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Controllers for Automatic Generation Control of Two Area Interconnected Power System: A Review

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Abstract

This work presents a brief review and performance comparison of various controllers utilized in past few years for the automatic generation control of the two area interconnected power system. In past few years, so many controller like conventional controllers I, PI, PID and soft controllers fuzzy tuned PID have been utilized for the control structure in two area interconnected power system. In this paper all the controllers and their characteristics have been revised and found that the fuzzy tuned PID controller with PSO technique provides better stability for the system compared to the other existing controllers.

1. Introduction

In this work, firstly discuss about twoarea control system, which is interconnected system and it will be control load and generation, when two utilities system which interconnected, one system is to be able to sell and buy the power with neighboring system whose operating costs make such transaction profitable. Even it is tie to neighboring system, when no power is transmitted by the system. If one system has a sudden loss of a generating unit, the units throughout all the interconnection will experience a frequency change and can help in restoring frequency [1].

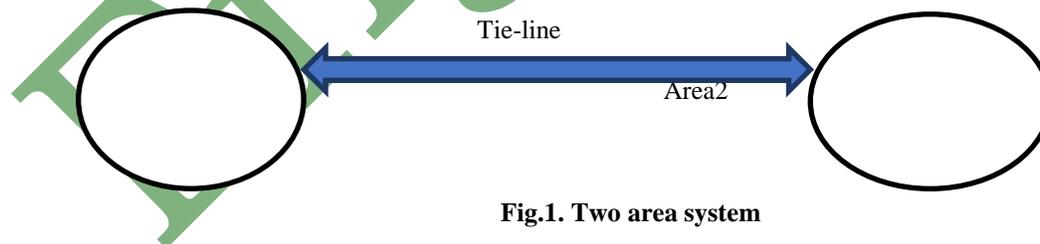


Fig.1. Two area system

In the power system, electrical generator which is converted mechanical energy generated by turbine into electrical energy, and prime mover also converted one form of energy into electrical energy. Automatic generation control is the name given to a control system having three major objectives, to hold system frequency at or close to a specified nominal value, maintain the interchange power between control areas, to maintain each unit's generation at the most economic value. a control area which the load and generation will be controlled. Mainly two types of control loops are available such as, primary control(load frequency control), secondary control(automatic voltage regulator) [2].in this paper reveal on comparison performance of different types of controllers in automatic generation control for an interconnected two unequal area of thermal power system.

2. Review of Controllers for Two Area Interconnected Power System

Firstly, In a generating unit load supplied by an isolated system, when changes in the load, speed change and magnitude of the frequency is also change and its dependent on droop characteristics of the governor and frequency characteristics of system load. When change in the system has occurred, mainly work of the supplementary control reset of frequency to nominal value. This can be accomplished by adding a reset control to the governor. Reset control action means frequency error to be zero by supplementary controller. So, different types of controller use in power system and analysis which controller(I,PI, PID and Fuzzy PID) give better performance and stability of the system.

In 2008, J. Nanda, Lalit Chandra Saikia .et .al .[2-4] in this paper present the performance of different controller, I, PI, ID, PID all provide more or less same response. Integral double derivative (IDD) controller provides better performance to all other controllers and optimized through bacterial foraging (BF) technique, it is more recent and powerful evolutionary computational technique. In this work present integral double derivative controller provide better performance and better response to other controller. In this work, performance of all (I, PI, ID, PID) controllers is approximately equal in response. BF technique for simultaneously optimization of controller gains and speed regulation parameter R has been applied for the first time in AGC.BF technique use first time in this paper and IDD controller got better performance to other controller which is use in this paper.

In 2012,B. K. Sahu, P.K. Mohanty, S. Panda, S.K. Kar, N. Mishra,[5] in this paper present AGC with using PID controller and comparison between many optimizing liaisons and PSO algorithm, and found the performance of MOLis better than PSO algorithm. For performance studies: Transient Response Analysis, Bode plot Analysis and root locus analysis.

In 2013, Jeevithavenkatachalam, Rajalaxmi.et. al .[6-9]In this paper presents the particle swarm optimization (PSO) technique to optimize the integral controller gains for the automatic generation control (AGC) of the interconnected two area power system. Each control area includes the dynamics of thermal systems. PSO based controller improves dynamic response and at the same time faster than conventional PI controller.

In 2013, Aswini Kumar Patel, MrDharmendra Ku. Singh, MrBinod Kumar Sahoo,et. al .[10] in this paper PID controller has been used, Differential evolution (DE) is one of the most power full stochastic real parameter optimization in current use. Differential evolution based optimization gains give better optimal transient response of frequency and tie line power changes compared toLozi-map based chaotic algorithm (LCOA).and the performance of DE PID controller is better than LCOA PID controller.

In 2014, KapilGarg*, JaspreetKaur .et. al .[11] this paper present particle swarm optimization technique for two area interconnected system, firstly conventional controller(I, PI) are then PSO based controller are used in this system then PSO based controller is used.It is clear from the results that the performance of PI controller is better than I . In case of PI with PSO controller settling time of frequency and tie line power is smaller as compared to I and PI controller. For a two-area power system various parameters are calculated by PSO technique. The results show that the performance of PSO based controllers is better than the performance of conventional controllers. The peak overshoot andsettling time is reduced in case of PSO based controllers.

In 2015, Tridipta Kumar Pati, JyotiRanjanNayak, Binod Kumar Sahu, Sanjeeb Kumar Kar,[12] in this work Fuzzy PID controller has been used and the gain of FPID controller is optimized by teaching learning based optimization technique and particle swarm optimization technique. Compare between them and performance. And according to these paper TLBO technique with using Fuzzy-PID controller provide better dynamic response.

In 2016,Emad Ali Daood¹, A.K. Bhardwaj², [13-15] in this work present improve the dynamic response with using Fuzzy PID Controller.It has been saw that responses of frequency deviation with Fuzzy Controller and WTG are well in terms of steady state error, settling time, transients.

3. Conclusion

In others papers saw, use different types of controller and optimization technique. Comparison between controllers and find out which controller provide better performance, dynamic response, settling time and transient response with using different optimization technique. In this paper will show, Fuzzy PID controller with using Particle Swarm Optimization Technique provide better performance, Dynamic response, stability and comparison between different types of Conventionalcontrollers. PSO is a computational intelligent based technique, more efficient and fast technique for optimization of different gains in load frequency control. MATLAB/SIMULINK is used as a simulation tools.

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