

# Piecewise Transfer Function Identification and Tracking Error Prediction Based on Trajectory Acceleration

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*Diamond turning of microlens arrays poses a significant challenge in balancing machining efficiency with surface profile accuracy, primarily due to the rapid variations in the spatial frequency of the microlens. This study introduces a piecewise transfer function identification method, modeling the machine tool as a dynamic system whose behavior varies with trajectory acceleration. Utilizing the piecewise transfer function, an axis tracking error predictive model has been developed and experimentally validated. The proposed predictive model approach can accurately predict axis tracking errors, achieving a local minimum deviation of 30 nm and an RMSE of 4 nm. This method provides a convenient tool for predicting surface profile errors and offers valuable insights for compensating machining errors.*

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