Multifarious Technique Applied for the Correctness the Nervous System of Electricity Demand Using GA & AI Technique

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Abstract

Due to huge electricity demand by consumers in all over the world being a volumetric challenge to engineer, researcher, scientist, and academician. As Nerve cells generate electrical signals and neurons control and communicate with our brain and bodies by transmitting information in a form of electricity, although neurons are not intrinsically good conductors of electricity. For fulfilling the electricity demand, it become necessary to continue enhance and improve the nervous system of the generating system by searching and applying the new techniques. In this paper, multifarious technique applied for the correctness the nervous system of electricity demand. Multifarious technique like; Traditional (PI, PID), Artificial Intelligent (Fuzzy) and GA Technique has been applied for effective outcome of amphibolic system, when the system is operating normal condition and also when in disturbing condition. Thermal unit has been considered as a source of electrical power generation. The comparative results shows that the GA technique gives better and effective results with respect to the other techniques by correctness the nervous system of the generating unit with expeditiously rising electricity demand.

Keywords: Nervous System, Amphibolic System, Traditional Technique, Artificial Intelligent Technique, GA Technique, Power Generation, Thermal Source, Electricity Demand.

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1. INTRODUCTION

Increasing the demand of electricity is one of the worst and biggest crises in the universe. More than half of the world's electric energy demand meets by thermal power generating plants. Through burning some fossil fuel in these power stations, steam is produced, which is then used to operate the steam turbines. Therefore, thermal power plants may also be classified as steam power plants. The steam is then condensed in the steam turbine, and then condensed in the condenser, and then the steam is reheated in the steam turbine. This is the ranking phase. Thermal power plant is a power plant that generates energy by burning fossil fuels, including coal, petroleum, etc. It conducts the chemical energy from the gasoline into mechanical energy and then translates it into electrical energy. This power is transferred to a motor which drives a generates electricity. Thermal power plants are planned for continuous operation, which enables the plant to run for years. The unit used to transform thermal energy into mechanical energy is known as a turbine. In thermal power plants, the fuel is used to convert heat to water. This hot water is converted to steam, and then the pressure is required for turbines to work. To produce mechanical energy, either the steam turbine or the gas turbine can be used. For controlling the frequency and power in the limit some computational technique like; traditional (PI, PID), artificial intelligent (Fuzzy) and GA technique has been applied. The nervous system is a complicated combination of nerves and cells known as neurons that transmit signals between different parts of the body. It is essentially the body's electrical wiring. Although neurons are not intrinsically good

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elaborate mechanisms for generating electrical signals based on the flow of ions across their plasma membranes. [1], [2], [5], [10], [20], [21], [24], [25], [26], [28] [29], [30], [31], [32], [33].

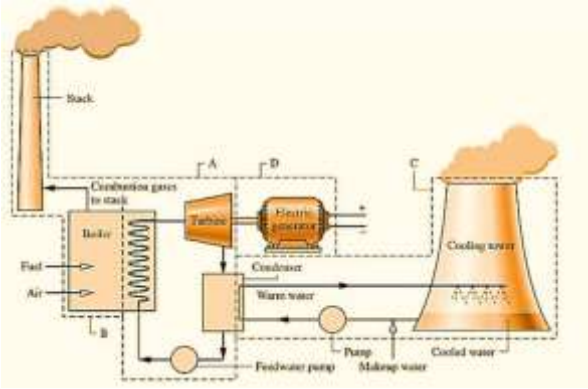

Figure 1 Typical Layout of a Thermal Power Plant

2. EQUATION FOR SYSTEM

The mathematical model has developed which is based on small deviations around a nominal steady state. Let us assume that under steady state power delivered (Pg) from the generator at nominal speed or frequency (F). Under this condition, the equation of frequency and power obtained shown below;

2.1 Equation of Frequency

Let us consider a simple case wherein the speed changer has a fixed setting, which means $\Delta P_C = 0$ and the load demand alone changes. For a sudden step change of load demand (ΔP_d),

$$\Delta P_g(s) = \frac{\Delta P_d}{s} \qquad (1)$$

Changes in frequency is given by

$$\Delta F(s)|_{\Delta PC(s)=0} = -\frac{K_{ps} * \Delta P_d}{T_{ps}} \times \frac{RT_{ps}}{K_{ps+R}} \left[\frac{1}{s} - \frac{1}{(s+\frac{K_{ps+R}}{RT_{ps}})}\right] \qquad (2)$$

$$\Delta f(t) = L^{-1}\, \Delta F\,(s)$$

$$\Delta f(t) = -\frac{RK_{ps}}{K_{ps+R}}\left[1 - e^{\left[-\frac{t}{T_{ps}}\frac{RT_{ps}}{K_{ps+R}}\right]}\right] \Delta P_d \qquad (3)$$

2.2 Equation of Corresponding Power

Corresponding Power must be accounted for the incremental power balance equation of each area, since there is power flow in or out of the area through the tie line.

Power flow out can be expressed as

$$\Delta P_{TL1}(s) = 2\pi T_{12}\left[\frac{\Delta F_1(s)}{s} - \frac{\Delta F_2(s)}{s}\right] \qquad (4)$$

T_{12} is known as the synchronizing or the stiffness coefficient of the tie-line. [2], [3], [4], [5], [8], [10], [14], [16], [17], [18], [19], [32], [33].

3. MULTIFARIOUS TECHNIQUES

In this paper traditional (PI, PID), artificial intelligent (Fuzzy) and GA technique has been used to control the correctness and limit of frequency and power variation.

3.1 Traditional Technique (PI And PID)

Different types of technique are using from past year for controlling the frequency and power flow in interconnected power system. PI (Proportional Plus Integral) and PID (Proportional Plus Integral Plus Derivative) techniques are the traditional technique shown in figure 2.

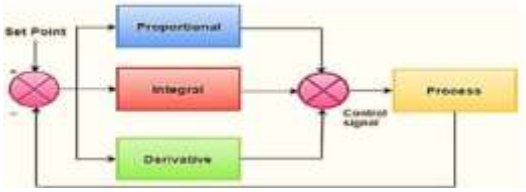

Figure 2 Traditional Technique for Correctness the Nervous System

The transfer function of the PI controller is

$$G(s) = Kp + \frac{Ki}{s} \quad (5)$$

Where K_p is proportional and Ki is an integral gain. The transfer function of the PID controller is

$$G(s) = Kp + \frac{Ki}{s} + sKd \quad (6)$$

Where K_p is proportional gain, Ki is an integral gain and K_d is derivative gain.

3.2 Artificial Intelligent Technique (Fuzzy)

Fuzzy controllers, formulated on the basis of human understanding of the process or identified from measured control actions, can be regarded as emulators of human operators. Fuzzy logic control has more advantages because it can compensate the bad influence by nonlinearity and uncertainties based on advanced human expertise experience, also because it has strong robustness independent of a mathematical model. Fuzzy logic controller is shown below in figure 3.

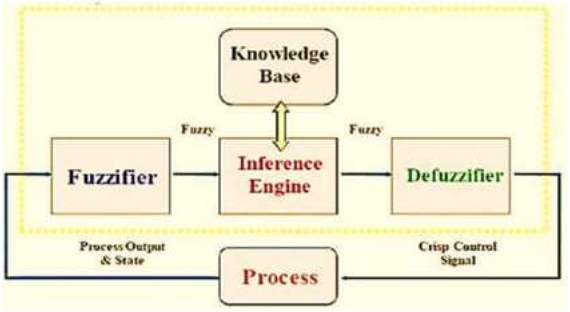

Figure 3 AI Technique for Correctness the Nervous System

3.3 GA Technique

Genetic Algorithm (GA) is the collective name for a range of problem-solving techniques based on principles of biological evolution, which are being increasingly applied to a variety of problems,
ranging from practical applications in industry and commerce to leading-edge scientific research. The parameter used in GA controller for solving the problem of frequency and power in thermal generating unit is shown in Table 1.

All the parameters value has been chosen default.

Table 1: GA Parameters for System

Parameters	Fitness Function	Variables	Population Size	Selection	Mutation	Cross Over	Bound Limit
Generating System	@gene_mh	6	20	Stochastic Uniform	Constraint Dependent	Scattered	Upper [8] and Lower [-5]

It uses iterative progress, such as growth or development in a population. This population is then selected in a guided random search using parallel processing to achieve the desired end. Such processes are often inspired by biological mechanisms of evolution. Main parts

of GA are chromosomes, selection, recombination (crossover), and mutation. Flow Chart shown in figure 4;

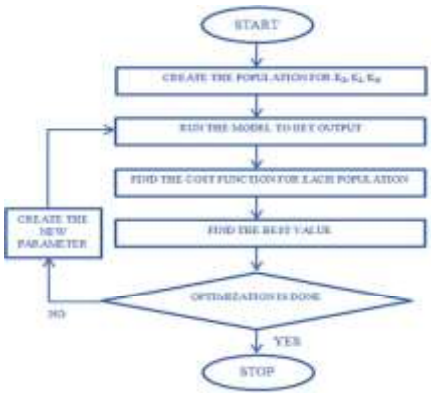

Figure 4 Flow chart of GA

4. RESULTS AND DISCUSSION

In this paper different techniques (Traditional, Artificial intelligent technique and GA) has been used for the correctness of the nervous system of electricity demand in the term of frequency and power variation. The results of figure 5 and figure 6 has been tabulated in Table 2,

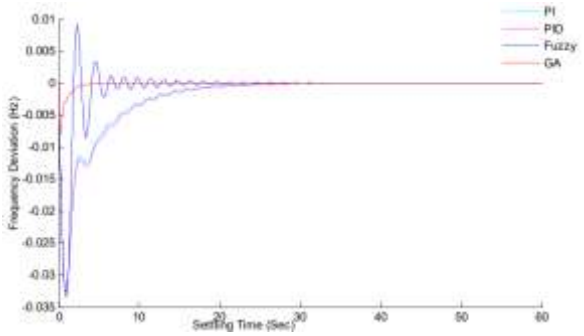

Figure 5 Frequency Correctness Response of Nervous System of Thermal Plant

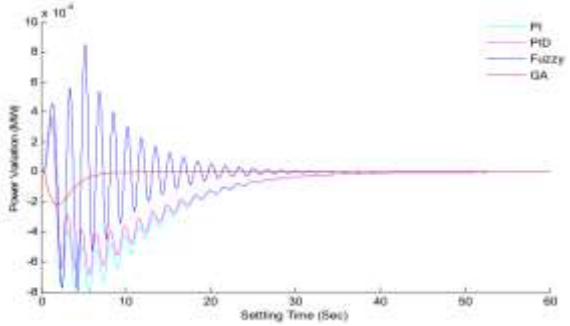

Figure 6 Power Correctness Response of Nervous System of Thermal Plant

Comparative results obtained from different techniques have been tabulated in Table 2.

Table 2: Comparative Result of All Techniques

Technique	Frequency Deviation Settling Time (Sec)	Power Deviation Settling Time (Sec)
Traditional (PI)	26	39
Traditional (PID)	25	38
Artificial Intelligent (Fuzzy)	23	28
GA	5	8

5. CONCLUSION

For making the limitness and correctness the nervous system of electricity demand, multifarious technique like; Traditional (PI, PID), Artificial Intelligent (Fuzzy) and GA Technique has been applied for effective outcome of amphibolic system, when the system is operating normal and disturbing condition. Thermal unit has been considered as a source of electrical power generation. The comparative results tabulated in table 2 shows

that the GA technique, settle down the disturbance in 5 Sec and 8 Sec for frequency and power variation with compare to other technique. It can be concluded that the GA techniques gives better and effective results with respect to the other techniques by correctness the nervous system of the generating unit with expeditiously rising electricity demand.

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