Unsupervised anomaly detection using acoustic emission signal for milling processes

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Résumé

In industrial machining processes, tool failures may result in losses in surface and dimensional accuracy of a finished part, or possible damage to both the work piece and the machine. Consequently, tool condition monitoring has become essential to achieve high-quality machining as well as cost-effective production. Moreover, cutting tool degradation may vary considerably under different operation conditions and materials behaviour. In this study the acoustic response of the cutting tool during the milling process is measured with the help of a microphone. In fact, microphones are easier to install in a milling machining center than vibration sensors. Different milling experiments were conducted for several conditions and tool failures, from which features were calculated in time and frequency domains. Unsupervised machine learning approaches (distance-based clustering, similarity detection ,...) have been applied and compared. Thus, all the tool defects have been automatically identified and classified separately: one damaged tooth, several damaged teeth, all damaged teeth, a missing teeth.

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