

煤矿生产系统干扰事件的离散小波变换检测

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Title: Interference events detection in mine production system based on discrete wavelet transform

作者: [王汉斌](#); [张竹欣](#);
太原理工大学经济管理学院;

Author(s): [WANG Han-bin](#); [ZHANG Zhu-xin](#)
chool of Economics and Management, Taiyuan University of Technology, Taiyuan 030024, China

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摘要: 小波变换常用于数字信号传输的噪声检测与处理,为了检测煤矿生产系统中的突发事件,将其模拟为数字信号传输中的干扰,构建系统稳态方程和对应的扰动方程,根据离散小波变换原理,将煤矿生产系统中的监测数据分解为近似部分和细节部分,再进行离散变换。采用多尺度边缘检测法,由光滑后的一阶和二阶导数检测出信号的模极大值点即为瞬态突变点。将A矿记录到的瓦斯浓度监控数据进行可行性分析后,在MATLAB的wavelet工具中对该瓦斯浓度监控数据作离散小波变换,找到四个瓦斯浓度瞬态突变点,那么这四个时刻发生了煤与瓦斯突出事件。结果表明该方法简单、实用性强。据此从计算机实时监控和现场技术防突方面提出应对煤矿干扰事件的措施。

Abstract: Wavelet transform is commonly used on noise detection and treatment of digital signal transmission. To detect emergencies in coal production systems, these emergencies were simulated as the events of interference in digital signal transmission. And the system steady-state equation and the corresponding perturbation equation were built. According to discrete wavelet transform theory, monitoring data in mine production system was decomposed into approximate part and detailed part, and then discretely transformed. Multi-scale edge detection method was used with smoothed first and second derivative, to find that modulus maxima points were transient abrupt-change points which we just need. Gas concentration monitor data of Mine A was feasibility analysed, and discrete wavelet transformed using wavelet tools in MATLAB. Four transient abrupt-change points were found and the results showed that on the four times there happened coal and gas outburst events. The concluding was that the method was simple and practical. Accordingly, in terms of computer real-time monitoring and on-site technology conflict prevention, some measures were put forward to deal with mine disturbance events.

参考文献/REFERENCES

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