AUTO-TUNING OF DSP-BASED CONTROLLER DESIGN FOR LINEAR BRUSHLESS DC MOTOR

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ABSTRACT

LINEAR MOTORS ARE DESIGNED FOR DIRECT DRIVING PAYLOAD. THEY ARE NOT ONLY ABLE TO ELIMINATE THE NONLINEAR EFFECTS THAT GENERALLY EXIST IN TRANSMISSION SYSTEMS DRIVEN BY ROTARY MOTORS, BUT ALSO POSSESS HIGHER DYNAMIC RESPONSE, MORE PRECISE POSITION CONTROL CAPABILITY, HIGHER STATIC STIFFNESS, AND HIGHER IMMUNITY FROM DUST. THEY HAVE GRADUALLY REPLACED THE ROLES THAT ROTARY MOTORS USED TO BE IN PRECISION MACHINERY. DUE TO THE PROSPEROUS DEVELOPMENTS OF INTEGRATED CIRCUIT TECHNOLOGY, A FULL DIGITAL CONTROLLER DESIGN HAS BECOME THE MAIN STREAM OF THE CURRENT MARKET FOR MOTOR CONTROL SYSTEMS. THIS PAPER NOTICES THE TRENDS, WHICH ADOPTS THE DSP TECHNOLOGY TO IMPLEMENT A FULL DIGITAL CONTROLLER FOR BOTH THE ROTARY AND LINEAR MOTOR SYSTEM, AND ANALYSES THEIR SIMILARITIES AND DIFFERENCES. AN AUTOMATIC PARAMETER TUNING PROCEDURE IS ALSO PROPOSED THAT INCLUDES THE IDENTIFICATION OF SYSTEM MODEL AND CONTROLLER DESIGN FOR MOTOR CONTROL FEEDBACK LOOPS. THE METHOD IS EXTENSIVE VERIFIED BY SIMULATION AND EXPERIMENT OBSERVATIONS, AND FOUND GOOD FEASIBILITY FOR INDUSTRIAL APPLICATIONS.

Keywords : 無

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