IMAGE PROCESSING USING FOURIER TRANSFORM

Image processing:

The Fourier Transform is an important image processing tool which is used to decompose an image into its sine and cosine components. The output of the transformation represents the image in the *Fourier* or [frequency domain](https://homepages.inf.ed.ac.uk/rbf/HIPR2/freqdom.htm), while the input image is the [spatial domain](https://homepages.inf.ed.ac.uk/rbf/HIPR2/spatdom.htm) equivalent. In the Fourier domain image, each point represents a particular frequency contained in the spatial domain image.

The Fourier Transform is used in a wide range of applications, such as image analysis, image filtering, image reconstruction and image compression.

Fourier analysis is used in image processing in much the same way as with one-dimensional signals.

 Taking the Fourier transform of an image converts the straightforward information in the spatial domain into a scrambled form in the frequency domain.

[the Fourier transform has extensive applications to signal processing. A number of signal processing techniques, such as filtering, are modeled using the convolution of two functions. Since the convolution is very computationally intensive, especially so in higher dimensions, it is common practice to take advantage of the Convolution Theorem [2].

If we first compute the transform of each function, multiply the transformed functions, and finally compute the inverse transform of their product, the result is exactly the convolution of the two initial functions. The greatest advantage comes when considering the symmetries of the Fourier transform, allowing us to perform fewer computations for the forward and inverse transforms. Some of these symmetries, along with memory-management techniques, allow a far more computationally efficient algorithm for computing the Fourier transform on discrete data sets]