

推土机半物理试验系统与作业效率复合控制研究 Semi-physical Experiment System and Control Strategy for Bulldozer

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关键词: 推土机 半物理 试验装置 变论域 模糊神经网络 控制策略

摘要: 针对推土机研制中的试验难题, 构建一个模拟推土作业全过程的半物理试验系统。通过推土机动力学特性分析和模型研究, 为推土作业自动控制提供理论基础。试验系统采用液压对顶缸装置实时模拟作用在推土工作装置液压缸上的负载, 同时推土工作装置的液压执行机构根据硬件控制器的命令信号调节铲刀的位置, 通过铲刀的虚拟样机模型和整车动力学模型实现半物理仿真试验。提出了一种变论域模糊神经网络控制方法, 将其应用于发动机转速的调节与控制中, 并结合滑转率极限控制和发动机管理系统, 研究了推土机作业效率的复合控制策略。试验结果表明, 该控制策略能有效地稳定发动机转速, 提高推土作业效率。 To solve the problems in research and development of bulldozer, a semi-physical experiment system is established to simulate the whole process of bulldozer operation. Based on the research results of bulldozer dynamics characteristics, a model is suggested and the theoretical foundation of bulldozer automatic control is built. A loading device is used to simulate the force on the blade-controlled cylinder. The blade position is adjusted by the blade control system according to the control signal from hardware controller. Then the semi-physical experiment is performed through simulation calculations. A fuzzy neural network control method based on variable universe is proposed for engine speed control. And the overall control strategy of bulldozer operation efficiency is studied combined with slip rate control and engine management system. Experimental results show that the engine speed is stable and the working efficiency is improved when using the new control strategy.

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