OPTIMIZATION OF AUTOMATIC VOLTAGE REGULATOR BY PROPORTIONAL INTEGRAL DERIVATIVE CONTROLLER

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Abstract

This paper is basically based on the optimization of working of Automatic voltage regulator by the proportional Intigral derivative controller. In this analysis, optimization is done by very novel concept Particle Swarm Optimization and simulated using MATLAB Simulink software. The primary reason for a programmed voltage controller framework is to keep the voltage extent of a synchronous generator at a predetermined level the generator excitation framework keeps up the generator voltage and controls the reactive power stream.

IndexTerms: AutomaticVoltageRegulator,MATLAB

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1. INTRODUCTION

The primary reason for a programmed voltage controller framework is to keep the voltage extent of a synchronous generator at a predetermined level the generator excitation framework keeps up the generator voltage and controls the receptive force stream. Excitations of more established frameworks were supplied through slip rings and brushes by method for DC generators mounted on the same shaft as the rotor of the synchronous machine. However, advanced excitation frameworks typically utilize the brushless excitation.
distinctive control technique like relative indispensable controller (PI), PID controller and so on. Distinctive state criticisms controllers have

been proposed and altered addition controller of ideal conditions have been outlined however they neglected to give better control execution. The PI controllers enhance consistent state mistake (ess) with little overshoot and routine controller has been easy to actualize yet extremely tedious and gives the high recurrence deviation. PID controller has such ability to enhance overshoot with least consistent state blunder. This paper utilizes a PID controller to keep up the stream of responsive force.

2.PARTICLE SWARM OPTIMIZATION:

Particle Swarm Optimization (PSO) is a developmental calculation, streamlining procedure (a hunt strategy in view of a characteristic framework) created by Kennedy and Eberhart. The framework at first has a populace of irregular particular arrangements. PSO system can produce excellent arrangements with in shorter figuring time and have more steady joining attributes than other stochastic methods.PSO is a met heuristic as it makes few or no supposition about the issue being improved and can seek expansive spaces of hopeful arrangement. The decision of PSO parameter can largy affect enhancing execution. In connection to PSO the word unions normally mean one of the two things, in spite of the fact that it is regularly not cleared up which definition is implied and in some cases they are erroneously thought to be indistinguishable. Initial step is to locate a potential arrangement. Every potential arrangement is known as a molecule. Every molecule is given an arbitrary speed and is flown through the issue space. The particles have memory and every molecule monitors its past best position (called as Pbest) and its comparing wellness. There exist various Pbest for the particular particles in the swarm and the molecule with most noteworthy wellness is known as the worldwide best (Gbest) of the swarm. The fundamental idea of the PSO method lies in quickening every molecule towards its Pbest and Gbest areas, with an irregular weighted speeding up at every time step. The accompanying step depicts how molecule swarm enhancement calculation and choice procedure is utilized for examination.

[1]. Instate a populace of particles with arbitrary positions and speeds in d measurements of the issue space and fly them.
[2]. Evaluate the wellness of every molecule in the swarm. For each cycle, contrast every molecule's wellness and its past best wellness (Pbest) got. In the event that the present worth is superior to anything Pbest, then set Pbest equivalent to the present quality and the Pbest area equivalent to the present area in the dimensional space.
[3]. For each emphasis, contrast every molecule's wellness and its past best wellness (Pbest) acquired. In the event that the present quality is superior to anything Pbest, then set Pbest equivalent to the present worth and the Pbest area equivalent to the present area in the dimensional space. In this examination 1000 cycle is utilized and thinks about every base expense of distinctive variable with its past best least cost esteem.

2.1 Pid Controller

A proportional–integral–derivative controller (PID controller) is a control circle input component (controller) ordinarily utilized as a part of electrical control frameworks. A PID controller persistently computes a mistake esteem as the distinction between a deliberate procedure variable and a fancied setpoint. The controller endeavors to minimize the blunder after some time by modification of a control variable, for example, the position of a control valve, a damper, or the force supplied to a warming component, to another worth dictated by a weighted to:

$$u(t) = K_p e(t) + K_i \int_0^t e(\tau) d\tau + K_d \frac{de}{dt}$$

where K_p, K_i, and K_d, all non-negative, denote the coefficients for the proportional, integral, and derivative terms, respectively (sometimes denoted *P*, *I*, and *D*). In this model,

- P accounts for present values of the error
- I accounts for past values of the error
- D accounts for possible future values of the error, based on its current rate of change.

3. COMPARATIVE ANALYSIS OF PSO-PID OF AVR WITHOUT CONTROLLER

Simulink based particle swarm optimization PID controller of AVR model is designed. The block diagram of AVR with and without controller is shown in fig-1 and 2 respectively.

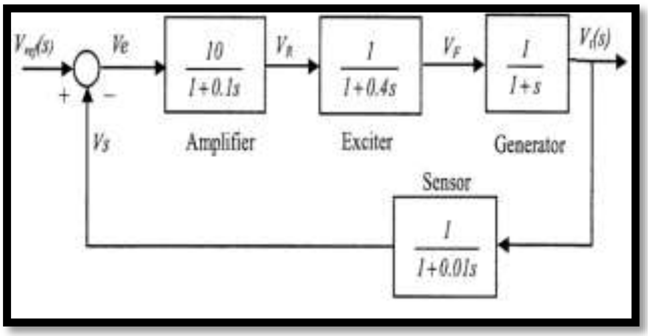

Fig. 1 AVR WITHOUT CONTROLLER

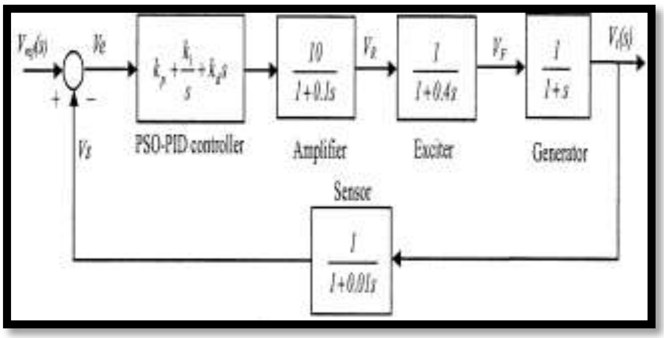

FIG.2 AVR WITH CONTROLLER

MATLAB simulation of comparative analysis for automatic voltage regulator is shown in figure-9. With stabilizer overshoot of system is reduces to zero and settling time is set at 3.98 sec as shown in figure 10.

- **Noise in derivative**

A problem with the derivative term is that it amplifies higher frequency measurement or process noise that can cause large amounts of change in the output. It does this so much, that a physical controller cannot have a true derivative term, but only an approximation with limited bandwidth. It is often helpful to filter the measurements with a low-pass filter in order to remove higher-frequency noise components. As low-pass filtering and derivative control can cancel each other out, the amount of filtering is limited. So low noise instrumentation can be important. A nonlinear median filter may be used, which improves the filtering efficiency and practical performance. In some cases, the differential band can be turned off with little loss of control. This is equivalent to using the PID controller as a PI controller.

CONCLUSION:

This paper basically based on automatic voltage regulator which is optimized by very novel concept particle swarm optimization which is better than compare to other optimized technique. However, with PSO-PID system performance is improved but further have small overshoot and undershoot are developed in the model. So we add a zero to the AVR open-loop transfer function. One way to do this is to add a rate feedback to the control system.

We have also used in future a well designed transformer and its price is very high but other circuit element cost is very cheap enough that the total system costs low or inexpensive. Although, this adaptable system is not wide-spreader in our country we hope if it becomes accessible, the customers will be grateful for it. So the proper steps should be taken to encourage the owner of industries to produce this type of regulator system and deliver to the customer at a reasonable price. In future there are very modification is necessary in automatic voltage regulator and proportional integral derivative. This examination goes for the planning and usage of an Automatic Voltage Regulator (AVR) with higher accuracy and hysteresis. Air conditioning power supplied by PDB (Power improvement load up) in Bangladesh is subjected to variety every once in a while. In addition in rustic ranges supplied voltage stays lower than indicated. This makes an impressive danger the refined electronic gadgets like PC, fridge, TV and so on. So guaranteeing the information voltage to stay in a bearable pre-determined point of confinement has turned into a need in country and additionally some urban territories.

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