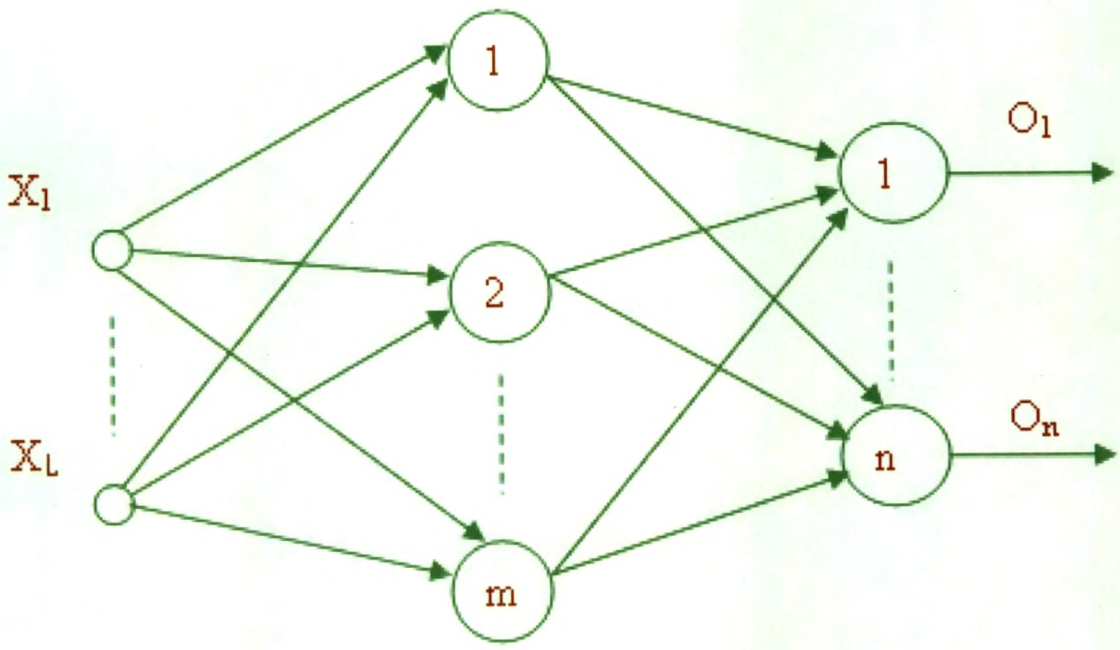
Abstract



Abstract

'Artificial Neural Networks' (ANN)s plays a primary role in contemporary artificial intelligence and machine learning. Models of neural networks are developed from a biological point of view. They are used in areas such as Speech and Language Processing, Vision Research, Bioinformatics, Time Series Analysis, Data Mining and many others. In our work we have elaborated upon the use of feedforward Neural Network as "Controller" in the Plants where human intervention is required minimally.

All the Neural Networks show the dynamic behavior during the training phase whereas the Hopfield Neural Networks behaves dynamically in the retrieval phase. These Neural Networks hence can be mathematically modeled by a system of differential equations. In our work we mathematically model and analyze the Hopfield Neural Networks as semilinear dynamical system and prove its qualitative and quantitative properties.

Controllability is one of the most important qualitative properties of the dynamical system. This work aims at a rigorous practical applicability of Neural Networks as nonlinear steering controller. The research work is centered around proper mathematical formulation and analysis of the complex and abstract issues and therefore no experimental data are given. The main aim of this work is to explore the capabilities of deterministic, continuous-time neural networks as state-space, generic, parametric models in the framework of nonlinear control. To substantiate the theory these ANNs are applied as controllers in a chemical process and a diffusion processes. These controllers are simulated using MATLAB.

Key words: Neural Network, Controllability, Semilinear dynamical systems