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## Turning Process Monitoring with Deep Neural Network Trained by FEM Simulation

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### Abstract

Metal cutting is a complex process in machining where a direct measurement at the contact point between a cutting tool and workpiece is not straight forward. However, a numerical approach, such as the metal cutting finite element method (FEM), can provide the distribution of quantities (e.g., residual stress) that are usually not measured during actual machining. In this study, we attempt to develop an integrated approach in which the information obtained from the FEM is correlated with actual machining images using deep neural networks, such that the information can be referenced during machining. The feasibility of the proposed approach is assessed by experimental images obtained from turning experiments. The feed and corresponding effective stress are verified to be estimated from the experimental images.

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