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基于GA-BP神经网络的深海集矿机避障系统

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摘要: 结合深海集矿机的实际作业环境, 建立集矿机的实时避障神经网络模型。该模型采用多传感器融合技术, 将声纳传感器采集到的环境信息进行处理后作为BP神经网络的输入; 设定车体的注视向量、转向角和速度为网络输出; 根据集矿机实际行进情况, 并综合人的行走经验, 设置能够实现实时避障的网络导师训练信号。引入遗传算法对已建立BP避障模型进行改进, 以克服局部极小值问题。仿真研究表明: 遗传算法优化后的BP神经网络, 能够有效训练达到预期目标, 并能在很大程度上克服BP网络的局部极小值问题。在Matlab中给出障碍物环境中的避障仿真结果, 表明此方法的可行性。

关键字: 深海集矿机; BP神经网络; 遗传算法; 避障

System of obstacle avoidance used in deep-seabed vehicle based on BP neural network and genetic algorithm

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Abstract: A real-time obstacle avoidance neural network model was created according to the real working environment of deep-seabed vehicle. An information fusion method of multi-sensor was proposed to deal with the environmental situation collected by sonar sensors used in deep-seabed vehicle, and then the input of BP neural network was realized. Watching vector, steering angle and speed of the vehicle was set as output of BP network. Tutor training signal to achieve real-time obstacle avoidance was developed based on the moving way of both vehicle and man. Then, genetic algorithm was introduced to improve the BP neural network, so the problem of incidental trap in local minima with BP neural network was overcome. The simulation results indicate that the BP neural network improved by genetic algorithm can efficiently reach the expected target, and the problem of incidental trap in local minima is modified to a large extent. The simulation result of movement of the vehicle in the environment with obstacles shown in MATLAB indicates that the method is feasible.

Key words: deep-seabed vehicle; BP neural network; genetic algorithm; obstacles avoidance

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