The 6-degree of freedom stitching method for the freeform surface

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As ultra-precision machining systems improve, freeform surfaces such as Fresnel lens, microstructured surface, smooth surface are widely applied. As a consequence, the techniques to machine and measure freeform surface are also drawing attention. To measure freeform surface, the required resolution is very high that leads to too small measuring range when using optical instruments. Therefore there are several stitching methods. These methods are available only when the models or equations for the surface are known such as plane, sphere, aspheric lens. For the freeform surface which cannot be represented with a single universal equation, conventional stitching methods have a critical limitation to be applied to. In this research, a 6-degree of freedom stitching method for the freeform surface for freeform surface is proposed. The proposed stitching is a method which combines calculation for regression plane and 2D cross correlation for a local data. The stitched results for various freeform surfaces are shown, analyzed and evaluated.