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基于逆模型解耦的风力提水变论域模糊控制

Variable universe fuzzy control based on inverse-model decoupling for wind water pumping

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中文摘要:

针对风力提水系统风、辅动力存在耦合使控制效果难以保证的问题，该文提出了一种基于逆模型解耦的变论域模糊控制方法。采用神经网络方法辨识风力提水系统的系统，并与被控对象进行串联，建立伪线性系统，实现风、辅动力解耦。同时采用模糊控制器对风、辅动力分别进行独立控制，对模糊控制器的论域进行改进，增强系的环境适应能力。逆模型仿真试验中变量泵控制和柴油机控制量平均误差分别为6.3%和4.5%，实际运行中离心泵的转速平均误差控制在5%以内，说明该文方法能有效抗风速变化的影响。研究结果对风力提水系统的推广具有重要的意义。

英文摘要:

Abstract: In recent years, with the development of new energy technology, a hybrid water system of wind power and conventional energy supplement was rapidly developed China. However, wind resources are affected by seasonal and geographical patterns, water system, wind energy, and conventional energy cooperation. The two are mutual coupli so the control effect is difficult to guarantee. Therefore studies of one kind of establishment of auxiliary control system based on dynamic decoupling in the wind, the stability, wa effect, and promotion of wind water pumping technology to solve the power shortage in agricultural and pastoral areas, have important practical significance for improving the ecological environment in China.The traditional decoupling algorithm with a feed-forward compensation method based on expert rules and the state equation decoupling method on requirements, moths model of controlled object were described, because the wind is certain nonlinear water system, and mathematical models are difficult to access, so these methods are difficult to use. An intelligent decoupling method based on an inverse model does not need to rely on the mathematical model, or the nonlinear control system in the f and achieved good results.Based on the in-depth analysis of the water system on the wind, the wind water pumping system, physical and chemical complex, the wind, the auxiliary power coupling problem, the paper put forward a fuzzy control method based on a neural network inverse decoupling variable. By using the neural network method to identify the inverse system of the original system, and being connected in series with the original system, a pseudo linear system, the wind, the auxiliary power is decoupling. At the same tim fuzzy controller to control the wind, auxiliary power independently, using the variable universe theory to improve the fuzzy control theory domain, enhance the system's ability to adapt to the environment.The control system consisted of the inverse system decoupling compensation based on a neural network, and based on the variable universe fuzzy algo in wind, and the auxiliary power independent control of the two parts. A neural network decoupling compensator, utilizing the self-learning characteristic of the neural network, th reverse identification of the original system, thus approaching wind inverse model of water system, the parallel inverse system with the original system, a pseudo linear system, so the wind power transmission and auxiliary power transmission and conversion into subsystems are independent of each other, then a linear system control method was used to co the variable universe fuzzy algorithm based on a fuzzy controller. First, according to the wind, the auxiliary power was set the detection feedback value and system, the wind, the auxiliary power closed the loop control; and then the variable universe fuzzy algorithm was used to solve the parameter sensor parameter drift and system device of fixed rules of f algorithm, the algorithm is adaptation to environment improvement.In order to verify the feasibility of this method, the inverse modeling method of a model simulation test; at the s time, in order to validate the proposed algorithm, the test of comparison, carried on the analysis to the control system from the point of system performance. The inverse model in simulation experiment of variable pump and diesel engine control showed average errors of 6.3% and 4.5%, and a centrifugal pump speed error in the actual operation of the contro within 5%, proved the effectiveness of this method. This fully illustrated the influence of the method in this paper that can effectively restrain the velocity changes, and has extren vital significance to the promotion of the water system of the wind.

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