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An Effective Image Based Surface Roughness Estimation Approach Using Neural Network

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Abstract

The accurate measurement of surface roughness is essential in ensuring the desired quality of machined parts. The most common method of measuring the surface roughness of machined parts is using a surface profilometer with a contact stylus, which can provide direct measurements of surface profiles. This method has its own disadvantages such as workpiece surface damage due to mechanical contact between the stylus and the surface. In this paper we proposed a contactless method using image processing and artificial neural network as a pattern classifier. Having trained the network for any specific workpiece with 10 sample patterns, the system would learn how to approximate the actual surface roughness with 3D texture features of the surface image. The input parameters of a training model are RaArea and RqArea, defined parameters for gray level of surface image, arithmetic mean value, and standard deviation of gray levels from the surface image, without involving cutting parameters (cutting speed, feed rate, and depth of cut). Experimental results show effectiveness of this estimation method.

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