Synopsis

There has been a great deal of interest in applying neural networks to the control of complex plants and processes.

This book reports on the use of neural networks to control robotic devices. Following a brief review of the literature in the areas of neural networks and control, neural networks with a hybrid structure are proposed for this task. These networks are multi-layered and comprise linear and non-linear neurons in the hidden layer. They are shown theoretically to be able to represent the forward dynamics of non-linear systems. Furthermore, they can be trained using the backpropagation algorithm to approximate the inverse dynamics of robotic systems. Different types of robotic systems have been controlled in simulation. They are a single SCARA planar robot arm, two co-operating SCARA arms and a bipedal robot. These non-linear systems have been controlled to follow prescribed trajectories under conditions of varying or unknown loads. The control schemes discussed include inverse control, internal model control and model-reference hybrid position/force control.

The book presents computer simulation results which show that the proposed neural controllers are superior to conventional PID controllers, giving deviations for desired trajectories that are significantly lower and being able to deal with much greater disturbances.

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