Wavelet Transforms in C++

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1 Proposal

We would like to implement wavelet transforms (or fast wavelet transforms) in C++ in frequency using Fourier Transforms. We would like to write the FFT routine in parallel, generate the filters used in parallel, and do the matrix multiplication routine in parallel with my own code.

Here is the process we will use:

- Make the filters in frequency in parallel.

- Calculate FFT of original image using a parallel routine.

- Do matrix multiplication for FFT in parallel and calculate IFFT in parallel.

We would like to use openMP for these routines first so that we can use it on CPUs. Then we would like to use CUDA so that we can do these routines on a GPU also.

The dataset we will try to use this on the Yale Faces Dataset and see the results on a subset of images. Wavelet Transforms are already implemented in Python/using libraries, so we want to see if it is better than the other implementations out there. A success if it was faster than the python implementations.

We would like to compare this to a wavelet transform routine that is written in python, the pywavelet routine, and a C++ implementation without being in parallel.

Goals:

- Implement filters in parallel by first week of November.

- Implement 2D FFT and 2D IFFT in parallel by middle of November.

- Implement matrix multiplication by third week of November or use LL-PACK library if we run out of time.

- Write paper over the last two weeks.