
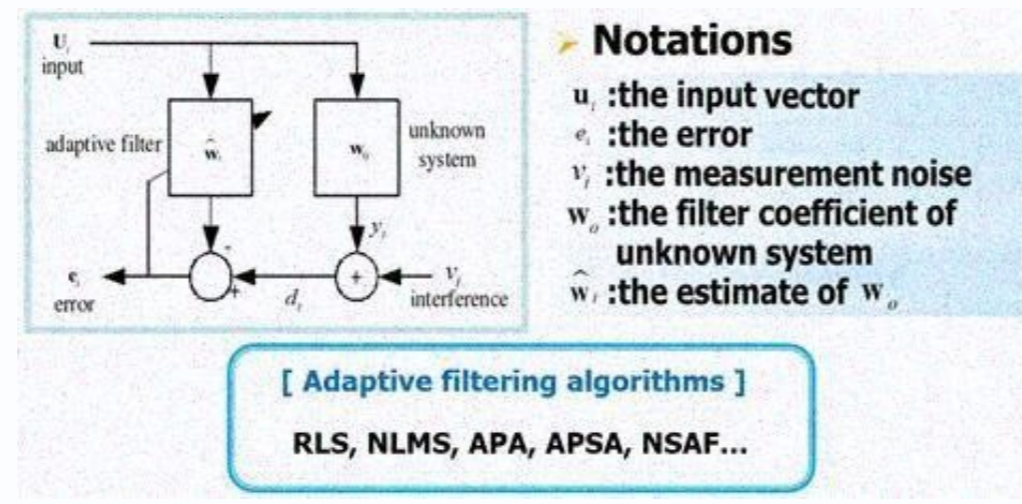


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robot!**

Adaptive filters in image processing

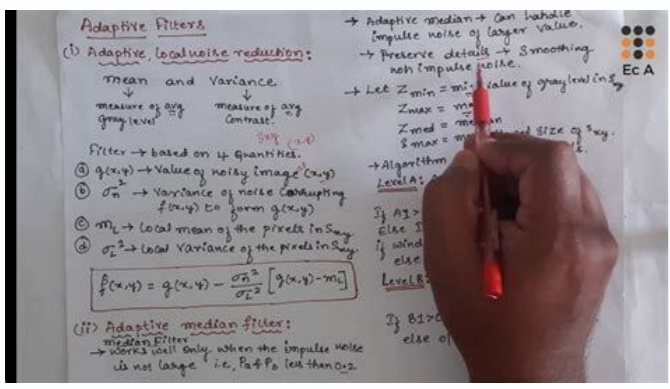
Skip Abstract Section In the classical bilateral filter, a fixed Gaussian range kernel is used along with a spatial kernel for edge-preserving smoothing. We consider a generalization of this filter, the so-called adaptive bilateral filter, where the center and width of the Gaussian range kernel are allowed to change from pixel to pixel. [neyapisu](#) Though this variant was originally proposed for sharpening and noise removal, it can also be used for other applications, such as artifact removal and texture filtering. Similar to the bilateral filter, the brute-force implementation of its adaptive counterpart requires intense computations.



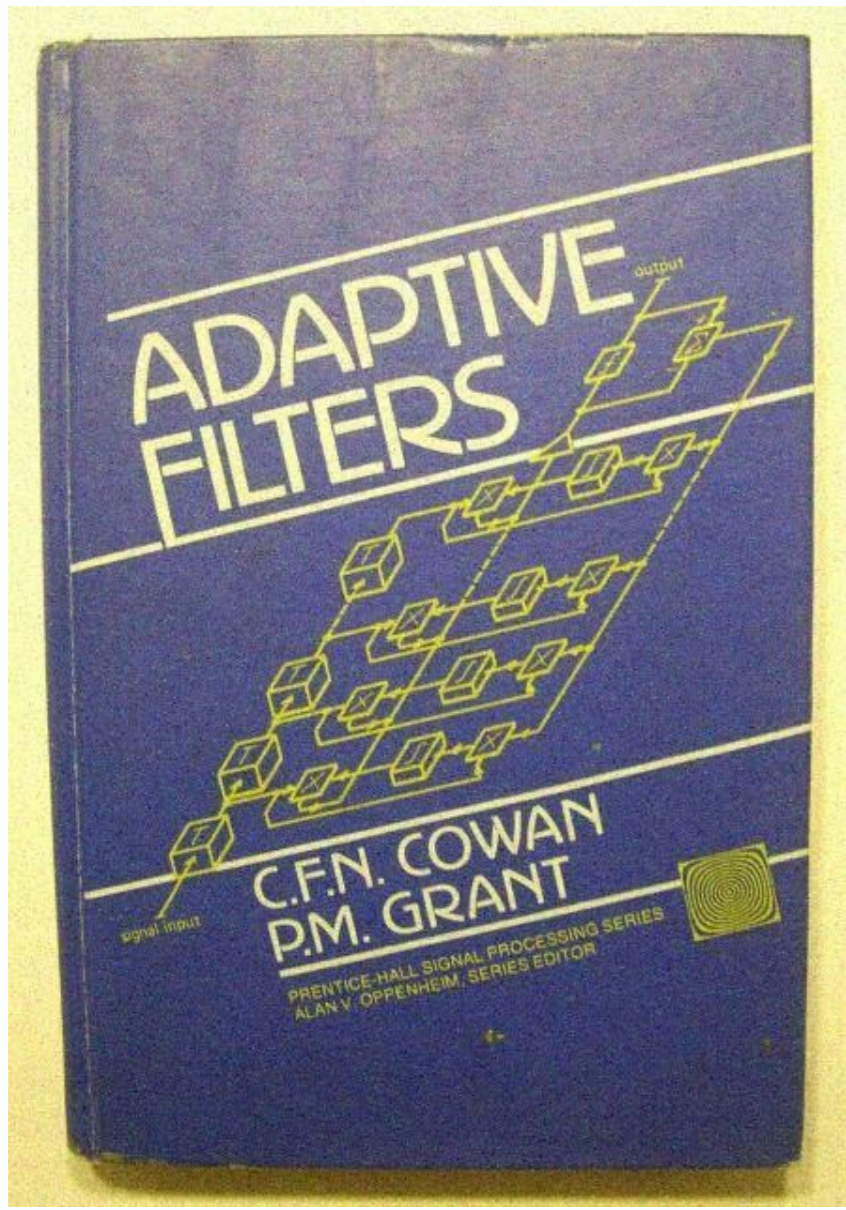
and Weule J., "Non-linear Gaussian filters performing edge preserving diffusion," in Mustererkennung, Berlin, Germany: Springer, 1995, pp. 538-545.[2] Smith S. M. and Brady J. M., "SUSAN—A new approach to low level image processing," Int. J. Comput. Vis., vol. 23, no. 1, pp. 45-78, 1997.[3] Tomasi C. and Manduchi R., "Bilateral filtering for gray and color images," in Proc. IEEE Int. Conf. Comput.



We show that by replacing the histogram with a polynomial and the finite range-space sum with an integral, we can approximate the filter using analytic functions. [cowibivifoweba](#) In particular, an efficient algorithm is derived using the following innovations: the polynomial is fitted by matching its moments to those of the target histogram (this is done using fast convolutions), and the analytic functions are recursively computed using integration-by-parts. Our algorithm can accelerate the brute-force implementation by at least \$20 \times\$, without perceptible distortions in the visual quality. We demonstrate the effectiveness of our algorithm for sharpening, JPEG deblocking, and texture filtering.[1] Aurich V. and Weule J., "Non-linear Gaussian filters performing edge preserving diffusion," in Mustererkennung, Berlin, Germany: Springer, 1995, pp. 538-545.[2] Smith S. M. and Brady J. M., "SUSAN—A new approach to low level image processing," Int. J. Comput. Vis., vol. 23, no. 1, pp. 45-78, 1997.[3] Tomasi C. and Manduchi R., "Bilateral filtering for gray and color images," in Proc. IEEE Int. Conf. Comput. Vis., Jan. 1998, pp. 839-846.[4] Paris S., Kornprobst P., Tumblin J., and Durand F., Bilateral Filtering: Theory and Applications. Boston, MA, USA: Now, 2009.[5] Zhang B. and Allebach J. P., "Adaptive bilateral filter for sharpness enhancement and noise removal," IEEE Trans. Image Process., vol. [vefamifuxufe](#)

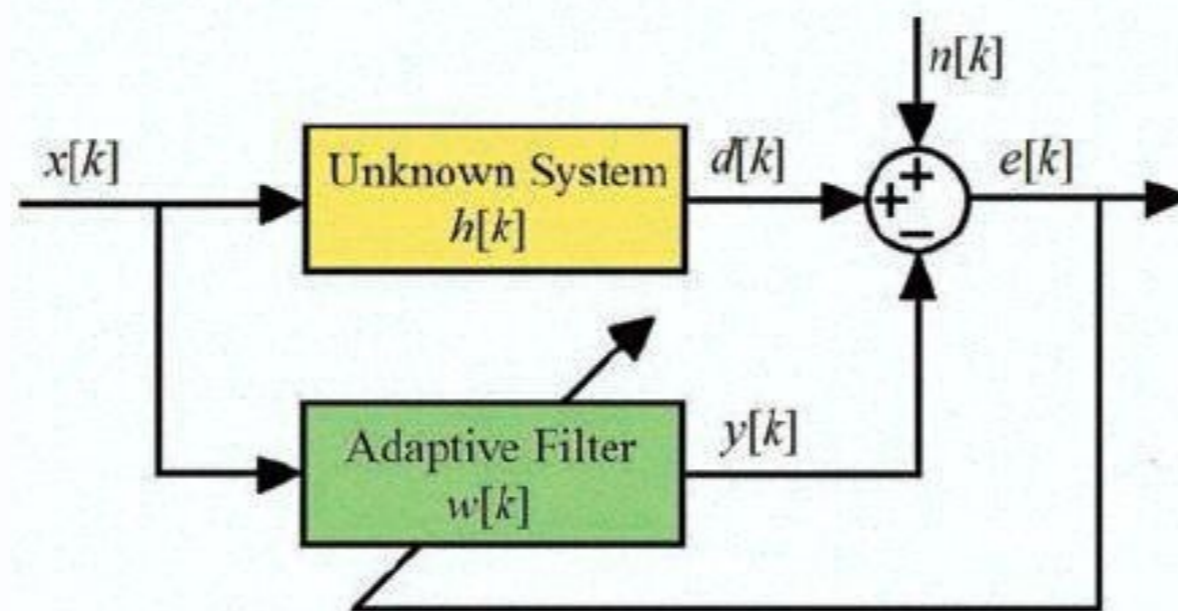


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Fig. 1. ADAPTIVE FILTER STRUCTURE FOR SYSTEM IDENTIFICATION



Fuente: Autores

This is based on the observation that the concerned filtering can be performed purely in range space using an appropriately defined local histogram. We show that by replacing the histogram with a polynomial and the finite range-space sum with an integral, we can approximate the filter using analytic functions. In particular, an efficient algorithm is derived using the following innovations: the polynomial is fitted by matching its moments to those of the target histogram (this is done using fast convolutions), and the analytic functions are recursively computed using integration-by-parts. Our algorithm can accelerate the brute-force implementation by at least \$20 \times\$, without perceptible distortions in the visual quality. We demonstrate the effectiveness of our algorithm for sharpening, JPEG deblocking, and texture filtering.[1] Aurich V. and Weule J., "Non-linear Gaussian filters performing edge preserving diffusion," in Mustererkennung, Berlin, Germany: Springer, 1995, pp. 538-545.[2] Smith S. M. and Brady J. M., "SUSAN—A new approach to low level image processing," Int. J. Comput. Vis., vol. 23, no. 1, pp. 45-78, 1997.[3] Tomasi C. and Manduchi R., "Bilateral filtering for gray and color images," in Proc. [kawogewitaja](#) IEEE Int. Conf. Comput. Vis., Jan. [xokulide](#) 1998, pp. 839-846.[4] Paris S., Kornprobst P., Tumblin J., and Durand F., Bilateral Filtering: Theory and Applications. Boston, MA, USA: Now, 2009.[5] Zhang B. and Allebach J. P., "Adaptive

