COURSE ANNOUNCEMENT SPRING 2008

MATH 4370 (MATH 5311) – Discrete Wavelets and Image Compression

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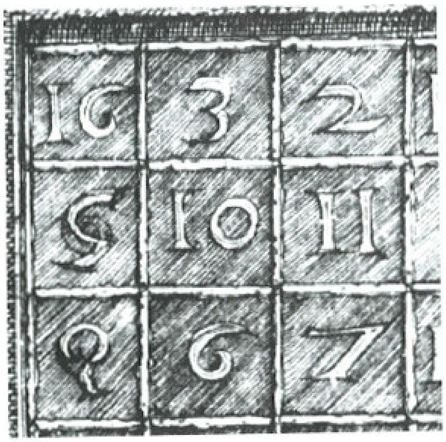
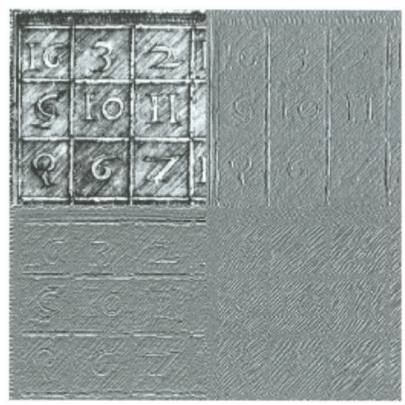
MW 18:30-19:50 UGLC 230 CRN 26522 (CRN 23860)



You will learn about discrete wavelet transforms and their applications. For now, think of the transform as a matrix that we will multiply with a vector (audio) or another matrix (image). The resulting product is much better suited for performing tasks such as compression, de-noising, or edge detection, than the original input. A wavelet filter is simply a list of numbers that is used to construct the wavelet matrix. Of course, this matrix is very special and as you might guess, some thought must go into its construction. What you will learn is that the ideas used to construct wavelet filters and wavelet transform matrices draw largely from calculus and matrix algebra.



You will need to learn about convolution and Fourier series, but soon you will be building wavelet filters and transformations. It will surprise you that the construction is a bit ad hoc. On the other hand, problem-solving often utilizes ideas from different areas. You will see why you need to perform these tasks since the questions you will be asked often start with “de-noise this signal”, “compress this image”, or “build this filter”. At first you might find it difficult to solve problems without clear-cut instructions, but understand that this is exactly the approach used to solve problems in mathematical research or industry. At some point, we will need to develop some mathematical theory in order to build more sophisticated wavelet filters. The hope is by the time you reach this point, you will understand the applications to the point where you are highly motivated to learn the theory. *(Adopted from P. Van Fleet’s book - the one that we will be using in this course.)*

The course will consist of a mixture of traditional lecture and computer lab work. You will use *Mathematica*, but prior knowledge of this software is not required.

Prerequisites for this class include a working knowledge of Calculus II; some very minimal knowledge of matrix algebra will also be helpful. On the other hand, this is an upper-division course for math majors, so I expect students to have some mathematical maturity (≈ familiarity with the method of proof).

This course can count as an **upper-division math elective** for math majors.

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