Wavelet transform and mel-frequency cepstral coefficient-based feature extraction of the sheet metal trimming process to study burr formation

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Abstract: The sheet metal trimming process is extensively employed to achieve the final shape of components. However, burr formation is a major quality related issue of trimmed parts, and the burr height could be utilised to assess the quality of the component. Punch wear and material thickness variation were considered significant parameters, causing deviation in the burr height. This study proposes the pragmatism of the wavelet transform (WT) coupled with mel-frequency cepstral coefficients (MFCCs) to extract acoustic signal features to examine burr formation. The MFCCs of features indicate variations in the process parameters. Furthermore, the experimental results reveal a correlation between burr formation and MFCCs. These results suggest that the WT, coupled with MFCCs, can be useful in retrieving features pointing burr formation. Thus, features of the signal could be used to monitor the burr height, and these would prevent the need for offline burr height measurement, reworking, and scrapping.

Keywords: sheet metal trimming; MFCCs; mel-frequency cepstral coefficients; acoustic emission; feature extraction; monitoring.

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