Spatial Prediction Methods Applied to Rendering of Round Features

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Abstract

Spatial prediction models are briefly reviewed in an attempt to apply the methodology to a manufacturing problem of geometric-shape estimation from the data obtained by 3-D coordinate measuring machines(CMM). Traditionally, there have been two major streams of research in spatial interpolation and prediction: kriging and splines. While stochastic kriging and deterministic spline models differ from each other in origin and professed objectives, the latter may be viewed in terms of the former; in particular in terms of intrinsically stationary isotropic kriging. Keeping in mind the equivalence of kriging and splines, their common basis in such matters as model building and validity checking of kernel functions are reinvestigated and identified as general least squares method (GLSM), with a view to an application to 3-D rendering of machined or used parts. Our main illustrative emphasis is placed on the engineering problem of characterizing the attained shape of manufactured objects intended to be "round", such as circles, spheres, cylinders and toruses. The approach proposed in this study can find its wide applicability in the area of manufacturing, especially for geometric representation of form-errors of machined parts or wear-pattern of abraded parts.

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