Topology Preservation in Cortical Reconstruction Using Implicit Surface Evolution

Abstract:
This talk is concerned with automatic methods to find and geometrically represent the cortex of the human brain from magnetic resonance images. Topology preservation is needed in order to guarantee that the resulting surface is anatomically feasible. Desire to exploit the advantages of level set methods for this purpose led to the development of a class of topology preserving geometric deformable models several years ago. Recently, we have extended this work so that it applies to adaptive grids, and have demonstrated significant computational advantages as well as more accurate reconstructed surfaces. The overall process of brain cortex estimation will be described with emphasis on the aspects related to topological preservation. Validation results will be provided and examples of how these methods are being used in neuroscientific research will be given.

Brief Biography:
Jerry L. Prince received the B.S. degree from the University of Connecticut in 1979 and the S.M., E.E., and Ph.D. degrees in 1982, 1986, and 1988, respectively, from the Massachusetts Institute of Technology, all in electrical engineering and computer science. He has worked as an engineer at the Brigham and Women's Hospital, MIT Lincoln Laboratories, and The Analytic Sciences Corporation (TASC). He joined the faculty at the Johns Hopkins University in 1989, where he is currently William B. Kouwenhoven Professor in the Department of Electrical and Computer Engineering and holds joint appointments in the Departments of Radiology, Biomedical Engineering, Computer Science, and Applied Mathematics and Statistics. Dr. Prince is a Fellow of the IEEE and a member of Sigma Xi. He also holds memberships in Tau Beta Pi, Eta Kappa Nu, and Phi Kappa Phi honor societies. He was an Associate Editor of IEEE Transactions on Image Processing from 1992-1995, an Associate Editor of IEEE Transactions on Medical Imaging from 2000-2004 and is currently a member of the Editorial Board of Medical Image Analysis. Dr. Prince received a 1993 National Science Foundation Presidential Faculty Fellows Award and was Maryland's 1997 Outstanding Young Engineer. He is also co-founder of Diagnosoft, Inc., a medical imaging software company. His current research interests are in image processing and computer vision with primary application to medical imaging and has published over 200 articles and abstracts on these subjects.