BLIND IMAGE DECONVOLUTION USING A NON-SEPARABLE POINT SPREAD FUNCTION

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This paper considers the problem of the removal of blur from an image that is degraded by a non-separable point spread function (PSF), when information on the PSF is not known. The non-separable nature of the PSF implies that two blurred images, taken by the same system such that the PSF can be assumed to be the same for both images, are required to determine the PSF. The most difficult part of the computation is the determination of the size of the PSF because this problem reduces to the determination of the rank of two matrices (one matrix for the horizontal component of the PSF and one matrix for the vertical component of the PSF). It is shown that this computation requires the determination of the greatest common divisor of two polynomials, after they have been transformed to the Fourier domain. The Sylvester resultant matrix and its subresultant matrices are used for this computation. A structure-preserving matrix method is used to perform each deconvolution, and thereby compute deblurred forms of the given blurred images because this method preserves the Tœplitz structure of the coefficient matrix in the linear algebraic equation.

The presentation includes examples that demonstrate the method.