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Automatic First Arrival Identification System of AE Signals by Means of High-Order Statistics Approach

T. Lokajicek (1), K. Klima (1)

(1) Institute of Rock Structure and Mechanics, Academy of Sciences of the Czech Republic, Czech Republic (tl@irsm.cas.cz)

One of the fundamental problems in nondestructive testing is the precise determination of acoustic emission (AE) signals recorded by multichannel systems. The knowledge of this time is very important, mainly in the case of localization of individual AE events. New multichannel AE recoding systems are able to record huge amount of acoustic emission data. This high quantity of data requires very fast, automatic and precise first arrival identification software. Several approaches are routinely used in the practice, as crossing of the noise signal, analysis of the LTA/STA average, etc. In our contribution, a new approach based on high-order statistics (HOS), which is able to carry out price precise arrival time determination without human determination is presented. The algorithm use skewness and kurtosis parameters of individual AE signals, which are able to show their transition from Gaussianity to non-Gaussianity dependence. The approach was tested on real AE data, which were recorder by Vallen 8 channel recording system, of loaded granite rock samples. The recorded signals covered different types from noisy to strong ones. This simple, accurate and quite fast method is predetermined to be used in automatic processing of transient data, as acoustic emission, seismic signals, ultrasonic sounding, etc.