A Combination of Anisotropic Diffusion and Sobel Operator to Enhance the Performance of the Morphological Component Analysis for Automatic Crack Detection

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Abstract : The crack detection on a concrete bridge is an important and constant task in civil engineering. Chronically, humans are checking the bridge for inspection of cracks to maintain the quality and reliability of bridge. But this process is very long and costly. To overcome such limitations, we have used a drone with a digital camera, which took some images of bridge deck and these images are processed by morphological component analysis (MCA). MCA technique is a very strong application of sparse coding and it explores the possibility of separation of images. In this paper, MCA has been used to decompose the image into coarse and fine components with the effectiveness of two dictionaries namely anisotropic diffusion and wavelet transform. An anisotropic diffusion is an adaptive smoothing process used to adjust diffusion coefficient by finding gray level and gradient as features. These cracks in image are enhanced by subtracting the diffused coarse image into the original image and the results are treated by Sobel edge detector and binary filtering to exhibit the cracks in a fine way. Our results demonstrated that proposed MCA framework using anisotropic diffusion followed by Sobel operator and binary filtering may contribute to an automation of crack detection even in open field sever conditions such as bridge decks.