On-line Chatter Detection Using Wavelet Based Parameter Estimation

Summary

A new method for on-line chatter detection has been developed. The proposed method characterizes the significant transition from high dimensional to low dimensional dynamics in the cutting process at the onset of chatter. Based on the likeness to the nearly-1/*f* process of the cutting process, this wavelet-based maximum likelihood (ML) estimation algorithm is applied for on-line chatter detection. The presented chatter detection index γ is independent of the cutting conditions and gives excellent detection accuracy and permissible computational efficiency, which makes it suitable for on-line implementation. The validity of the proposed method is demonstrated through the tests with extensive actual data obtained from turning (Fig. 1) and milling processes (Figs 2 and 3).
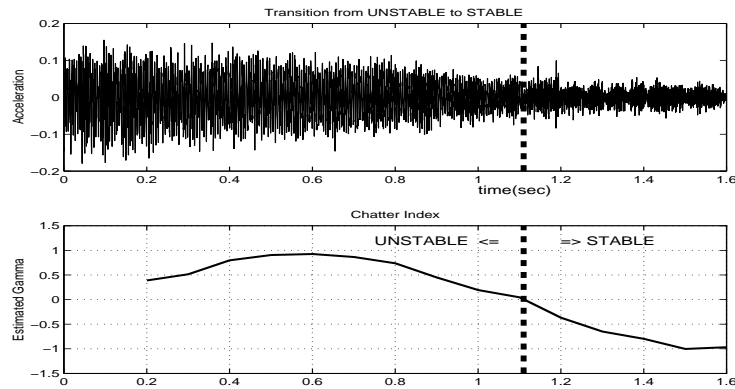

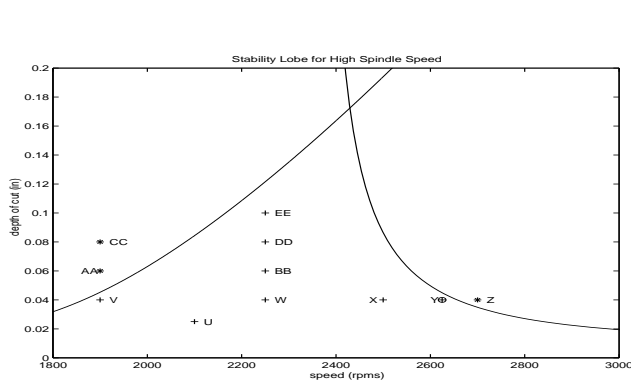**Figure 1. Chatter index variation during transient process in conventional turning.**

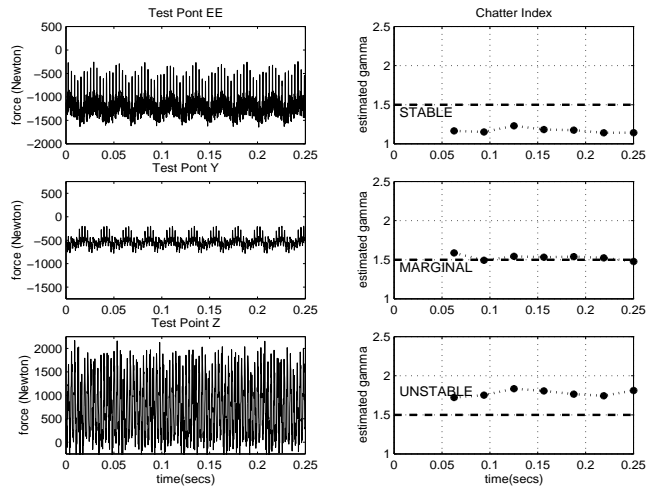**Figure 2. Experimental test points (speed range: 1900 – 2700 rpm)**

Figure 3. X- force signals and estimated γ values at test point EE, Y and Z (•: estimation point).