

## Signal Processing Seminar

**Title:** Order Relation Based Image Compression Using a Quadtree Decomposition

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**Date:** Wednesday, October 22, 2008

**Time:** 4:00 - 5:00 pm

**Where:** 4269 Beckman Institute

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**Abstract:** The main task in every kind of image processing is finding an efficient image representation that characterizes the significant image features in a compact form. Geometry is at the heart of perception and is required to improve state of the art image processing algorithms. Moreover understanding how to represent complex geometrical structures and derive sparse representations is a key issue for image compression.

During the past decades, according as simple wavelet domain modeling framework based on zerotrees has been successfully applied in image coders, wavelet transforms became the foundation of most state of the art image coders such as JPEG2000. Actually, wavelet transforms are able to efficiently capture and characterize 1-D singularity but not so good for 2-D singularities such as edges, ridges, or other geometrical features.

Recently, several modified wavelet transforms which take edge flow or texture orientation into account have been developed. These transforms include curvelet, ridgelet, bandelet, wedgelet, contourlet, and directionlet. Some of these new transforms have shown successful applications in image denoising and enhancement. However, their potential in highly efficient image compression remains still unclear. One of the major reasons is that these methods cause significant over-sampling which prevents efficient data compression.

Until now, many researchers have made efforts to solve the problem of 2D singularity by finding good basis. In this seminar, we will introduce a new approach to solve the problem. The key point of our approach is that an uncertainty contained in images is highly related with an order relation. Conceptually, our approach converts a hard-to-compress image having 2D geometric features into an easier-to-compress one by changing a local structure based on a predefined order relation. In the aspect of frequency, our one converts a high frequency signal into a low frequency one which can be easily compressed, and as a result, significantly improves the coding gain of DCT based transform coding.