# Performance Analysis of Transient Stability and Its Improvement Using Fuzzy Logic Based Power System Stabilizer

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***Abstract* - This article is focused on the implementation of Fuzzy Logic Controller based Power system Stabilizer to enhanced transient stability of the multi machine system. Power system is very complex as well as highly nonlinear system. At present, there are different control mechanism used to control excitation system of the generator to enhance stability of system. Power system stabilizer (PSS) installed in the excitation system of the synchronous generator to improve the small-signal power system stability by damping out low frequency oscillations signal. It does that by providing supplementary perturbation signals in a feedback path to the alternator excitation system. The use of power system stabilizer has become very common in operation of large electric power systems. The conventional PSS which uses lead-lag compensation, where gain setting designed for specific operating conditions, is giving poor performance under different loading conditions. Therefore, it is very difficult to design a stabilizer that could present good performance in all operating points of electric power systems. To minimize the problem with conventional controller, paper present robust control method which based on artificial intelligent. Fuzzy logic control has been suggested as a possible solution to overcome this problem, thereby using linguist information and avoiding a complex system mathematical model, while giving good performance under different operating conditions. For analysis of stability, 2-machine 3-bus model used and simulation carried out with CPSS as well FLPSS.**

***Keyword* - Power system Transient Stability, AVR, Power System Stabilizer, Fuzzy Logic, Neuro-Fuzzy**

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## 1. INTRODUCTION

The power system is a highly nonlinear system that operates in a constantly changing load, environment, generator outputs, network topology, and key operating parameters change continually. When subjected to any disturbance, the stability of the system depends on the nature of the disturbance as well as the initial operating condition of the system. The disturbance may be small or large. Small disturbances in the form of load changes occur continually, and the system follow adjusts to the changing conditions. So main aim of Utility of any system is to system must be able to operate satisfactorily under these conditions and successfully meet the load demand. It must also be able withstand against disturbances of a severe nature, such as short-circuit on a transmission line or loss of a large generator etc.

There are many way can define Power system stability. According to IEEE Transactions on Power Systems, 2004 the Power system stability define, "Power system stability is the ability of an electric power system, for a given initial operating condition, to regain a state of operating equilibrium after being subjected to a physical disturbance, with most system variables bounded so that practically the entire system remains intact" [1][2]. Also it can described "Power system stability is the ability of the system, for a given initial operating condition, to regain a normal state of equilibrium after being subjected to a disturbance".

***Classification of Power System Stability***

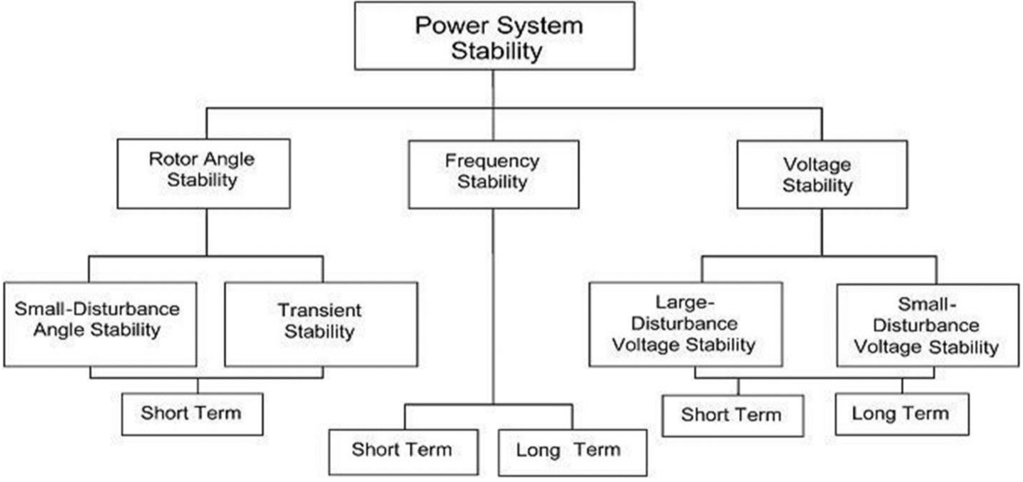


**Figure 1: Classification of power system stability**

Power system stability is a single problem; however, it is impractical to deal with it as such. Instability of the power system can take different forms and is influenced by a wide range of factors [2]. Shows in Figure 1, a possible classification of power system stability into various categories and subcategories. The following are descriptions of the corresponding forms of stability phenomena. There are different types of stability. Rotor angle stability, frequency stability and voltage stability is main three consideration out of this.

### *Basic Idea of Transient Stability & Problem Identification*

Transient stability analysis can identify from the swing curve which is characterized by the plots of generator rotor angle (δ) v/s time as shown in Figure 2. These "swing curves" plotted for a generator subjected to a particular system disturbance show whether a generator rotor angle recovers and oscillates around a new equilibrium point as in trace "a" or whether it increases aperiodically such as in trace "b". The former case is deemed to be transiently stable, and the latter case transiently unstable.

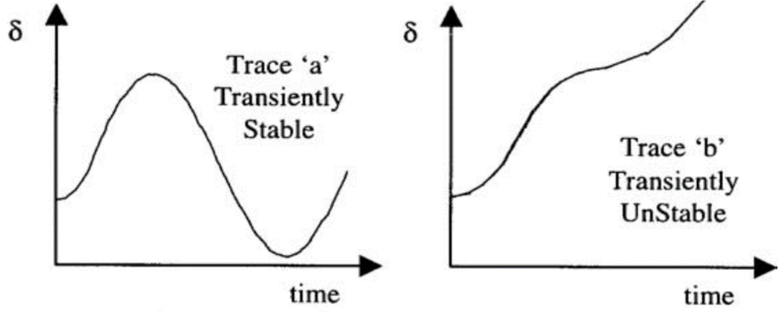


**Figure 2: Typical Swing Curves**

The main cause of transient instability of generator is inability of mechanical torque to quickly balance out changes in electrical torque and also generator rotor inertia plays major role. After disturbance the electrical torque can be resolved into two components, one is synchronizing torque and other is called damping torque given by,

$$\Delta T_E = K_S \Delta\delta + K_D \Delta\omega \qquad [1]$$

Where $\delta$ is load angle also known as torque angle, $\omega$ is angular speed and $K$ is constant. The first term of Equation [1] is synchronizing torque. This torque is dependent on air gap magnetic flux and magnetic coupling between rotor and armature of synchronous generator. This component of torque can be enhanced by high initial response Automatic Voltage Regulator and negative field forcing capability of Exciter as well.

Excitation system comprises of Automatic Voltage Regulator and Exciter. The second component of Equation [1] is damping torque. It has very profound impact on small signal stability and generator dynamics during transient state following short circuit fault. Damping torque results from the phase lag or lead of excitation current. The first swing transient instability is due to lack of sufficient synchronizing torque. Power system can diverge after convergence of first swing mainly because of insufficient damping torque. Currently, installed excitation systems are very fast responding systems and can immediately take corrective measures following very small oscillations. Nevertheless, from the time of recognition of desired excitation action to its real fulfillment, there is inevitable time delay owing to high time constant of field and armature windings. During this time period, position of oscillating system is bound to change and thus resulting in need of new excitation adjustment. The overall outcome of this time lag is induction of oscillations at the generator end. Power System Stabilizers can effectively be used to damp out generator electromechanical oscillations by minimizing the phase lead and lag between synchronously rotating armature flux and rotor. Automatic Voltage Regulator along with Power System Stabilizers are used to enhance power system stability [17]. The focus of this work is transient stability enhancement by using efficient controlling at generator end, as it is a primary control.

- **Mitigation of transient stability problem**

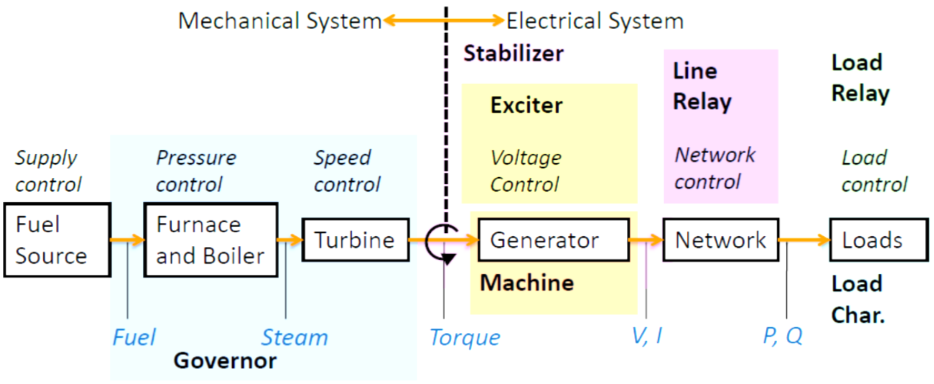


**Figure 3: Physical Structures of Basic Control Scheme**

The control actions at generator end to enhance the system stability are either in terms of excitation system or power system stabilizers or at mechanical end of power plants. Figure 3 show the general structure of primary control system to enhanced transient stability at generator end side in the system [3].

## 2. EXCITATION CONTROL

Generator excitation controls are a basic stability control. Thyristor exciters with high ceiling voltage provide powerful and economical means to ensure stability for large disturbances. Modern automatic voltage regulators and power system stabilizers are digital, facilitating additional capabilities such as adaptive control and special logic. A modern excitation system contains components like automatic voltage regulators (AVR), Power System stabilizers (PSS), and filters, which help in stabilizing the system and maintaining almost constant terminal voltage. These components can be analog or digital depending on the complexity, viability, and operating conditions. The final aim of the excitation system is to reduce swings due to transient rotor angle instability and to maintain a constant voltage. To do this, it is fed a reference voltage which it has to follow, which is normally a step voltage. The excitation voltage comes from the transmission line itself [4] [5]. The purpose of conventional automatic voltage regulator (CAVR) in synchronous generators to control the terminal voltage and reactive power has been the common phenomena in power systems control which shown in Figure 4.

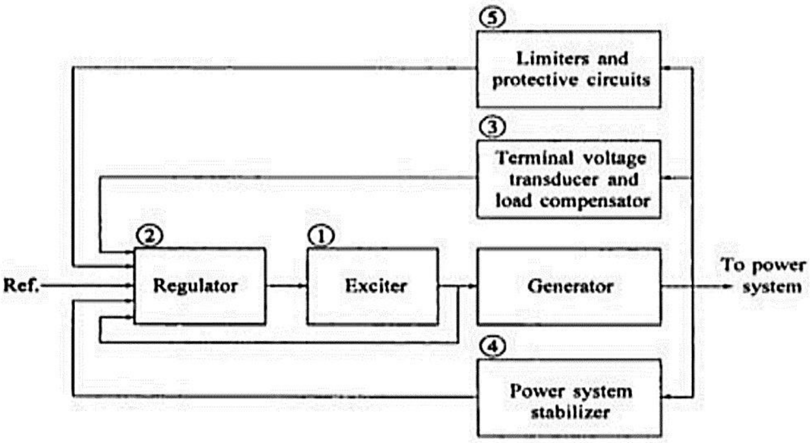


**Figure 4: Functional Block Diagram of Excitation System**

### *Automatic Voltage Regulator (AVR)*

The main objective of the Automatic Voltage Regulator is to control the terminal voltage by adjusting the generators exciter voltage. The Automatic Voltage Regulator must keep track of the generator terminal voltage all the time and under any load condition, working in order to keep the voltage within pre-established limits. Based on this, it can be said that the Automatic Voltage Regulator also controls the reactive power generated and the power factor of the machine once these variables are related to the generator excitation level.

However, use of Automatic Voltage Regulator has detrimental effect on the dynamic stability or steady state stability of the power system as oscillations of low frequencies (typically in the range of 0.2 to 3 Hz) persist in the power system for a long period and sometimes affect the power transfer capabilities of the system [6].

### *Power System Stabilizer (PSS)*

Disturbances that comes in electrical networks cause electromechanical oscillations. These power oscillations must be damped effectively so that to maintain the stability of generators and preserve the integrity of the entire system. Transient stability is the most severe problems in the reliability and proper functioning of electrical networks. The generators are equipped with power stabilizer (PSS) as control devices for damping power oscillations and provide better dynamic performance. These PSS are mainly used to absorb low frequency oscillations. Synchronous generator improves the small-signal power system stability by damping out low frequency oscillations in the power system. It does that by providing supplementary perturbation signals in a feedback path to the alternator excitation system [8].

A Power System Stabilizer installed in the excitation system of the. The basic operation of Power System Stabilizer is to apply a signal to the excitation system that creates damping torque which is in phase with the rotor oscillations. Shown in Figure 5 and Figure 6, Power System Stabilizer is modeled by the nonlinear system [7]. The model consists of a low-pass filter, a general gain, a washout high-pass filter, a phase-compensation system, and an output limiter. The general gain K determines the amount of damping produced by the stabilizer

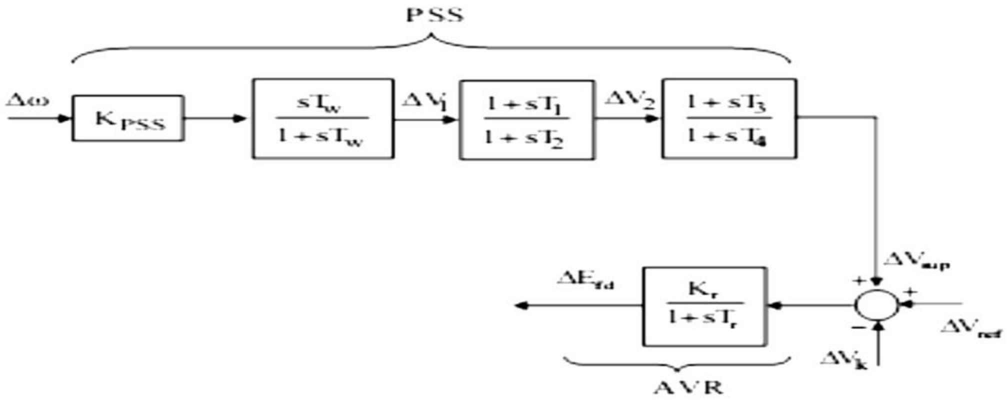


**Figure 5: Basic Structure of Conventional PSS**

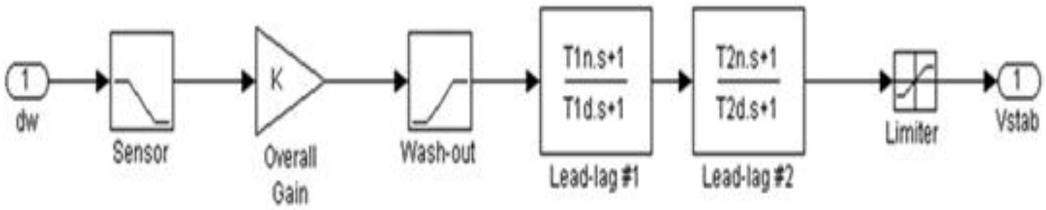


**Figure 6: PSS block**

The washout high-pass filter eliminates low frequencies that are present in the dw signal and allows the Power System Stabilizer to respond only to speed changes. The phase-compensation system is represented by a cascade of two first-order lead-lag transfer functions used to compensate the phase lag between the excitation voltage and the electrical torque of the synchronous machine.

***Design considerations***

Although the main objective of Power System Stabilizer is to damp out oscillations it can have strong effect on power system transient stability. As Power System Stabilizer damps oscillations by regulating generator field voltage it results in swing of VAR output. So the Power System Stabilizer gain is chosen carefully so that the resultant gain margin of Volt/VAR swing should be acceptable. To reduce this swing the time constant of the “Wash-Out Filter” can be adjusted to allow the frequency shaping of the input signal [8].

Again a control enhancement may be needed during the loading/unloading or loss of generation when large fluctuations in the frequency and speed may act through the PSS and drive the system towards instability. Modified limit logic will allow these limits to be minimized while ensuring the damping action of Power System Stabilizer for all other system events.

***PSS input signals***

Till date numerous PSS designs have been suggested. Using various input parameters such as speed, electrical power, rotor frequency several PSS models have been designed. Among those some are depicted below.

- **Speed as input:** A power system stabilizer utilizing shaft speed as an input must compensate for the lags in the transfer function to produce a component of torque in phase with speed changes so as to increase damping of the rotor oscillations.
- **Power as input:** The use of accelerating power as an input signal to the power system stabilizer has received considerable attention due to its low level torsional interaction. By utilizing heavily filtered speed signal the effects of mechanical power changes can be minimized. The power as input is mostly suitable for closed loop characteristic of electrical power feedback.
- **Frequency as input:** The sensitivity of the frequency signal to the rotor input increases in comparison to speed as input as the external transmission system becomes weaker which tend to offset the reduction in gain from stabilizer output to electrical torque, that is apparent from the input signal sensitivity factor concept [8].

## 3. REVIEW OF DIFFERENT PSS TECHNIQUES

**A. PID Control Approach:** PID is used for stabilization in the system. The input is the change in speed from the generator. The aim is to control the angle between load and speed of generator. The PSS parameters are tuned from Open loop transfer function to close loop based on Fuzzy logic. Therefore, the open loop transfer function and maximum peak response parameter make the objective function which is used to adjust PID parameters.

**B. LAG-LEAD Design:** The washout block is used to reduce the over response of the damping during extreme events. Since the PSS produces a component of electrical torque in phase with speed deviation, phase lead blocks circuits can be used to compensate for the lag between the PSS output and the control action(hence lead-lag). It proves its value when the disturbance is multi natured.

**C. Pole Placement Method**: The pole placement method is applied to tune the decentralized output feedback of the PSS. The objective function is selected to ensure the location of real parts and damping ratios of all electro mechanical modes. At the end of the iterative process, all the electromechanical modes will be moved to the region if the objective function converges to zero [7] [8].

**D. Model predictive Control:** It can handle non linarites and constraints in saturated way for any process model. In these techniques an explicit dynamic model of a plant is used to predict the effect of future actions of manipulated variables on the output.

**E. Linear Matrix Inequalities:** The important feature is the possibility of combining design constraints into a single convex optimization problem.it is used in many engineering related problems. The condition that the pole of a system should lay within this region in the complex plane can be formulated as an LMI constraint.

**F. Linear Quadratic Regulator:** These are well known as compared to lag-lead stabilizers. This is used as a state feedback controller. A coordinated LQR design can be obtained with Heffron- Phillips Model and it can be implemented by using the information available within the power system. During the presence of faults even these methods prove to be stable [8].

**G. Genetic Algorithm:** Genetic algorithm is independent of complexity of performance parameters and to place the finite bounds on the optimized parameters [8]. As a result it is used to tune multiple controllers in different operating conditions or to enhance the power system stability via PSS and SVC based stabilizer when used independently and through different applications.

**H. Fuzzy Logic Control:** These are rule based controllers. The structure of this logic resembles that of a knowledge based controller; it uses principle of fuzzy set theory in its data interpretation and data logic. It has excellent response with small oscillations. The controller is robust and works effectively under all types of disturbance. It has very short computation time [9] [10].

**I. Neural Network:** Neural Network is used to approximate the complex non-linear dynamics of power system. Magnitude constraint of the activators is modelled as saturated non-linearity and is used in Lyapnov's stability analysis [9] [10]. The overshoot is nearly same as conventional PSS but settling time is drastically reduced.

***J. Anfis PSS:*** The actual design method may be chosen based on real time application and dynamic performance characteristics. If the training data and algorithm are selected properly then good performance can be observed. 1.5 Different Issues with Conventional Controller/Model.

## 4. Limitation of Conventional Controller

The highly complex and non-linear nature of power systems causes the derivation of accurate models extremely difficult. Therefore, there exist limitations for the mathematical model based schemes [10]. Automatic Voltage Regulator produces a negative damping especially at high values of external system reactance and high generator outputs [11]. The conventional PSS which uses lead-lag compensation which giving poor performance under severe loading conditions specially in inter area oscillation[15] .Due to the over-stretching of interconnection and generation limits, the number of oscillation modes experienced by a single generator has become large and the frequency of these modes have begun to vary over a wide range. 'Thus, the design of PSS for a single generator has become extremely complex [16]. PSS is designed for using linearized model in the specific operating point show a good control performance But these approaches are difficult to obtain a good control performance in case of operating conditions such as change of large load or three-phase fault, etc. [18] Generally, effective robust performance of closed loop system is proportional inversed with controller response time. Therefore, it can be concluded that classical and nonflexible controllers do not represent good solutions due to nonlinear, multivariable and uncertain power system containing a wide array of devices each having different response rate. Additionally, contingencies and load variations smoothed the way for fast and highly flexible control schemes [19].

## 5. Fuzzy Logic Controller

The Fuzzy control systems are rule-based systems and generally deal with natural language rather than crisp, in which a set of Fuzzy rules represent a control decision mechanism to correct the effects of certain system stimuli. With the help of effective rule base, it can be says that fuzzy control systems can replace a highly skilled human operator. The fuzzy logic controller delivers an algorithm which can change the linguistic control approach based on skilled knowledge into an automatic control scheme. [16]

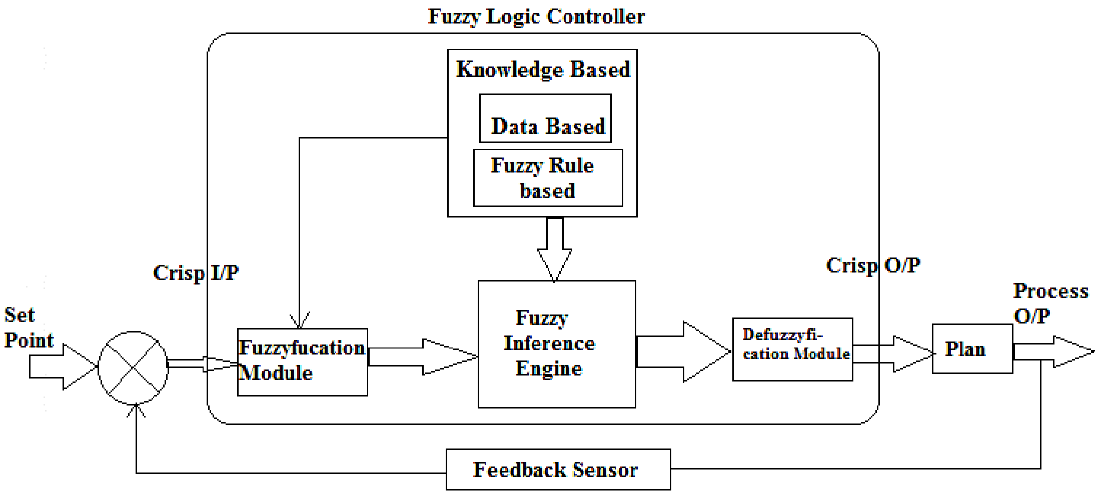


**Figure 7: Functional block of Fuzzy logic controller**

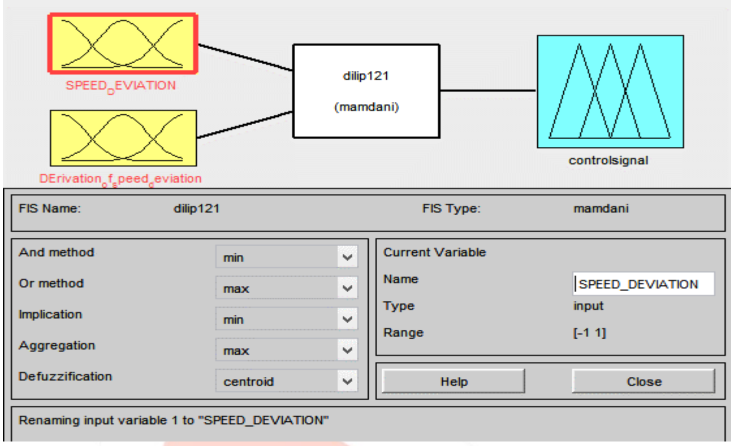
Show in Figure 7 the basic functional block of fuzzy logic controller with input-output crisp pair and fuzzy inference engine for particular application. The design of Fuzzy system totally based on expert who design the rule and membership function.

**Design of Fuzzy logic controller:**

The improvement of the control system based on fuzzy logic involves the following steps [16]:

- **Selection of the control variables**

This is the first steps in which the input variables are speed deviation and the power acceleration generally taken in case of analysis of stability in terms of excitation system control. The output variable in form of voltage is control signal to excitation input of synchronous generator. Shown in Figure 8 Fuzzy Mamdani model is used to implement Fuzzy Logic Control.

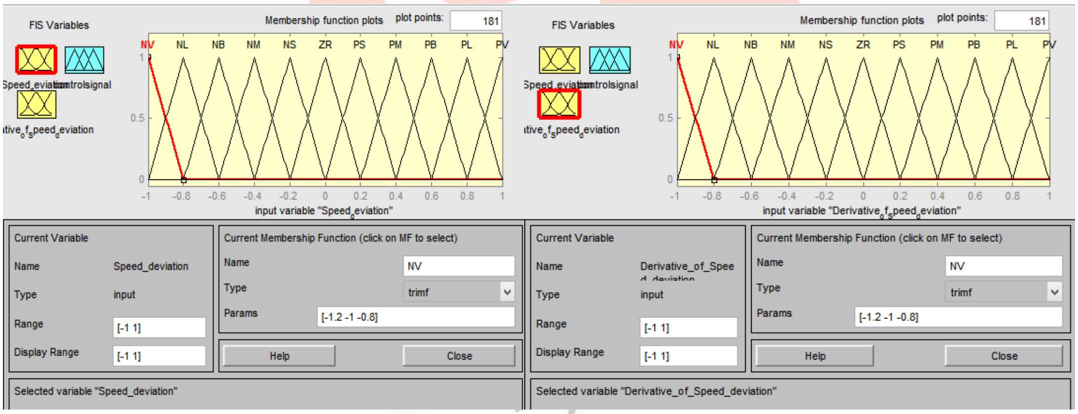


FIS Name: dilip121
FIS Type: mamdani
And method: min
Or method: max
Implication: min
Aggregation: max
Defuzzification: centroid
Current Variable
Name: SPEED_DEVIATION
Type: input
Range: [-1 1]
Renaming input variable 1 to "SPEED_DEVIATION"

Figure 8 Fuzzy Mamdani model

- **Membership function**

In this work, eleven types of membership functions are considered for input and output variable. The input1 and input 2 are speed change (ω) and Derivation of speed change (Δω). The membership function for all of parameter mentioned before is set to triangular-shaped membership function (Trimf). No of reference suggest different types of fuzzy model in terms of different membership function.

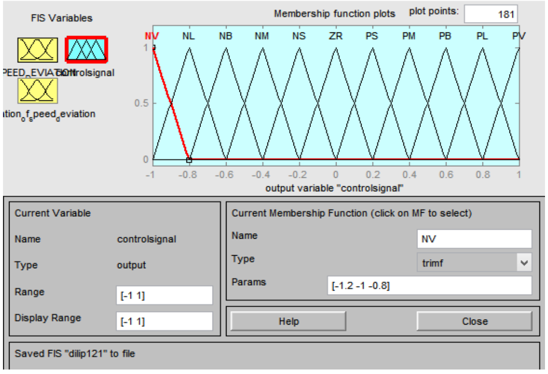


Plot points: 181
Current Variable
Name: Speed_deviation
Type: input
Range: [-1 1]
Display Range: [-1 1]
Current Membership Function (click on MF to select)
Name: NV
Type: trimf
Params: [-1.2 -1 -0.8]
Selected variable "Speed_deviation"

Plot points: 181
Current Variable
Name: Derivative_of_Speed_deviation
Type: input
Range: [-1 1]
Display Range: [-1 1]
Current Membership Function (click on MF to select)
Name: NV
Type: trimf
Params: [-1.2 -1 -0.8]
Selected variable "Derivative_of_Speed_deviation"

Figure 9 Input parameter added in FIS

The range of membership function is set between -1 to 1. Shown in Figure 9 & 10 is two input and one output signal added in model.

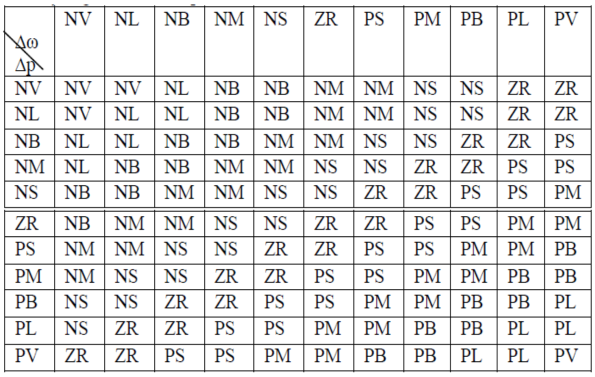


Plot points: 181
Current Variable
Name: controlsignal
Type: output
Range: [-1 1]
Display Range: [-1 1]
Current Membership Function (click on MF to select)
Name: NV
Type: trimf
Params: [-1.2 -1 -0.8]
Saved FIS "dilip121" to file

Figure 10 Controllable Output signal of FIS

- **Rule formation**

The rule actually shows the habit of the controller when it sense the changes of the input. It works like human brains, when problem occurred; brain might find the way out from the problems or constraints. The solutions for the problem based on human experiences. If human involved in the similar problem before, then the brain will solve the problem quickly. This concept similar with the Fuzzy Controller rules. It will make a decision based on its rules. All 121 rule formulated shown in Figure 11.



| Δω<br>Δp | NV | NL | NB | NM | NS | ZR | PS | PM | PB | PL | PV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NV | NV | NV | NL | NB | NB | NM | NM | NS | NS | ZR | ZR |
| NL | NV | NL | NL | NB | NB | NM | NM | NS | NS | ZR | ZR |
| NB | NL | NL | NB | NB | NM | NM | NS | NS | ZR | ZR | PS |
| NM | NL | NB | NB | NM | NM | NS | NS | ZR | ZR | PS | PS |
| NS | NB | NB | NM | NM | NS | NS | ZR | ZR | PS | PS | PM |
| ZR | NB | NM | NM | NS | NS | ZR | ZR | PS | PS | PM | PM |
| PS | NM | NM | NS | NS | ZR | ZR | PS | PS | PM | PM | PB |
| PM | NM | NS | NS | ZR | ZR | PS | PS | PM | PM | PB | PB |
| PB | NS | NS | ZR | ZR | PS | PS | PM | PM | PB | PB | PL |
| PL | NS | ZR | ZR | PS | PS | PM | PM | PB | PB | PL | PL |
| PV | ZR | ZR | PS | PS | PM | PM | PB | PB | PL | PL | PV |

Figure 11 Rule Formulation

**Defuzzification strategy**

It is a process of converting the FLC inferred control actions from fuzzy vales to crisp values. This process depends on the output fuzzy set, which is generated from the fired rules. The performance of the FLC depends very much on the deffuzzification process. This is because the overall performance of the system under control is determined by the controlling signal (the defuzzified output of the FLC). This is implemented using following FIS (fuzzy Inference System) properties: And Method: Min, Or Method: Max, Implication: Min Aggregation: Max, Defuzzification: Centroid.

**The main disadvantages of Fuzzy Logic System** [21]

- Knowledge used to design a fuzzy logical controller mainly comes from the heuristic knowledge or expertise of the human experts. This sort of knowledge is sometimes difficult to acquire and represent in the required form.
- Parameters of the fuzzy logic controller are usually determined by trial and error. This method is time consuming and does not guarantee an optimal controller.

## 6. Description of the Network Studied

A test system consists of 2 machines with 3 buses is considered. Plant 1 (M1) is a 1000 MW Generation Plant is connected to a load center through a long 500 kV, 700 km transmission line. The load center is represented as a 5000 MW resistive load and supplied by the remote plant 2 (M2). Consists of a 1000 MVA plant and a local generation of 5000 MVA shown in Figure 12. Also all the parameter value of system given in Table 1, 2 and 3. The two machines are equipped with a hydraulic turbine and governor (HTG), excitation system and Power System Stabilizer. Figure 15 to 17 shows Result of Positive Sequence Voltages at buses B1, B2, and B3 and Power as well as Rotor angel, Speed and Terminal Voltage without any controller which shows the local oscillation. Without PSS controller in Power System Oscillation damping after fault in two machine system is examined.

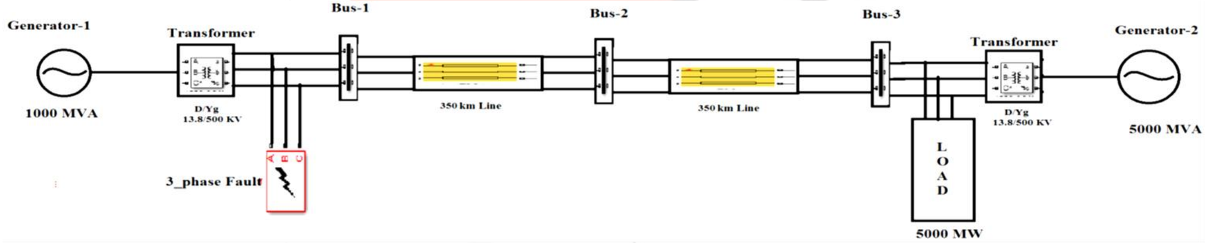


**Figure 12: 2-Machine 3-Bus system**

**Table 1: Generator Parameter**

| **GENERATOR-1** | 1000MVA, 60Hz | **REACTANCE** | **TIME CONSTANT** |
|---|---|---|---|
| **GENERATOR-2** | 5000MVA, 60Hz | Xd = 1.305 | Td' = 1.01 |
| **STATOR RESISTANCE** | 2.86E-03pu | Xd' = 0.296 | Td'' = 0.053 |
| **INERTIA CONSTANT** | 3.7 | Xd'' = 0.252 | Tq0 = 0.1 |
| **FRICTION FACTOR** | 0 | Xq = 0.474 | |
| **POLE PAIR** | 32 | Xq'' = 0.243 | |
| **G1, G2- PF** | 0.9, 0.80 | Xl = 0.18 | |

**Table 2: Transformer, Line and Load Parameter**

| | |
|---|---|
| **TRANSFORMER-1** | Delta- Star, 13.8/500kv, 60Hz |
| **TRANSFORMER-2** | Delta- Star, 13.8/500kv, 60Hz |
| **R1 & R2, L1 , L2** | 0.002pu, 0.002 pu, 0 pu, 0.12 pu |
| **LOAD** | 5000MW |
| **LINE** | 700km |
| **LINE PARAMETER** | R-0.01755ohm/km, L-0.8737e-3H/km, C-13.33e-9F/km |

| | |
|---|---|
| **3-PHASE FAULT** | Transition time [0.1 0.2]sec |

**Table 3: Power System Stabilizer Parameter**

| | | | |
|---|---|---|---|
| **SENSOR TIME** | 15e-3 | **GAIN** | 2 |
| **WASHOUT** | 0.7 | **LEAD-LAG#1** | [60e-3, 0.5] |
| **LEAD-LAG#2** | [0, 0] | **O/P LIMIT** | [-0.15, 0.15] |

**Simulink Model**

Figure 13 & 14 shows Simulink model of Generator excitation system of two machine system in which PSS coordination with Excitation system, also coordination Fuzzy logic controller with excitation system through PSS.

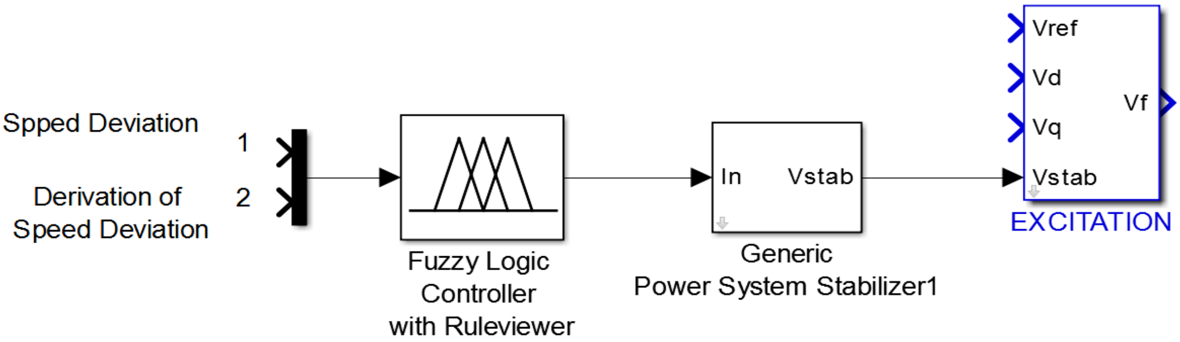


**Figure 13: FLPSS**

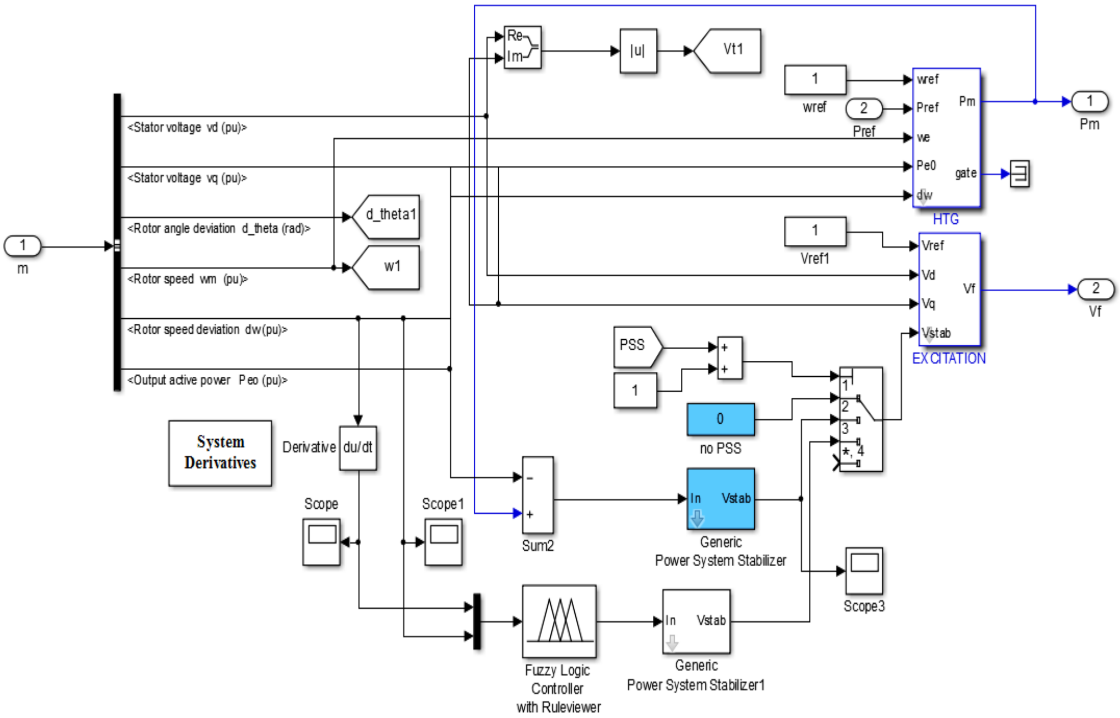


**Figure 14: Power System Stabilizer Model Coordination with Excitation System**

## 6. Result

1) 3 Phase Fault clear within 0.01sec, without any controller with Excitation system

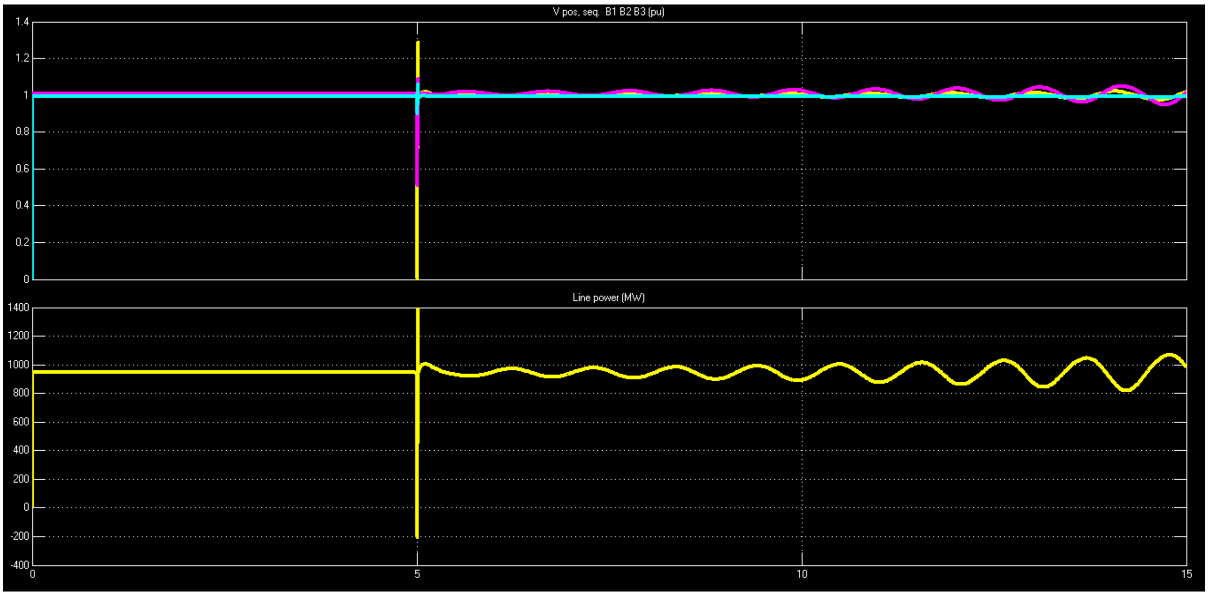


Figure 15: Case-1 Positive Sequence Voltage at Bus and Power

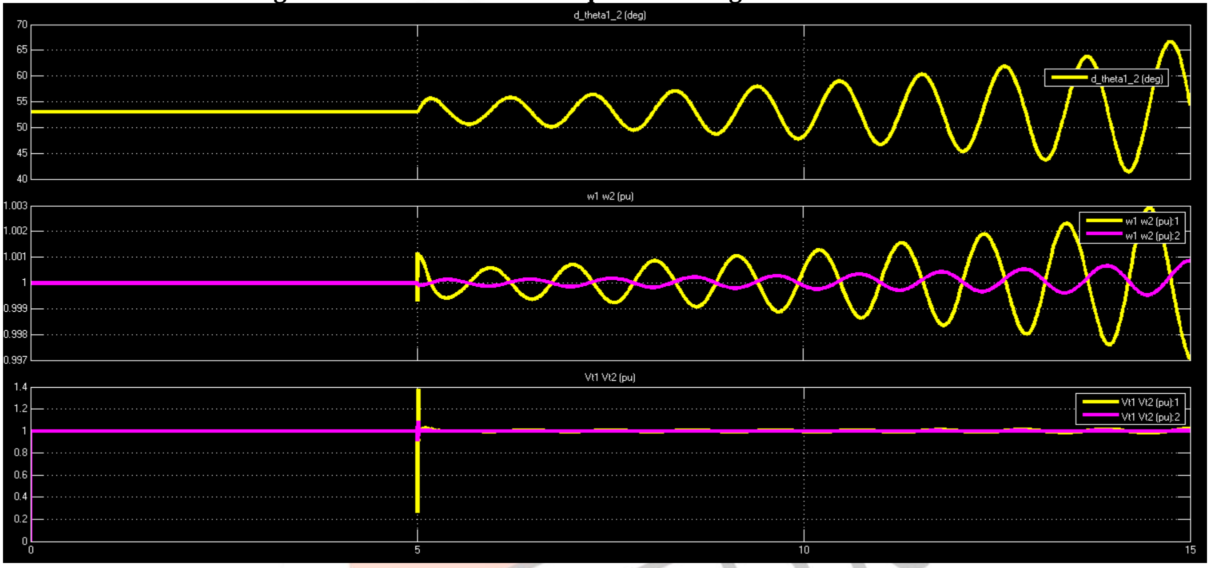


Figure 16: Case-1 Rotor Angle, Speed and Terminal Voltage

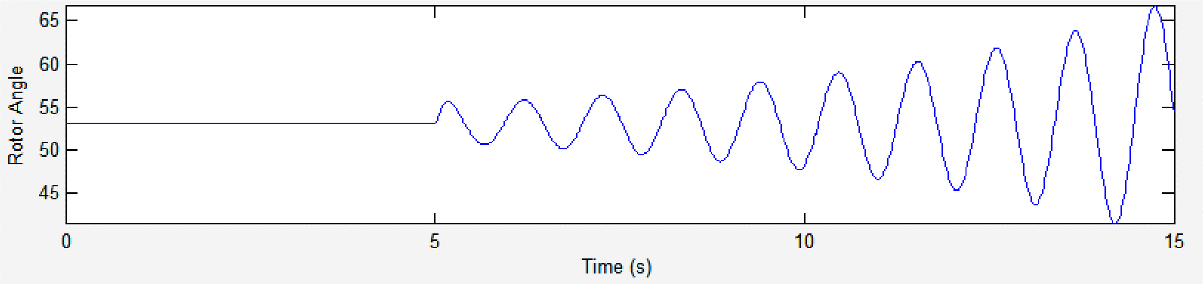


Figure 17: Rotor angle v/s Time

Figure 18 to 20 shows above parameter of case 1 with adding PSS with Excitation system has been Examine. Its shows the better damping oscillation and improve the stability of system.

2) 3 phase line to ground fault clear within 0.01sec, with Power System Stabilizer

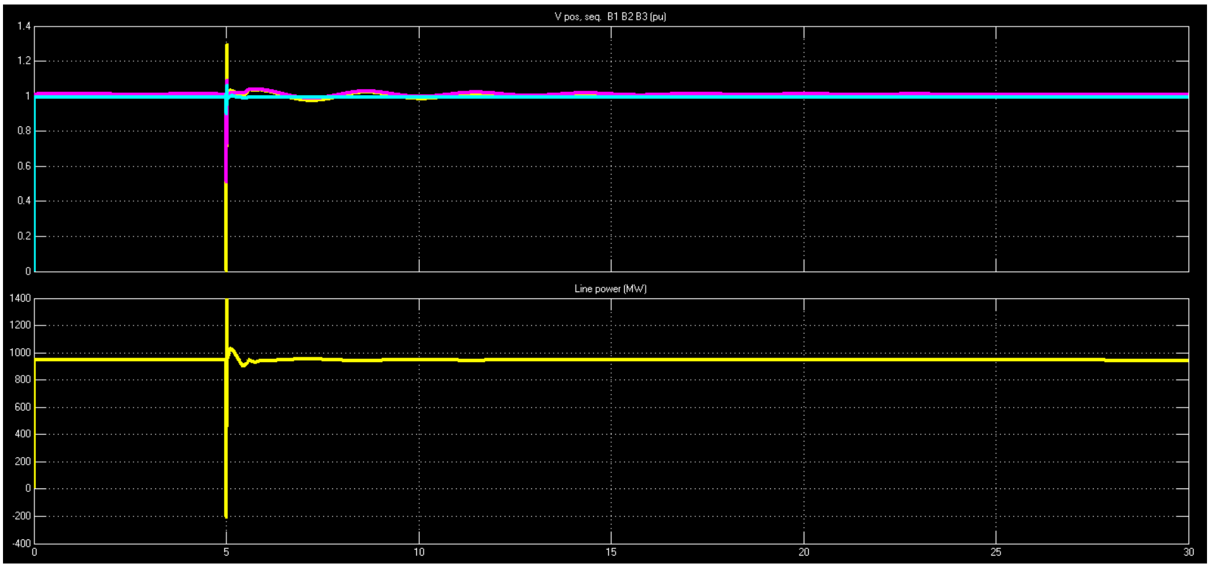


Figure 18: Case-1 Positive Sequence Voltage at Bus and Power

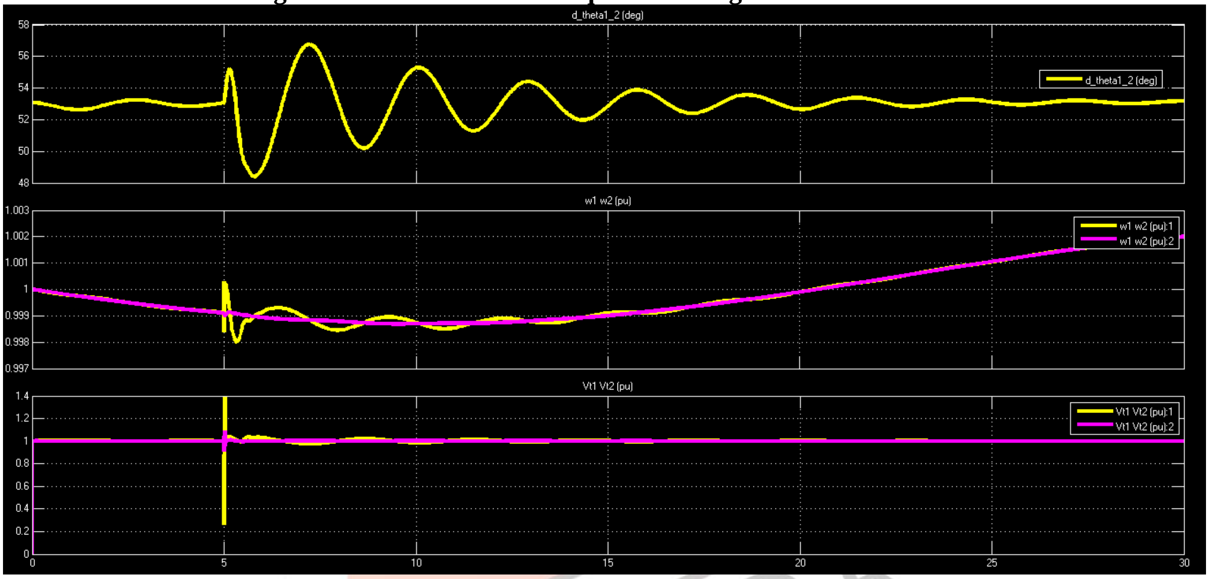


Figure 19: Case-1 Rotor Angle, Speed and Terminal Voltage

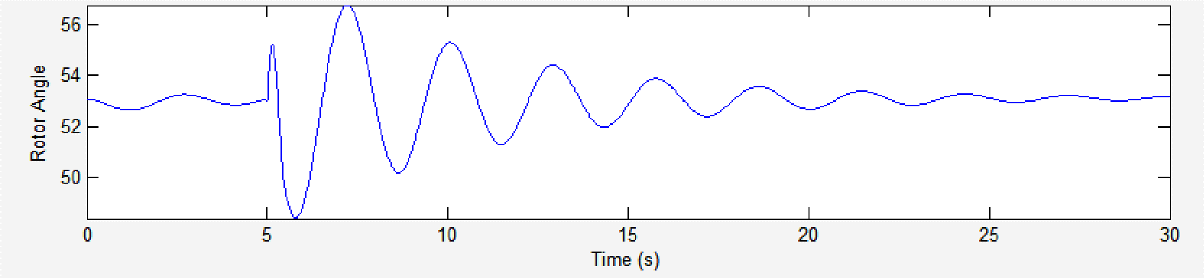


Figure 20: Rotor angle v/s Time

Figure 21, 22 & 23 shows above parameter of case 2 with Coordination of Fuzzy logic with PSS and adding with Excitation system has been Examine. Its shows the better damping oscillation and improve the stability of system as compare to conventional in terms of quick settling time to damp the rotor angle oscillation.

2) Fault clear within 0.01sec, with Fuzzy Logic Based Power System Stabilizer

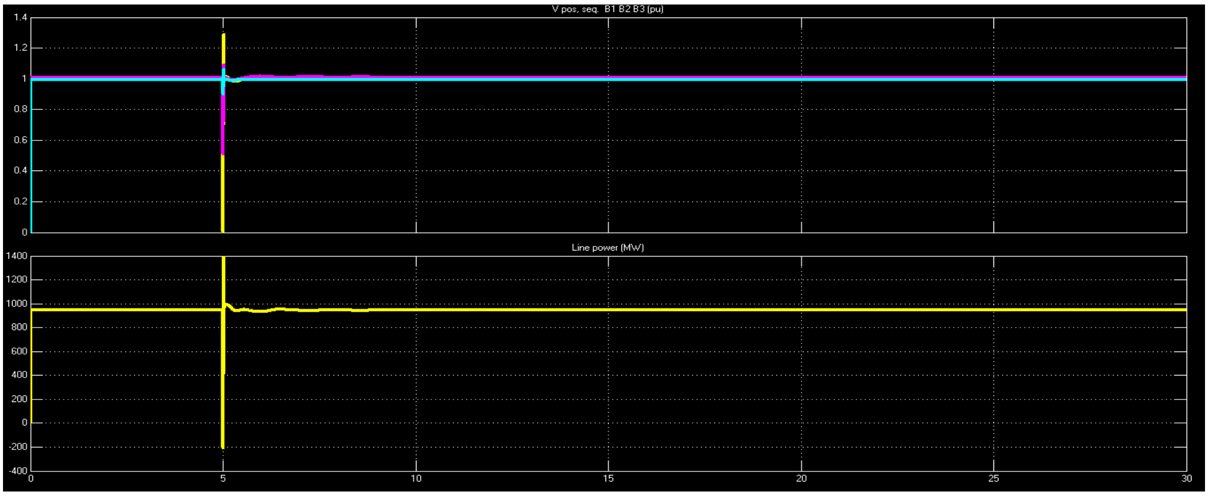


Figure 21: Case-1 Positive Sequence Voltage at Bus and Power

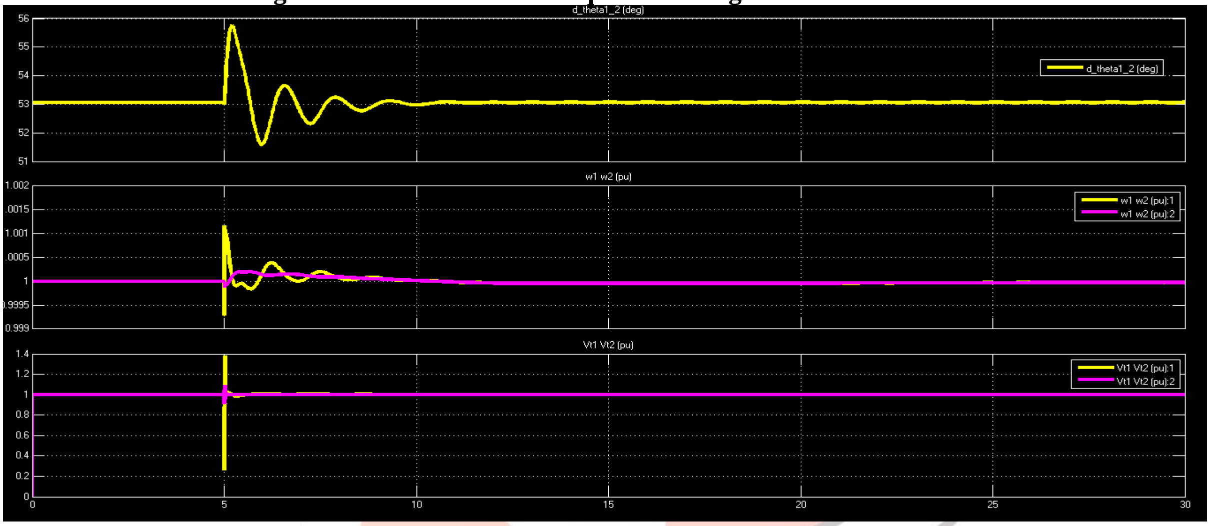


Figure 22: Case-1 Rotor Angle, Speed and Terminal Voltage

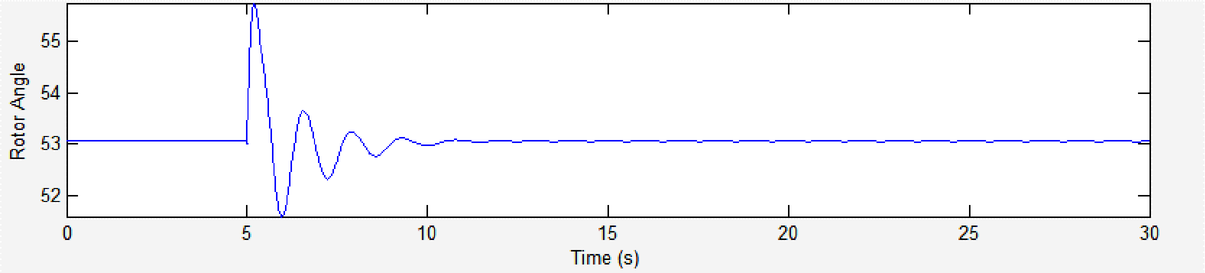


Figure 23: Rotor angle v/s Time

**Comparison:**

Shown in figure 24 comparison is made between Fuzzy logic based Power System Stabilizer and Convention Power System Stabilizer in terms of Rotor angle v/s Time. From the result it can be conclude that the FLPSS can damp oscillation fast as compare to convention PSS and within 11 second it's make signal completely stable, on the other side PSS take more time to stable the rotor angle of the generator in case of 3 phase to ground fault in the system.

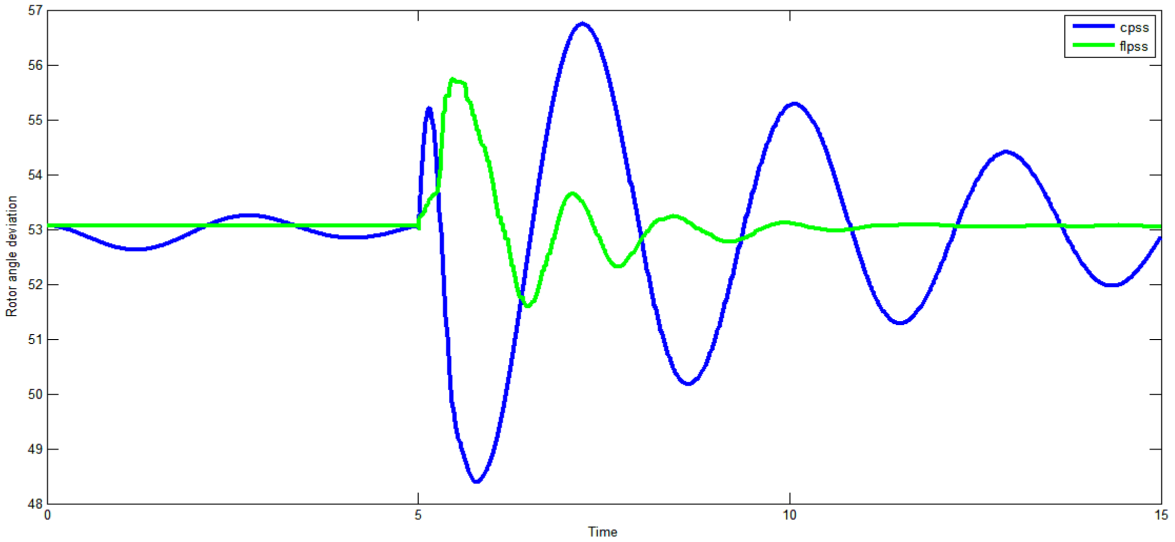


Figure 24: Comparison of Rotor angle v/s Time between FLPSS and CPSS

## 7. CONCLUSION

Transient stability is one of the major issues in today's power system world. The control actions at generator end to enhance the system stability are either in terms of excitation system or power system stabilizers or at mechanical end of power plants. From the theoretical point of view as well from the design it can be conclude that proposed controller is robust and effective as compare to conventional one. There is no need any mathematical model to design Fuzzy controller. The performances of the system during three-phase fault conditions are performed. The resultant characteristics of speed deviation, active power deviation, terminal voltage and active power transfer from bus1, 2 and 3 are observed for the two conditions mentioned above. For the disturbance investigated, the fuzzy logic power system stabilizer (FLPSS) has increased the damping of the system causing it to settle back to steady state in much less time than the conventional power system stabilizer (CPSS). The FLPSS, though rather basic in its control proves that it is indeed a good controller due to its simplicity. To minimized problem with Fuzzy logic techniques, some other Artificial intelligent based methods are proposed in some of the references. So future work will be analysis of transient stability by nonconventional neuro fuzzy techniques and it's implemented with power system stabilizer for better enhancement and also cover wide range of different disturbances in large interconnected power system. Neuro-Fuzzy logic techniques is modern techniques which can handle power system problem like stability, more easily as compared to other conventional techniques in modern world. With Neuro-fuzzy techniques and some other artificial intelligent techniques, Power system problem like load forecasting, voltage control, stability assessment, and security assessment etc., can easily and reliably control.

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