APPLICATION OF ARTIFICIAL NEURAL NETWORK (ANN) FOR UNIT COMMITMENT PREDICTION

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ABSTRACT

This report presents an application Artificial Neural Network (ANN) in MATLAB for predicting a unit commitment in power system. Presented here is a design framework parallel training process over the unit commitment data. Dedicated artificial neural networks can handle a large number of inequality constraints included in unit commitment. Results from existing Genetic Algorithm (GA) program were used as the NN training and testing data set. The minimum operating cost from that results as a input and targeted output of neural network (NN). Stage of scheduling, temperature and day were added to the training input for speeding up the convergence process. The developed ANN is capable to predict a unit commitment when an unseen data fed to the network using MATLAB ANN toolbox, Version 6.5.

Keywords: Artificial Neural Network (ANN), Unit Commitment (UC), The Language of Technical Computing (MATLAB).

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CHAPTER 1

INTRODUCTION

1.1 Introduction

An efficient unit commitment plays an important role in the economic operation of power system. The unit commitment (UC) problem involves determining a start-up and shunt-down schedule for the generating units over a period of time to meet the forecasted load demand at minimum cost. The commitment schedule must satisfy other constraints such as those on reserve, fuel, and individual units. Mathematically, the unit commitment problem is a mixed-integer one, typically with thousands of 0-1 variables and a large and complex set constraints. The exact solution of such a problem can only be obtained by exhaustive computation time [1].

With the introduction of new network topologies and improved training algorithms, neural networks have demonstrated their effectiveness in several power system application. Artificial neural networks (ANNs) are programs designed to simulate the way a simple biological nervous system is believed to operate. They are based on simulated nerve cells or neurons, which are joined together in a variety of ways to form networks [2]. These networks have the capacity to learn, memorize and create relationships amongst data. There are many different types of ANN but some are more popular than others. The most widely used ANN is known as the Back Propagation ANN. This type of ANN is excellent at prediction and classification tasks.

Neural networks are composed of simple elements operating in parallel. These elements are inspired by biological nervous systems. As in nature, the network function is determined largely by the connections between elements. Train a neural network to perform a particular function by adjusting the values of the connections (weights) between elements. Commonly neural networks are adjusted, or trained, so that a particular input leads to a specific target output [2]. Such a situation is shown in figure 1.