Abstract

The biped robot consists of five links, namely the torso and two links in each leg. Four rotating joints (two hips and two knees) are used to connect these links together to make the biped robot model resemble the human being model. The four rotating joints are driven by independent servo motors via control signals generated from designed control systems. The biped walking is difficult to control because it is a nonlinear system with various uncertainties. In this paper, the application of Neurofuzzy control to a nonlinear five links biped robotic model is studied and compared to designed PD controllers which are applied to the given model. First of all, the optimal parameters of four PD controllers are selected using Particle Swarm Optimization (PSO) algorithm to drive four servo motors of biped robot. Then, the parameters of four fuzzy controllers are tuned using neural networks depend on the input-output data which are collected from the designed PD controllers. To make the designed Neurofuzzy controllers more robust, the optimal inputs and outputs gains of the designed controller are selected using PSO algorithm. The proposed controllers are tested in different environments such as: moving on rough terrain with random profile and climbing the stairs. The results of numerical simulation
clearly indicate the robustness and effectiveness of the proposed controller to drive the five links biped robot.

References


Index Terms

Computer Science

Algorithms
Keywords

Biped robot, Neurofuzzy control, PD control, Particle Swarm Optimization algorithm