

先端科学技術研究科 修士論文要旨

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要旨			
<p>When cutting metal, the rapid metal-cutting process often leaves numerous scratches on the metal cutting surface. Hence, it becomes crucial to evaluate the aesthetic appearance of this surface. In order to facilitate aesthetic assessment, computer graphics (CG) techniques are expected to predict the appearance of the metal cutting surface and visualize the scratches using simulated micro-shape data before the actual metal cutting takes place. This study introduces two distinct methods for visualizing scratches on metal cutting surfaces. The first method relies on the quantitative evaluation of scratches utilizing the geometry of the metal cutting surface. Applying Principal Component Analysis (PCA) to the normal distribution on the metal cutting surface enables us to clearly discern scratches by visualizing the variance of the normal distribution. However, the quantitative evaluation alone is insufficient for assessing the aesthetic appearance of the metal cutting surface since it does not capture how these scratches are perceived by the human eye. In other words, qualitative evaluation of scratches becomes equally significant. To address this, we propose a visualization method that integrates both qualitative and quantitative evaluations of scratches. Built upon ray tracing, this approach introduces auxiliary rays for the original camera ray to calculate the normal change from the metal cutting surface and incorporates it into the rendering process. Our method not only simulates how scratches are perceived by the human eye but also clearly visualizes scratches that are noticeable to human observers.</p>			