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A Model-Reference Sliding Mode for Dual-Stage Actuator Servo Control in HDD

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Abstract : This paper presents a method of sliding mode control (SMC) designing and developing for the servo system in a dual-stage actuator (DSA) hard disk drive. Mathematical modelling of hard disk drive actuators is obtained, extracted from measuring frequency response of the voice-coil motor (VCM) and PZT micro-actuator separately. Matlab software tools are used for mathematical model estimation and also for controller design and simulation. A model-reference approach for tracking requirement is selected as a proposed technique. The simulation results show that performance of a model-reference SMC controller design in DSA servo control can be satisfied in the tracking error, as well as keeping the positioning of the head within the boundary of +/-5% of track width under the presence of internal and external disturbance. The overall results of model-reference SMC design in DSA are met per requirement specifications and significant reduction in %off track is found when compared to the single-state actuator (SSA).

Keywords : hard disk drive, dual-stage actuator, track following, hdd servo control, sliding mode control, model-reference, tracking control
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