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Simulation of Fuzzy logic Controller for controlling the position and speedof the DC motor

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Abstract—This paper presents the design of a fuzzy control system to control speed of a DC motor. The motor was modelled and converted to a subsystem in Simulink. This paper describes the design of a Fuzzy logic based controller to control te speed of DC mtor. The contolling signal is computed in real time using suitable fuzzy membership functions depending upon the state of the power factor. The use of output membership function permits further fine tuning of the controller parameters for varied system configurations especially in multi machine environment. The efficacy of the proposed controlling technique has been demonstrated using multi-machine computer simulation model of power system under a wide range of system and test conditions.

Keywords—(PSS, Fuzzy Logic Controller (FLC), Fuzzy inference system, Membership function, rule viewer, membership editor.

I. INTRODUCTION

Because of their high reliabilities, flexibilities and low costs, DC motors are widely used in industrial applications, robot manipulators and home appliances where speed and position control of motor are required. PID controllers are commonly used for motor control applications because of their simple structures and intuitionally comprehensible control algorithms. Controller parameters are generally tuned using hand-tuning or Ziegler-Nichols frequency response method. Both of these methods have successful results but long time and effort are required to obtain a satisfactory system response. Two main problems encountered in motor control are the time-varying nature of motor parameters under operating conditions and existence of noise in system loop. Analysis and control of complex, nonlinear and/or time-varying systems is a challenging task using conventional methods because of uncertainties. Fuzzy set theory (Zadeh, 1965) which led to a new control method called Fuzzy Control which is able to cope with system uncertainties. One of the most important advantages of fuzzy control is that it can be successfully applied to control nonlinear complex systems using an operator experiences or control engineering knowledge without any mathematical model of the plant (Assilian, 1974), (Kickert, 1976).

II. STRUCTURE MODELLING

The modelling of this system will be done in fuzzy toolbox of MATLAB. The FIS editor of this particular toolbox is used to model the structure as shown.

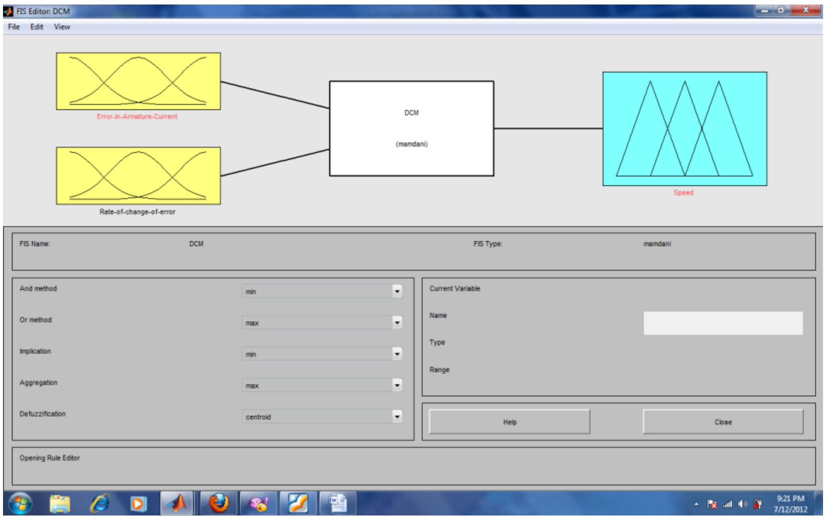

Fig.1 FIS Editor

Here are 2 inputs and one output in the structure as shown in FIS editor. The next thing to be done is defining the membership functions for all the input and output variables. This will be done in the membership editor as shown.

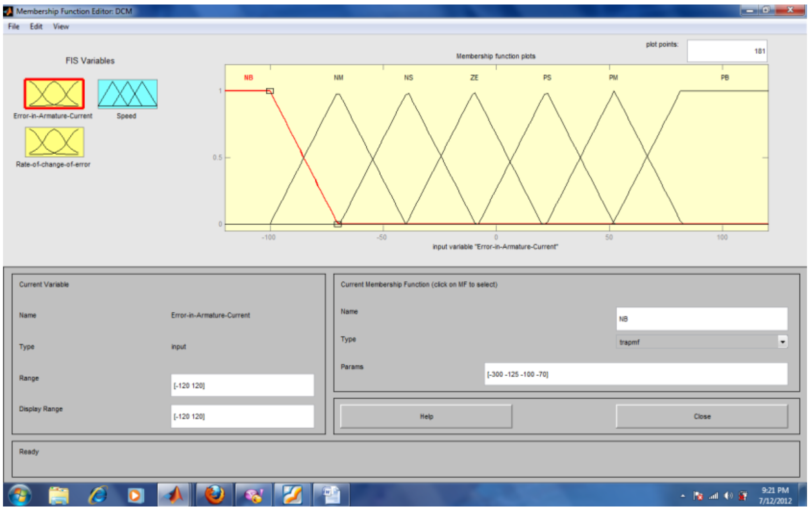

Fig.2 Membership Editing for input 1

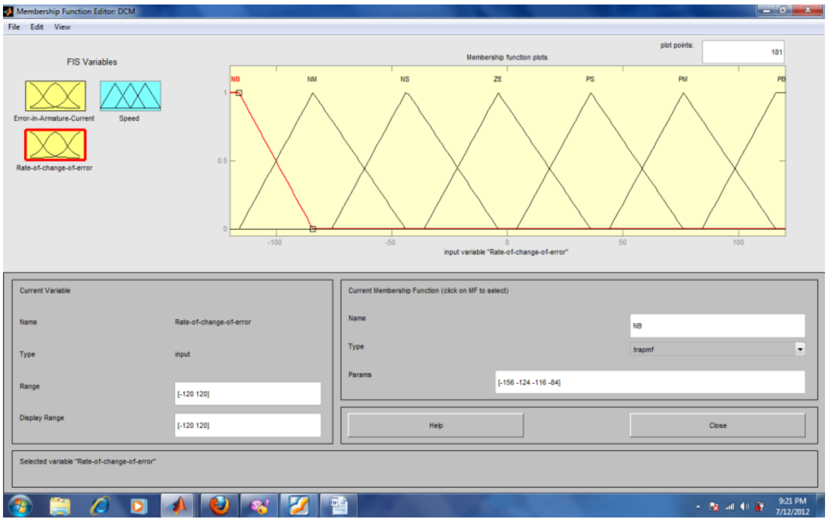

Fig.3 Membership Editing for input 2

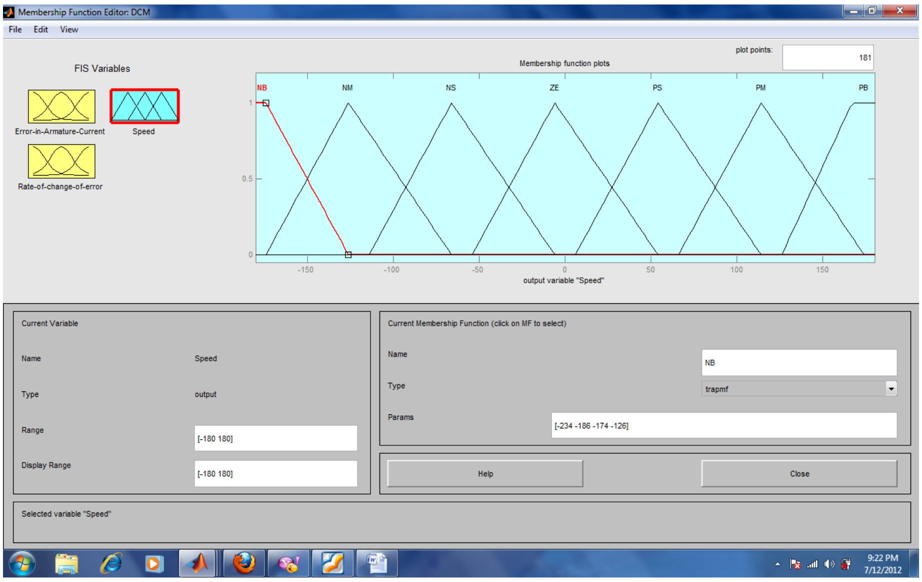

Fig.4 Membership Editig for output

The rule editor will used to format the rules using different combinations of input variables as shown.

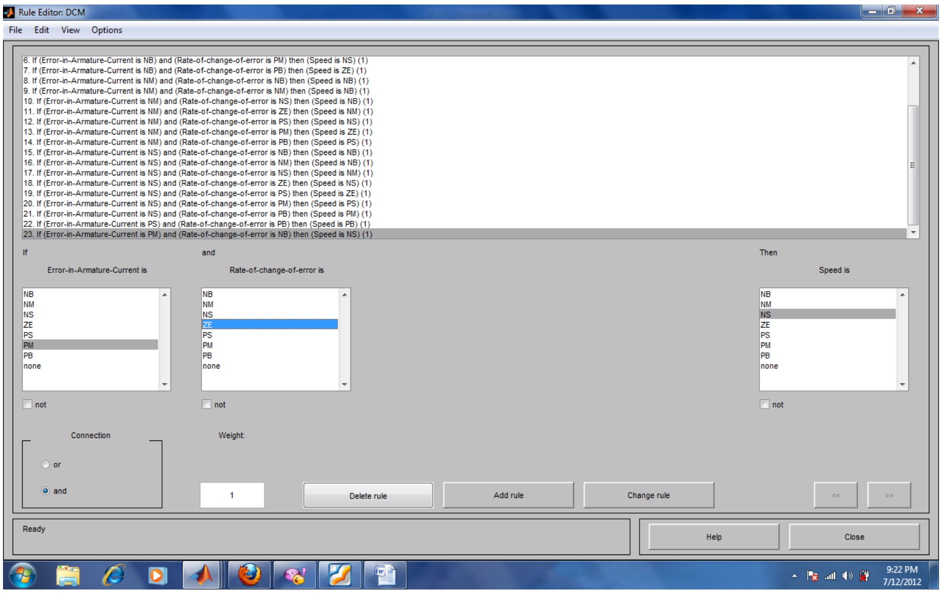

Fig.5 Rule Editor

III. RESULTS

The rule viewer showing the rules formatted for the control of capacitor bank switching on X-Y plane as shown.

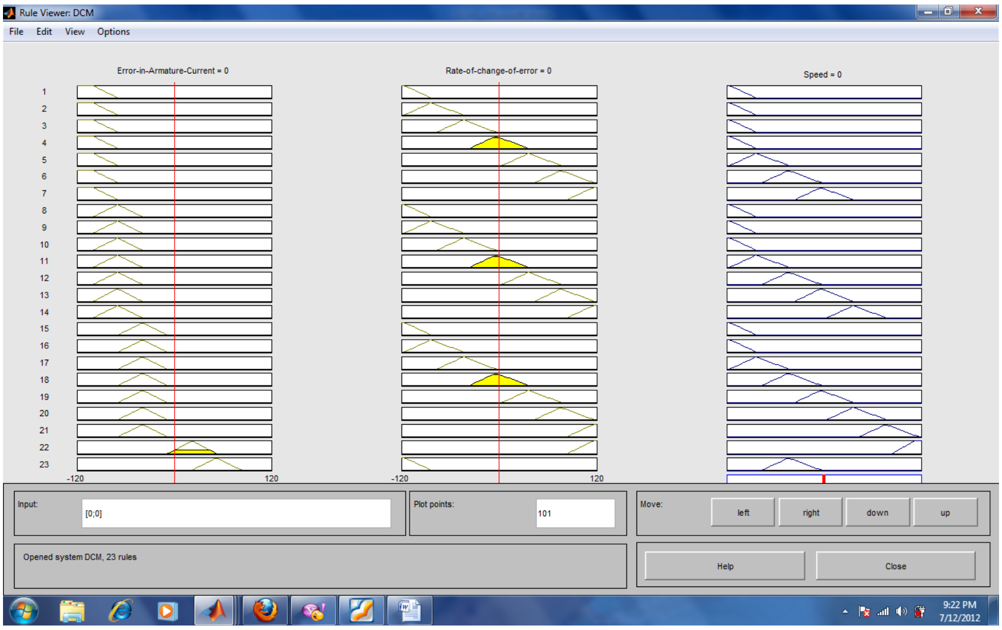

Fig.6 Rule Viewer

The performance on 3D plane is as shown in the surface viewer.

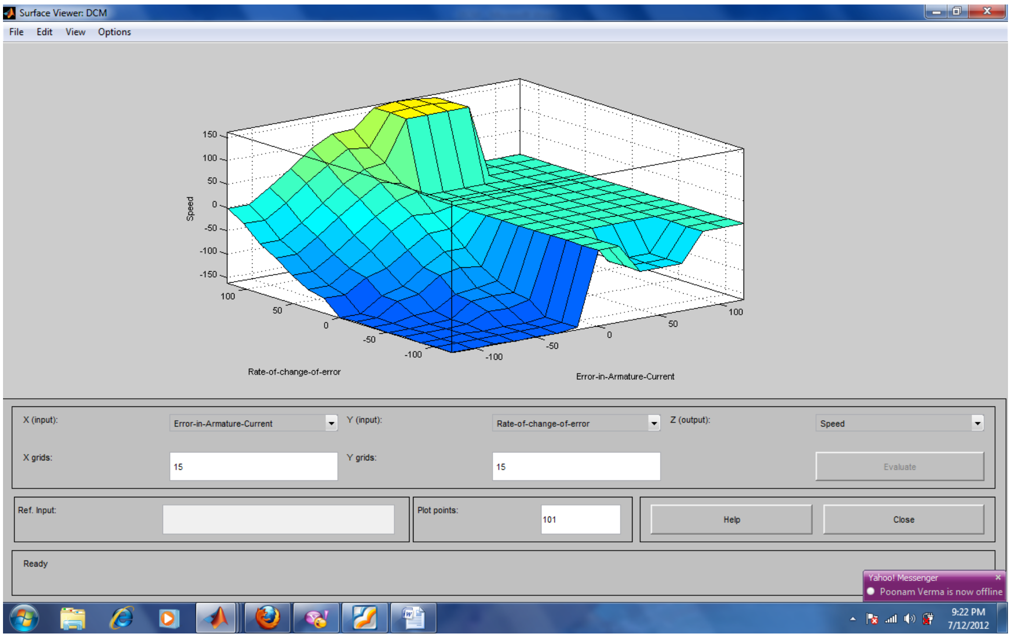

Fig.7 Surface Viewer

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