The main objective of this research is to study feedforward and recurrent neural networks (RNN) for nonlinear dynamic system identification and control. To be able to control, predict or analyze any system, accurate model is essential. Most real-world applications have inherent nonlinearities. Conventional PID or state feedback controllers are usually not capable of dealing with severe process nonlinearity, variable time delays, time-varying process dynamics and unobservable states. This research work will study RNN based controllers as a viable alternative to handle these difficulties. Due to the intrinsic characteristics of RNNs in having internal memory, they are capable of modeling any linear or nonlinear dynamic system.

In this research work we will develop an adaptive RNN-PID controller to compensate for the nonlinearity of a servomechanism. There are different learning strategies available for updating the weights of RNNs. All of these techniques are based on the gradient descent algorithm. In this research project the Real-Time Recurrent Learning (RTRL) technique will be applied for updating the weights. Numerical simulation will be used to validate the proposed algorithms.
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