MRI*, 2002.
3. Modeling and Visualization of Inter-Bone Distances in Joints. **Ç. Demiralp**, G. E. Marai, S. Andrews, D. H. Laidlaw, J. J. Crisco C. Grimm. *Proc. IEEE Visualization Work in Progress*, 2001.
2. Visualizing Diffusion Tensor Volume Differences. M. J. DaSilva, S. Zhang, **Ç. Demiralp**, and D. H. Laidlaw. *Proc. IEEE Visualization Work in Progres*, 2001.
1. Interactive Visualization of 3D Carpal Kinematics and Bony Anatomy. J. J. Crisco, **Ç. Demiralp**, D. H. Laidlaw, A-P. C. Weiss, E. Akelman, and S. W. Wolfe. *Scientific Exhibit at the American Surgery of the Hand 56th Annual Meeting* (***Best Scientific Content*** and ***Best Layout and Presentation*** awards), 2001.

PANELS

· Theories of Visualization–Are There Any? *IEEE VisWeek* (2011)

INVITED TALKS

· Cycles of Brain White Matter, *Dagstuhl Seminar* (2011)

· Exploring Brain Connectivity with Two-dimensional Neural Maps, *University College London* (2011)

· Coloring 3D Line Fields Using Boy's Real Projective Plane Immersion, *University of New Hampshire* (2010)

· Manifold Ways of Coloring, *Dagstuhl Seminar* (2009)

TEACHING EXPERIENCE

Teaching Assistant, Computational Topology, Brown University (Spring 2011)

Teaching Assistant, Discrete Mathematics, University of Utah (Fall 2005)

Teaching Assistant, Advanced Algorithms & Data Structures, University of Utah (Spring 2005)

SERVICE

Organizer, VisWeek'11 Panel,*Theories of Visualization–Are There Any?*

Reviewer, *CHI, EuroVis, PacificVis, IEEE Visualization, IEEE Trans. Vis. Comput. Graphics, MICCAI*

Organizer, Brown SciVis Seminars by *Mert R. Sabuncu, Ofer Pasternak, Miriah Meyer, Won-Ki Jeong, Peter Savadjiev*

PhD Admission Committee Member (2011)

Faculty Search Czar (2009 - 2010)

Department LaTeX Administrator (2007 - 2011)

OUTREACH & MEDIA COVERAGE

Exploring Brain Connectivity with Two-dimensional Neural Maps. **Ç. Demiralp**. *Visual Strategies: A Practical Guide to Graphics for Scientists and Engineers* by Felice C. Frankel and Angela H. DePace. Yale University Press, 2012.

"Researchers map, measure brain's neural connections" at *ScienceDaily et al.*

"A New Way to Look at the Brain Using Google Maps" at *Gizmodo et al.*