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ENHANCING QUALITY RESEARCH & INNOVATION for SOCIETAL DEVELOPMENT

P-112 Analysis of Transient Multiexponential Signals Using Homomorphic Deconvolution Technique

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Transient multiexponential signals with real decay constants occurs in different areas of science and technology. Such signals arise in deep-level transient spectroscopy, fluorescence decay analysis, NMR relaxation data, etc. Due to their nonorthogonality, their analysis has proved difficult using conventional signal processing techniques. Many techniques have been proposed by different researchers but they often produce mixed result. A new method of multiexponential transient signal analysis is hereby proposed and tested. The method based on cepstral deconvolution is fast and computationally inexpensive. The multiexponential signal is initially converted to a deconvolution model using Gardner transform after which the proposed method is used to deconvolve the data. Simulation and experimental results indicate that this method is good for determining the number of components but performs poorly in estimating the decay rates.

P-113 The Development of Tool Life Estimation Model Based on Volume Loss Method

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During high speed hard turning the dominating basic wears in the flank land are abrasive, adhesive, and diffusive. For that reasons the estimation of tool life should based on these three basic wears. A direct estimation method was used for modeling the flank wear based on the volume loss due to abrasive, adhesive and diffusive wears in turning hard materials with higher cutting speed by using ceramic cutting tool. A Matlab simulink based model is developed to simulate the tool life based on the flank wear rate. The Matlab simulink is used to simulate the flank wear rates by increasing the cutting speed during cutting process of hard materials. However there is no special box that can be used in the Matlab software therefore a new model was developed by the researchers. There are 3 subsystems will be used to calculate the volume loss as a result for abrasive, adhesive and diffusive wear respectively. In order to test and validate the simulation to estimate the tool life for the final equation and comparing that with Taylor extension equation, the researchers selected a hardened AISI 52100 bearing steel with a hardness of Rc 62 as a work piece. This is chosen because of its widespread use and industrial significance and the availability of detailed data for this material. The simulation results of the wear progress for three different types show different behavior of tool life.

P-114 Fluorescence Decay Analysis Using Exponential Compensation Deconvolution

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Fluorescence decay experiments is one of the major sources of transient multiexponential signals. A new method for the analysis of fluorescence decay experimental data is proposed. The method relies on the classical Gardner transform to convert the data signal into a convolution model which is deconvolved using exponential compensation deconvolution technique. Eigenvector algorithms are then used to further model the resulting complex exponentials to obtain better estimates of decay rates and number of components. Simulation and experimental results show that this method outperforms previous approaches if the truncation point of the deconvolved data is correctly selected.