Hochschule Aalen

Parameteridentifikation und Regelung hochdynamischer Linearachsen

Autoren: Schmid

Zeitraum: WS 2018

Abstrakt

The purpose of this master thesis is the development of an advanced simulation model and new controller design for a mobile test bench. This test bench is used for highly dynamic positioning of a spring loaded mass on a linear drive. The system is controlled by a programmable real-time target machine run by MATLAB Simulink Real-Time, which is controlling an EC motor with transmission attached to the linear drive. The task for the master thesis is split in three main work packages. In the first work package the test bench is extended by an additional magnetic sensor to measure the position of the spring loaded mass. After that the existing simple simu-lation model and its parameters are extended and optimized using theoretical co-herences as well as experimental parameter estimation. For the experimental pa-rameter identification the system is tested with different reference currents in open-loop control. During the investigation a damage of the linear drive was detected, which causes a directional and position depending behavior of the friction (espe-cially in counter clockwise direction of motor). This situation lead to a modification of the parameter identification focusing only on clockwise directional positioning. Considering this constraint the new simulation model shows an improved signal matching between simulated and measured position of the spring loaded mass. As last task a Set-Point-Filter is implemented in the cascade control system to allow the save positioning of the spring loaded mass with a simple step function demand in-stead of a complex profile for the positioning. In direct comparison the Set-Point-Filtered step shows a more aggressive behavior than the acceleration limited posi-tioning. It allows the reduction of the positioning time to 50 percent by the side effect of slightly

overshooting the target positioning. Another conclusion is that the stand-ard parameterized cascade control structure is not useful for the positioning of the spring loaded mass due to the small controller gain.