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# التوثيق الالكتروني والميكروفيلم

بالرسالة صفحات

لم ترد بالاصل

Ain Shams University
Faculty of Engineering

# CONTROL OF HVDC POWER SYSTEM USING ARTIFICIAL INTELLIGENCE

## A THESIS
## BY
## MOHAMMED MAHMOUD MOHAMMED AFIFI
### B.Sc. Electrical Power Engineering

Submitted in partial fulfillment of the requirements for the degree of
M.Sc. In Electrical Power Engineering

## SUPERVISED BY

Dr. ADEL SEDKY EMARAH
Ain Shams University

Dr.  IBRAHIM HELAL
Ain Shams University

1999

بســـم اللــــــه الرحمـــــن الرحيـــم

" وقل رب زدنى علمـــــا "

# APPROVAL SHEET

The undersigned certify that they have read, and recommend to the Ain Shams University Faculty of Engineering for acceptance, a thesis entitled:

## CONTROL OF HVDC POWER SYSTEM USING ARTIFICIAL INTELLIGENCE

Submitted by

MOHAMMED MAHMOUD MOHAMMED AFIFI SAYID,

in partial fulfillment of the requirements for the degree of MASTER OF Electrical Power Engineering.

Approved by

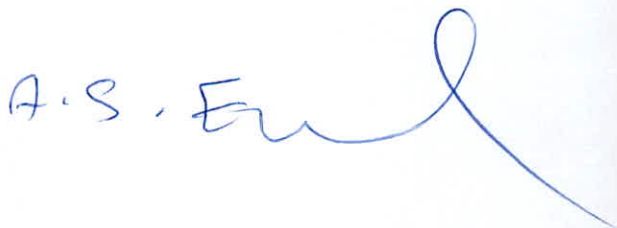| **Name** | **Signature** |
|---|---|
| 1. Prof. Dr. Ashraf Madkor<br>Faculty of Engineering<br>Al Azhar University | |
| 2. Prof. Dr. Metwaly Al Sharkawi<br>Faculty of Engineering<br>Ain Shams University | |
| 3. Dr. Adel Sedky Emarah<br>Faculty of Engineering<br>Ain Shams University | |

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## Abstract

High voltage direct current (HVDC) transmission controllers may not be optimized for a wide range of operating conditions because they exhibit a fixed gain structure.

A feasible alternative proposed to overcome this limitation is the use of an Artificial Neural Networks (ANN) controller. This thesis describes an application of ANN control technique in HVDC transmission link for dynamic performance improvement.

The proposed ANN utilizes the training data of the controllers optimal gains obtained from the time domain simulation using the PI fixed gains conventional controller structure combined with gain scheduling technique for steady state and fault conditions.

Two cases of disturbances are considered to evaluate the performance of the ANN, compared with the conventional PI controller, in HVDC power control.

First is the small signal disturbance such as the step change in the current regulator reference value and sudden load change (increase or decrease). Second is the large signal disturbance such as three-phase short circuit at the generator bus bar.

The MATLAB and the NEURAL NETWORKS TOOLBOX software are used for conventional and ANN controller simulation. The transient simulation results are obtained and conclusions are drawn.

## Keywords:

Artificial Neural Networks (ANN), Training Data, HVDC Transmission, Gain Scheduling, and Control Sensitivity Index.