



Level Set Methods, Visual Grouping, Registration and Medical Image Analysis

IMPORTANT ANNOUNCEMENT: we are sorry to inform you that due to personal reasons S. Osher will not be able to attend and participate at his scheduled MICCAI tutorial session. N. Paragios will then be the single orator presenting the material jointly prepared with S. Osher. For those of you that may want to reconsider their attendance to this tutorial, we offer you to change for another tutorial of the morning session. We are deeply sorry for this late announcement.

The MICCAI organizers.

Description

Image/Vision-based computer aided diagnosis is a growing has become a frequently employed tool in medical imaging. The central idea behind such an application is to compare the form appearance of anatomical structures of individuals with a model and make a decision based on the difference between the actual structure and its projection to the model space. Implicit representations refer to an elegant method to represent geometrical structures in higher dimension. Their use has grown during the past years because of their ability to describe topological structures and multi-component organs and their implicit geometry.

The objective of this tutorial is to gradually introduce the audience to the use of such representations, where first a link between curve propagation and level set methods will be established, then mathematical formulations that allow their as an optimization will be presented and last but not least, the tasks of model-free, model-based segmentation, tracking and registration in medical information processing will be addressed.

Provisional schedule

- **Introduction to the level set method**, NIKOS PARAGIOS (ENPC)
- **Segmentation, registration and tracking in medical image analysis**, NIKOS PARAGIOS (ENPC)

Responsible organiser

Pr. Nikos Paragios, nikos@cermics.enpc.fr

Detailed schedule

- **Introduction to the level set method**, STAN OSHER (UCLA)

Stan Osher received his MS and PhD (1966) from the Courant Institute, NYU. After working at Brookhaven National Laboratory, UC Berkeley and SUNY Stony Brook, he has been at UCLA



since 1976. He is Director of Special Projects at the Institute for Pure and Applied Mathematics at UCLA.

Dr. Osher is the co inventor of i) level set methods for computing moving fronts (8600 references on GOOGLE, ii) ENO, WENO and other numerical methods for computing solutions to hyperbolic conservation laws and Hamilton-Jacobi equations, iii) total variation and other PDE based image processing techniques. He has been a Fulbright and Alfred P. Sloan Fellow, received the NASA Public Service Group Achievement Award, Japan Society of Mechanical Engineers Computational Mechanics Award, was an invited speaker at the International Congress of Mathematicians and recently received the SIAM Pioneer Prize at the ICIAM conference in 2003. He has co-founded 3 companies, based, in part, on his own research. His work has been written up numerous times in the scientific and international media, e.g., Science News, Die Zeit (1999). He is a highly cited researcher according to web-of-science and an Associate Editor of 6 major journals.

<http://www.math.ucla.edu/~sjo/>

- **Segmentation, registration and tracking in medical image analysis, NIKOS PARAGIOS (ENPC)**

Nikos Paragios B.Sc. and M.Sc. (highest honours, valedictorian) in Computer Science [University of Crete (Greece) - 1994,1996] , Ph.D. (highest honours) in electrical and computer engineering [University of Nice/Sophia Antipolis (France) & I.N.R.I.A. , 2000] and Habilitation a Diriger de Recherches (HDR) (in preparation) [University of Nice/Sophia Antipolis (France), 2004]]. Currently, he is professor at the Ecole Nationale de Ponts et Chaussees, leading the vision for augmented reality group at the newly established Center for Research in Computer Science (CERTIS). Prior to that he was affiliated with Siemens Corporate Research (Princeton, NJ) as a project manager (leading the smart cameras and machine vision group) (2002-2004), senior research scientist (2004) at the Real-time Vision and Modeling Department and research scientist (1999-2003) at the Imaging and Visualization Department. In 2002 he was an adjunct professor at Rutgers University and in 2004 at New York University. His PhD dissertation received an honourable mention from the European Union (Cor Baayen award) in 2000. He has co-edited two books (in Level Set Methods and in Video-based Surveillance) and published more than fifty papers in the most prestigious journals and conferences of computer vision. His research interests include image processing, computer vision, augmented reality and medical image analysis. He is a senior member of IEEE, member of the Editorial Board of the International Journal of Computer Vision and has served several times as a guest editor for the most prestigious journals of computer vision.

<http://cermics.enpc.fr/~paragios/home.html>