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Final Project Abstract/Proposal

I propose to a recreation of the results detailed in “An Improved Chirp Type Blind Watermarking Algorithm Based on Wavelet and Fractional Fourier Transform”. In this article, Discrete wavelet transforms are used to embed a watermark into the low frequency sub-band of the 2D image. Later, a fractional Fourier Transform is used to extract the watermark for distortion and error measurements. Various forms of image distortions (described as “attacks”) are preformed to test the reliability of the 2D chirp (or variable frequency) watermark. The attacks tested are image cropping, image rotation, and applied noise. These results are compared to spatial domain water marking.

I plan to replicate the results of this article by implementing the same fractional Fourier transform algorithm, including the selection of Hermite polynomial order. I will then replicate the 2D chirp signal described in the article and embed it into the image’s low frequency sub-band, as described in the article. Once this is done, I will use wavelet transforms and the fractional Fourier transform to pull the watermark out of the image again and analyze any error present. I will the repeat this for the same attack cases (cropping, rotation, and noise) as discussed in the paper. If the image is not obtainable from our course textbook files or online repositories, the effects can be easily measured on other images of comparable image characteristic. All work done for this project will be done in Matlab.

Barring any setbacks or other delays in progress there is an interesting opportunity to expand upon the work done in this article. The first avenue of advancement of research through this methodology is to compare water marking effects across images with differing frequency distributions. The second avenue would be to conduct an attack of local spatial tampering, as suggested by the article.

Reference(s):

D. Wang, D. Li, Y. Jun and F. Chen, "An Improved Chirp Typed Blind Watermarking Algorithm Based on Wavelet and Fractional Fourier Transform," *Fourth International Conference on Image and Graphics (ICIG 2007)*, 2007, pp. 291-296, doi: 10.1109/ICIG.2007.38.