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FULL DESCRIPTION OF FIGURES

FIG. **1**: This is a flowchart showing the primary steps for the extraction of the filter function and the deconvolution of an image.

FIG. **2**: This series of images demonstrates the most basic process from start to finish. An image of Saturn (FIG. **2**A) is shown that was taken by the Hubble telescope before the optical correction took place in late 1993. The first step is to take the Fourier transform of the image (FIG. **2**B). The phase information is discarded and a power law using $\alpha=0.5$ is applied to the image. A smoothing filter is applied to this result (FIG. **2**C). Now this image can be used for D(u, v) in Equation 4 to deconvolve the image. The deconvolution is shown in FIG. **2**D. FIG. **2**E shows an enlarged view of the Fourier transform of D(u, v). also referred to as the point spread function.

FIG. **3**: FIG. **3**A was taken from the space probe Galileo of the surface of the moon Io of Jupiter. Although the image already exhibits a fair amount of high resolution, application of this process brings out more detail. FIG. **3**B shows the restoration result after applying the algorithm with a frequency-dependent α.

FIG. **4**: This image (FIG. **4**A) was photographed using a standard camera and digitized. The resulting blur stems from both the original photograph and from the digitization process. A single application of the process (FIG. **4**B) removes both blurs in a single iteration.

FIG. **5**: FIG. **5**A is an ultrasound waveform that traveled through a centimeter of air. In this frequency range, the higher frequencies are strongly attenuated by air. The frequency-dependent alpha function was determined using Equation 18, producing an appropriate point spread function. The data was deconvolved using the extracted PSF, also shown in FIG. **5**A. The red line is the original ultrasound wave and the green line is the deconvolution of the waveform. FIG. **5**B shows the frequency spectra of the two waves. Note the recovered peaks in the restored waveform and the improved higher frequency response.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A non-iterative method for identifying signal degradation comprising the following steps:

a) applying a transform to the signal, in part or whole, to represent said signal as a frequency spectrum, said frequency having phase information;

b) applying a power law to the result of step (a) to form a filter function;

whereby the filter function or inverse transform of said filter function is used to identify system degradation.

2. The method of claim **1**, further including the step of discarding said phase information of said frequency spectrum.

3. The method of claim **1**, further including the step of applying a smoothing function.

4. The method of claim **2**, further including the step of applying a smoothing function.

5. The method of claim **4**, wherein the order in which the claimed steps are performed is changed.

6. The method of claim **1**, further comprising the step of using said filter function or inverse transform of said filter function to remove aberrations, improve the quality, or alter the characteristics of said signal.

7. The method of claim **1**, further including the step of defining the value of said power law to be a constant of frequency, and determining the value of said power law by calculation, estimate, or guess.

8. The method of claim **1**, further including the step of defining the power law to be dependent on frequency, and determining the value of said power law by calculation, estimate, or guess.

9. A non-iterative method for identifying signal degradation comprising the following steps:

a) applying a transform to the signal, in part or whole, to represent said signal as a frequency spectrum, said frequency having phase information;

b) defining a power law to be dependent on frequency, and determining the value of said power law through comparison of said signal with a synthetic or empirical frequency spectrum representative of the desired result; and

c) applying said Dower law to the result of step (a) to form a filter function;

whereby the filter function or inverse transform of said filter function is used to identify system degradation wherein said determining step comprises determining said power law.

10. The method of claim **1**, wherein said applying step includes applying said transform to a multi-dimensional image or series of images.

11. The method of claim **1**, further comprising using a data processor to carry out the previously claimed steps.

12. The method of claims **1**, further comprising using a series of electronic circuits to carry out the previously claimed steps.

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