

**Meeting:** 998, Houston, Texas, SS 18A, Special Session on Designing Frames and Wavelets: From Theory to Digitization

998-00-35

**Wai Lam Chan\*** ([wailam@rice.edu](mailto:wailam@rice.edu)), ECE Department, MS-380, Rice University, P.O. Box 1892, Houston, TX 77251-1892, **Hyeokho Choi** ([choi@ece.rice.edu](mailto:choi@ece.rice.edu)), ECE Department, MS-380, Rice University, P.O. Box 1892, Houston, TX 77251-1892, and **Richard G. Baraniuk** ([richb@ece.rice.edu](mailto:richb@ece.rice.edu)), ECE Department, MS-380, Rice University, P.O. Box 1892, Houston, TX 77251-1892. *Directional Hypercomplex Wavelets for Multidimensional Signal Analysis and Processing.*

We extend the wavelet transform to handle multidimensional functions that are smooth save for singularities along lower-dimensional manifolds. We first generalize the complex wavelet transform to higher dimensions using a multidimensional Hilbert transform. Then, using the resulting *hypercomplex wavelet transform* (HWT) as a building block, we construct new classes of nearly shift-invariant wavelet frames that are oriented along lower-dimensional subspaces. The HWT can be computed conveniently using a 1-D dual-tree complex wavelet transform along each function axis. We demonstrate how the HWT can be used for fast line detection in 3-D. (Received January 03, 2004)