单质体非线性锐共振机械变结构同步控制 Variable Structure Synchronization Control for the Single-mass Nonlinear Sharp Resonance Vibration Machine

李小号 刘杰 刘劲涛

东北大学

关键词：　非线性 锐共振 变结构 同步控制

摘　要：　基于双电动机驱动单质体非线性振动机械的动力学模型，推导出双激振电动机的相位差状态空间方程，在系统锐共振(频率比为0.95~1.05)条件下，建立非线性系统的变结构同步控制器，并对同步控制器参数的选取进行了理论推导。仿真结果表明，双激振电动机的变结构控制同步策略比目前广泛应用的传统PID同步控制策略，能更有效地控制由电动机参数差异、外扰等因素引起的同步性误差，改善多电动机同步性能以及非线性系统的振动运动特性。 Based on the dynamic model of single-mass nonlinear vibration machine which driven by dual motors, the phase-difference state space equations of dual exciting motors were deduced. Under systemic sharp resonance conditions (frequency ratio was 0.95~1.05), the nonlinear variable structure synchronization controller was designed, and the parameters of the synchronization controller were deduced by theoretical method. The results of numerical simulation showed that, using the variable structure synchronization control strategy to make the dual exciting motors realized the control synchronization motion have more dominance than the traditional PID synchronization control strategy which widely used in industry control field. The variable structure control synchronization strategy could effectively improve the performance of synchronization for dual exciting motors by reduce the synchronization error which caused by the performance difference of motors, exterior disturbance and so on. It could also improve the vibrating characteristics of nonlinear system.

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