Recursively Identifying Process Parameters in Milling Carbon Fiber- Reinforced Polymers

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Abstract
The proposed online identification methods, Recursive Least Squares (RLS) and Kalman Filter, are shown to be accurate in estimating specific cutting forces (SFC) during milling of Carbon Fiber Reinforced Polymer (CFRP) composites. These methods take into account the effect of tool runout and measurement noises on the results, which is a significant improvement over traditional offline identification methods such as the average force method.

In addition to accurately estimating SFCs, the use of Kalman filter in online identification also allows for the identification of runout forces during the milling process, which is an important consideration in the machining of composite materials. Finally, the development of a mechanistic force model for multi-layer composites, and its successful extension from uni-directional to multi-directional composites, is also a significant contribution of the proposed methods.