



## 论文摘要

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### 基于瞬态特征的钻削过程与监控信号映射模型

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**摘要:** 为实现批量钻削工序质量在线监测和分析, 根据钻削加工特性、切削刃与工件的接触受力状况以及多维监控信号的分析, 将一个钻削过程划分为7个阶段。通过分析实验中功率信号和声信号在钻削过程中各阶段的变化特征, 采用离散RMS分析和离散求导方法进行特征识别, 提取与钻削过程7个阶段相对应的功率和声信号变化特征点, 并建立钻削过程与监控信号的特征映射模型。研究表明: 该模型可在0.7%的时间误差范围内找到钻刃刃尖切入特征点, 0.05%的时间误差范围内找到钻刃完全切入特征点, 1.2%的时间误差范围内找到钻刃刃尖切出特征点以及1.1%的时间误差范围内找到钻刃完全切出特征点, 因此, 可在1.2%左右的时间误差范围内, 建立监控钻削加工过程中功率信号和声信号与钻削过程在时间上的同步映射关系。该模型可用于钻削过程与监控信号映射机理的进一步研究。

**关键字:** 钻削过程; 映射模型; 瞬态特征; 功率信号; 声发射信号

### Mapping between phases and signals in drilling process based on transient features of signals

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**Abstract:** In order to study the machine quality of mass-drilling-production on line, the process of drilling was divided into 7 stages according to the analysis of the force situation, the contacts between the drilling blade and the work piece. Based on the discrete RMS analysis and discrete derivation of signals, transient feature points of power signals and acoustic signals were found through data mining, and the mapping model of drilling process and monitor signals could be built based on these transient characteristics. The results show that when drill tip start to cut in the feature points can be found from power and acoustic signals in the time error of 0.7%, when drill blade totally cut in the feature points can be found in 0.05%, when drill tip start to cut out the feature points can be found in 1.2% and when drill blade totally cut out can be found in 1.1%. So the corresponding changes range of the signals can be drawn out to match 7 stages within 1.2%. The mapping model is also helpful to study the drilling mechanism in different stages further.

**Key words:** drilling process; mapping model; transient feature; power signal; acoustic signal

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