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基于反演设计的超空泡航行体滑模控制(PDF)

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Title: Sliding Mode Control for Supercavitation Vehicle Based on Inversion

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关键词: [超空泡航行体](#); [反演设计](#); [滑模控制器](#); [自适应](#)

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摘要: 超空泡航行体是一个具有非线性滑力、系统参数不确定性的多变量系统。文中以Dzielski提出的航行体模型为基础,分析了超空泡航行体在运动中,由于空泡形态、尾部湍流等因素引起的不确定性及外界干扰力。利用反演法设计了超空泡航行体的滑模控制器,并在控制器设计中加入自适应律,估计不确定项的上界。仿真结果表明,设计的控制器能够有效的调整超空泡航行体的纵向状态,并对设计的标准弹道表现出良好的跟踪性能。

Abstract: Supercavitation vehicle is a multivariable system with parameter uncertainties and non linear sliding force. Based on a supercavitation vehicle model proposed by Dzielski, the uncertainties caused by cavitation shape and turbulence of afterbody were discussed. Then inversion method was used to design a sliding mode controller. Adaptive control law was introduced for estimating upper boundary of uncertain parameters and disturbances. The responses have high precision and small overshoot. A nominal trajectory was designed to testify tracking capability in a wide range. The simulation results show that the proposed controller has good tracking performance and can stabilize the system rapidly.

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