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Determining the Width and Depths of Cut in Milling on the Basis of a Multi-Dexel Model

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Abstract : Chatter vibrations and process instabilities are the most important factors limiting the productivity of the milling process. Chatter can leads to damage of the tool, the part or the machine tool. Therefore, the estimation and prediction of the process stability is very important. The process stability depends on the spindle speed, the depth of cut and the width of cut. In milling, the process conditions are defined in the NC-program. While the spindle speed is directly coded in the NC-program, the depth and width of cut are unknown. This paper presents a new simulation based approach for the prediction of the depth and width of cut of a milling process. The prediction is based on a material removal simulation with an analytically represented tool shape and a multi-dexel approach for the work piece. The new calculation method allows the direct estimation of the depth and width of cut, which are the influencing parameters of the process stability, instead of the removed volume as existing approaches do. The knowledge can be used to predict the stability of new, unknown parts. Moreover with an additional vibration sensor, the stability lobe diagram of a milling process can be estimated and improved based on the estimated depth and width of cut.

Keywords : dexel, process stability, material removal, milling
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