

Abstract

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Binary image enhancement via augmented self organizing mapping artificial neural network

Vision systems play an important role in modern metrology. They have wide applications in the fields of on-line measurements and nano-meterology. Edge boundary enhancement has been a major area of research in algorithm development. Many mathematical techniques were developed to achieve this enhancement of the image boundaries and background. The smoothness of the feature edges has great effects on the measured dimension accuracy. Dirt, swarf, and light spots degrade the edge smoothness and introduce inaccuracies in the analysis. This research introduces a new filter, which enhances the feature edges smoothness. In addition, it is able to correct the spiky points in the feature and in the background. Humanistic intelligence, as a basis for intelligent image processing, is simulated in this new filter through an artificial neural network suite. The base of the filter is a self organizing mapping (SOM) neural network with two-dimensional array in the input and output layers. For decoding purpose of the net output, a feed forward neural network layer is used to augment the SOM neural network. This research presents the design and the training schemes for the neural network. The results obtained showed the filter ability to enhance the smoothness of the tested image edges. The results also showed that the filter is capable of removing the spiky points from both the feature and its background. This paper is a step towards the full incorporation of artificial intelligence into modern vision systems.