KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

ELECTRICAL ENGINEERING DEPARTMENT

COMPUTER PROJECT 2, EE 556

For the system given in Computer Project # 1, develop a Neural Network (NN) based intelligent power system stabilizer (NNPSS) using $\Delta\omega$ as the control input. The following steps should be carried out.

a. Generate a set of 1000 training and testing patterns. Each pattern consists of the inputs and the desired outputs. The inputs are $\{P,Q,V_t\}$ with P is randomized between 0.1 and 1.2 pu, Q is randomized between -0.3 and 0.3 pu, and V_t is randomized between 0.95 and 1.05 pu. For each input pattern, design the PSS using classical or any heuristic technique. The PSS parameters $\{K_c,T_1\}$ are the desired outputs.

b. Train a BPNN using the first 500 patterns and plot the error variations. Consider only one hidden layer.

c. Study the effect of the number of hidden neurons (Try 4, 5, 6, …)

d. Test the trained BPNN using the rest 500 patterns and plot the error variations.

e. Train a RBFN using the first 500 patterns and plot the error variations. Consider only one hidden layer.

f. Study the effect of the number of hidden neurons (Try 4, 5, 6, …)

g. Test the trained RBFN using the rest 500 patterns and plot the error variations.

h. Develop your time domain simulation program to incorporate the neural network that will identify the PSS parameters in real-time based on measurement of P, Q, and V_t.

i. Carry out the time-domain simulations for 5 seconds with a 10% pulse input of mechanical torque from 1.0s to 1.1s. Compare the simulation results with the intelligent PSS and with the fixed-gain PSS designed at nominal loading condition.

Assume any missing data you may need.

Submission:

Write a formal report that includes training, testing, and simulation results. A hardcopy of the program developed must be attached. A softcopy of all materials (report and program) must be e-mailed to mabido@kfupm.edu.sa. All materials are due on November 18, 2007.