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Iterative Segmentation and Application of Hausdorff Dilation Distance in Defect Detection

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Abstract : Inspection of surface defects on metallic components has always been challenging due to its specular property. Occurrences of defects such as scratches, rust, pitting are very common in metallic surfaces during the manufacturing process. These defects if unchecked can hamper the performance and reduce the life time of such component. Many of the conventional image processing algorithms in detecting the surface defects generally involve segmentation techniques, based on thresholding, edge detection, watershed segmentation and textural segmentation. They later employ other suitable algorithms based on morphology, region growing, shape analysis, neural networks for classification purpose. In this paper the work has been focused only towards detecting scratches. Global and other thresholding techniques were used to extract the defects, but it proved to be inaccurate in extracting the defects alone. However, this paper does not focus on comparison of different segmentation techniques, but rather describes a novel approach towards segmentation combined with hausdorff dilation distance. The proposed algorithm is based on the distribution of the intensity levels, that is, whether a certain gray level is concentrated or evenly distributed. The algorithm is based on extraction of such concentrated pixels. Defective images showed higher level of concentration of some gray level, whereas in non-defective image, there seemed to be no concentration, but were evenly distributed. This formed the basis in detecting the defects in the proposed algorithm. Hausdorff dilation distance based on mathematical morphology was used to strengthen the segmentation of the defects.

Keywords : metallic surface, scratches, segmentation, hausdorff dilation distance, machine vision
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