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System Identification and Quantitative Feedback Theory Design of a Lathe Spindle

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Abstract : This paper investigates the system identification and design quantitative feedback theory (QFT) for the robust control of a lathe spindle. The dynamic of the lathe spindle is uncertain and time variation due to the deepness variation on cutting process. System identification was used to obtain the dynamics model of the lathe spindle. In this work, real time system identification is used to construct a linear model of the system from the nonlinear system. These linear models and its uncertainty bound can then be used for controller synthesis. The real time nonlinear system identification process to obtain a set of linear models of the lathe spindle that represents the operating ranges of the dynamic system. With a selected input signal, the data of output and response is acquired and nonlinear system identification is performed using Matlab to obtain a linear model of the system. Practical design steps are presented in which the QFT-based conditions are formulated to obtain a compensator and pre-filter to control the lathe spindle. The performances of the proposed controller are evaluated in terms of velocity responses of the the lathe machine spindle in corporating deepness on cutting process.

Keywords : lathe spindle, QFT, robust control, system identification
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