

Opening and Closing Control for Electromagnetic Engine Valve

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Abstract— An electromagnetic engine valve (EMV) has received a great deal of attention due to the growing importance of issues such as fuel economy and environmental protection in the automotive. In this paper we propose a new control method for the prototype linear motor developed for the EMV. This linear motor has nonlinear properties due to the detent force, force ripple and the friction. We design a positioning controller using the sliding mode servo control with variable switching hyper plane in order to realize the robust property against the nonlinear properties and the high speed positioning. We call this control method VSMC. Moreover, the low valve seating velocity is very important to avoid the wear of the linear motor. And a closing force against the pressure of the intake manifold is required after the valve is closed. For these reasons we add a feed forward control to the VSMC. The effectiveness of the proposed control methods are confirmed by some experiments.

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