learn from the experience and to make decisions when faced with a similar environment .The Artificial Neural Network is multitasking and can perform more than one function over the same period of time.

This paper suggests regulators of artificial neural networks.

3-Simulation Model.

The simulation model used in this paper is based on literature showing that block diagram of a hydraulic control system.Liu,G.P, & Dailey's. thoroughly analyzed and studied the model [6].In MATLAB SIMULINK ,Liu ,G.P, & Daley used three standard PID controller to control speed [6].but those controller are linear controller ,so we substitute those controller with controller based on Artificial Neural Network,The prototype can be seen in Figure-1. Which is a system block diagram of hydraulic control system..A feed forward Neural Network is modify with proportional integrated derivated.we modify the PID controller with adjustable gain calculating by ANN. Due to non linear nature of Artificial Neural Network, better performance is expected .Neural feed forward network are trained through the supervised learning strategy.

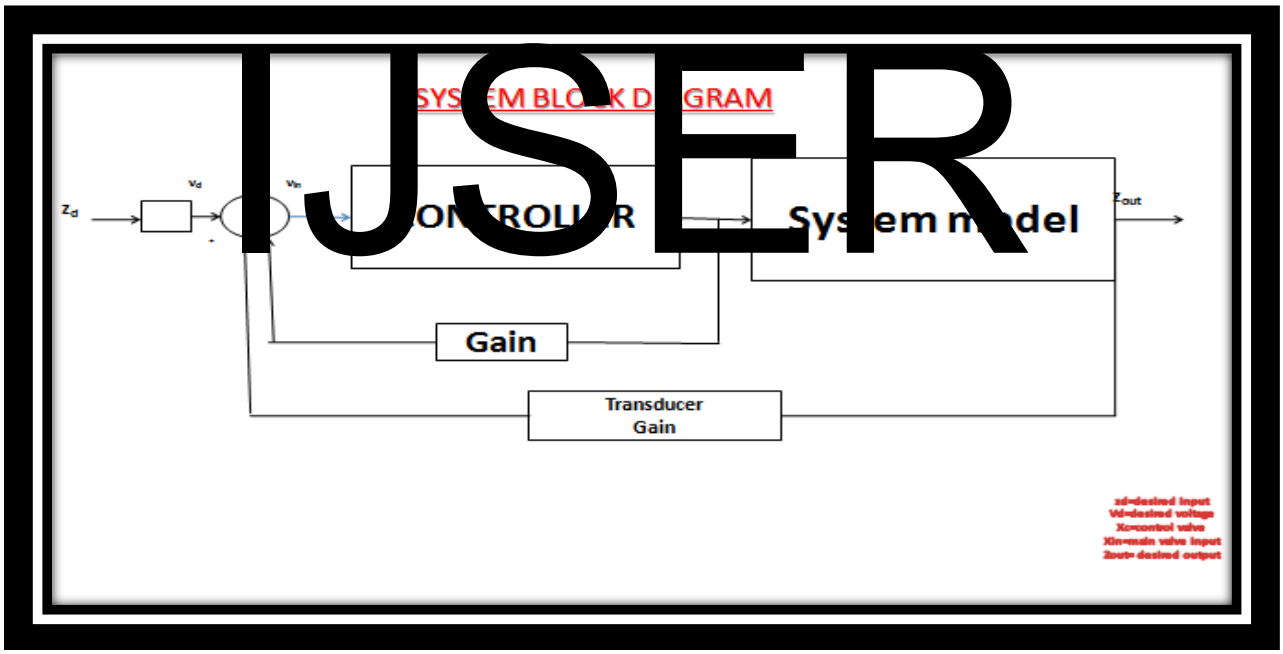

Fig.1 System block diagram.

4-Result and discussions.

The first step toward designing a neuro controller is to produce training data. We generated data for this purpose, usi ng the reference PI controller[11].The neural network toolbox was used for network testing.Figure5.below shows th e active NN speed controller model training and its contrast with the original speed controller where dotted blue line

s are the original controller response and solid red lines are trained NN speed controller response.Different response s from the original and trained NN model show that neural network technique for this particular application .

We take transfer function and put different values of Kp,Ki and Kd,

$$G(s) = \frac{213041}{s(s+653)}$$

Controller PID

KP=0.0041 (PROPORTIONAL)

KI=3.12 (INTEGRATED)

KD= 15.5 (DERIVATIVE)

We take transfer function and putting different values of PID.

In fig-2 we take three values of proportional , integrated and derivate the value of derivative is 0.0041, value of proportional is 3.12 and value of integral is 15.5 we combine all these values with the transfer function then we see the result with the scope the result will be shown in the fig -3.

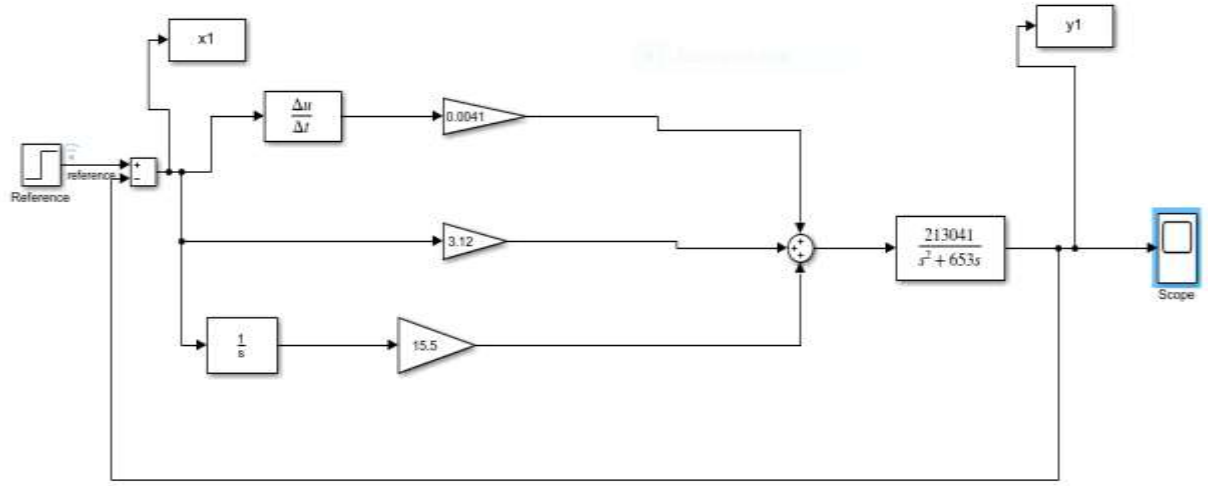

Fig-2 With Proportional Integrated Derative

In this fig -3 The time shows the pressure applied to the fluid and the Amplitude shows the flow of liquid .when the pressure of fluid is approximately 0.8 the Amplitude is unit response.the input shows the time and the output shows the Amplitute we see the response is step.

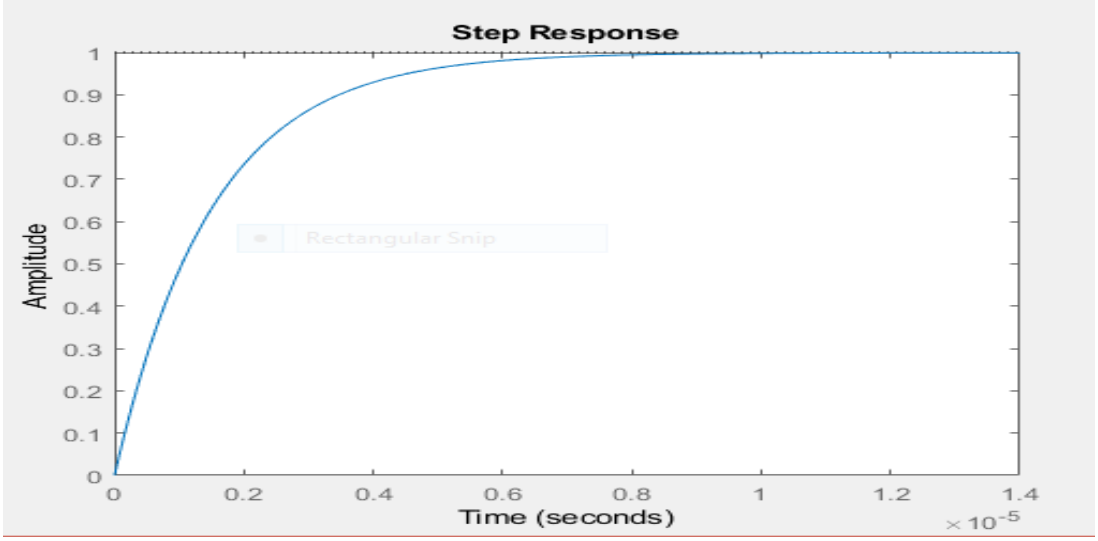

Fig-3 .Step response of PID controller

In this fig -3 The time shows the pressure applied to the fluid and the Amplitude shows the flow of liquid .

Neural Network training tool is shown in figure 5 which shows details and performance specifications about the trained NN speed controller, taken from MATALB. In training process of NN model, 50 iterations were done for successful results of NN speed controller as shown below.

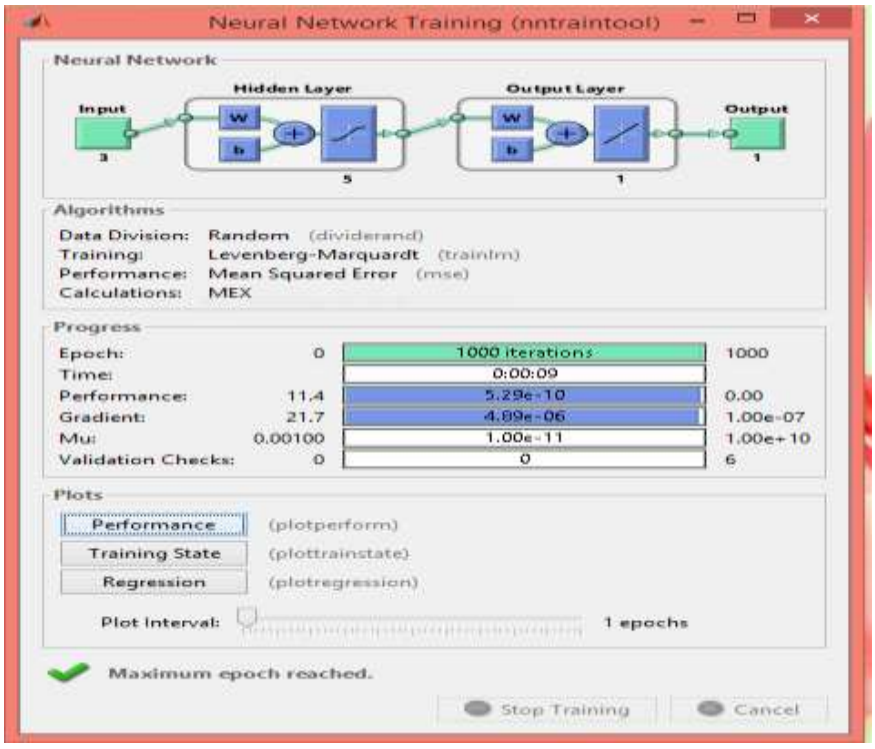

Figure.4. Training Tool for NN Speed Controller

Figure 5 .Displays the total output of the system when the neural network fluid controller is proposed. Neural network fluid controller derive response is better and more efficient than traditional fluid controller, which has no over shooting of the transient response and a stable steady response ,as shown in figure below, result obtained by the neural network fluid controller compared to the conventional PID controller. Solid blue lines in this figure represents the response of the conventional PID fluid controller and dotted lines shows the response of the neural network fluid controller . It can be seen that the proposed neural network controller response does not have any overshoot, however PID controller has overshoot. The proposed controller and PID controller both have same response but the neural network Fluid controller's transient response is better and more efficient than traditional PID fluid controller.

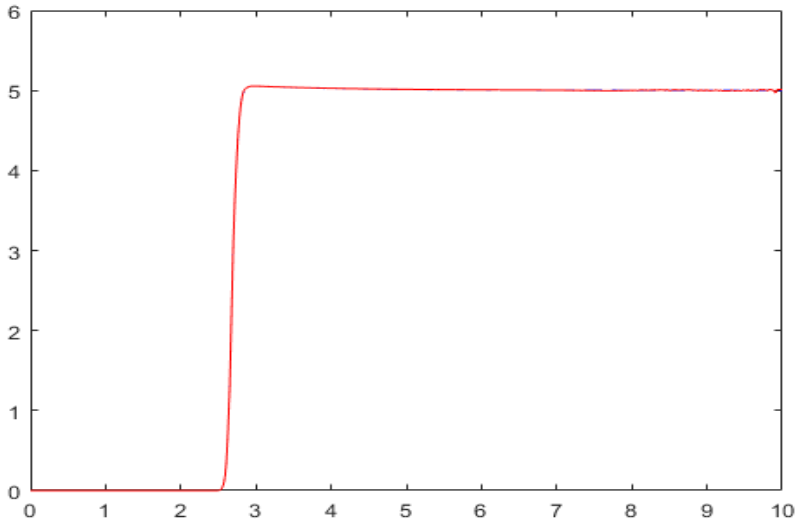

Figure.5. System Response of Neural Network fluid Controller

In fig 6 first we trained derivate controller then, we trained proportional controller and integral control controller with neural training box and we add these entire controller with transfer function we see result on the scope which will be shown on fig figure 6.

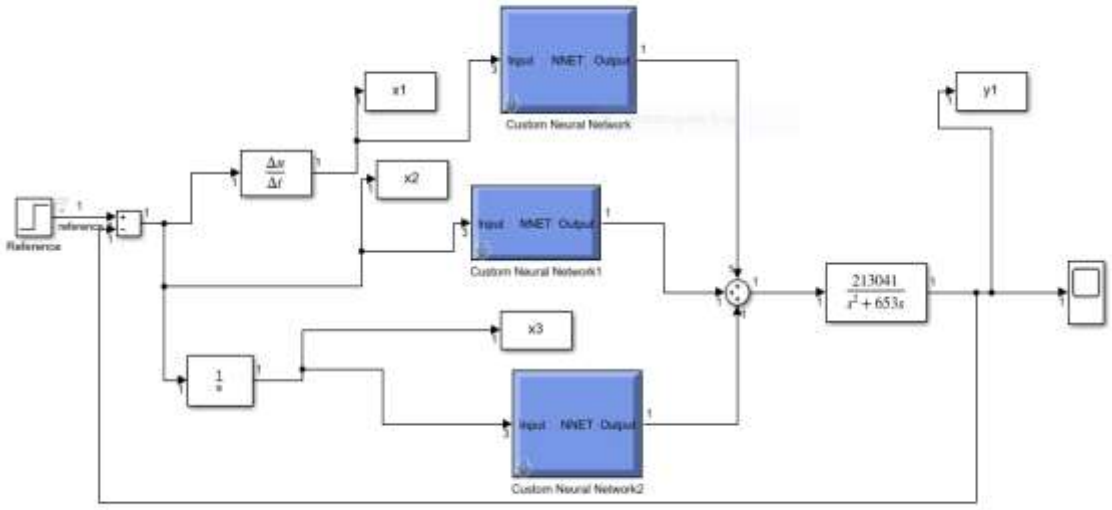

Fig.6 All neural network with PID.

In fig 7 shows the scope result of neural network based Proportional integrated derivate .in this fig we develop the neural network based controller for the application, steady state and the transient analysis of the system

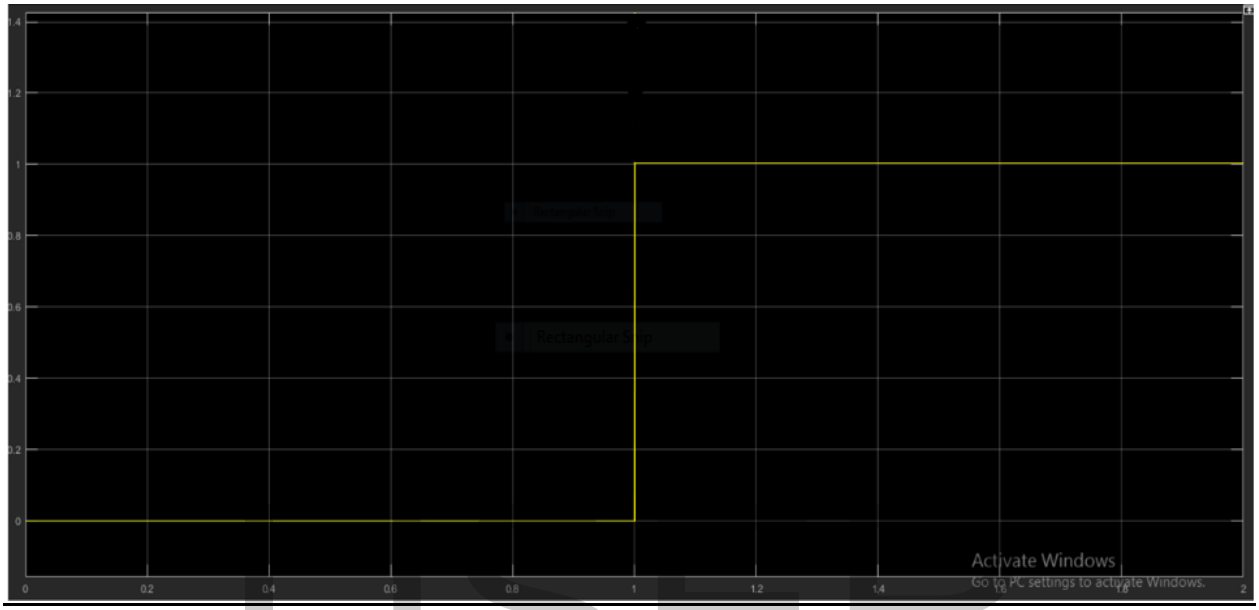

Fig-7 .SCOPE RESULT OF NEURAL NETWORK BASED PID.

CONCLUSION

This paper, proposes a neural network has been developed to compute three gains of an ANN. The controller is used to behave as an ideal hydraulic_switch, the results shows that Artificial Neural Network has been successful to behave like a switch and A comparison with PID shows that ANN is much better than PID. Neural network as a fluid controller for a hydraulic control system .The literature took a mathematical model, and a traditional PID controller was used to produce training data. Result of the simulation shows that the proposed fluid controller based on a neural network displays stronger transients behavior in terms of overshooting. Therefore, since its response is better than the PID controller, it gives optimal and efficient control of fluids. This is additionally preliminary work.

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References

- [1]Rozali, S. M., Rahmat, M. F., Wahab, N. A., & Ghazali, R. (2010, December). PID controller design for an industrial hydraulic actuator with servo system. In 2010 IEEE Student Conference on Research and Development (SCOReD) (pp. 218-223). IEEE.
- [2] Lin-ke, Y., Jian-ming, Z., Qi-long, Y., Ji-ming, X., & Yan, L. (2011, April). Fuzzy PID control for direct drive electro-hydraulic position servo system. In 2011 International Conference on Consumer Electronics, Communications and Networks (CECNet) (pp. 370-373). IEEE.
- [3]Aimin, L., Hailin, L., & Cheng, S. (2011, April). Application of PID control in hydraulic system of tensioning device. In 2011 International Conference on Electric Information and Control Engineering (pp. 4811-4814). IEEE.
- [4] Rahmat, M. F. (2009, June). Application of selftuning fuzzy PID controller on industrial hydraulic actuator using system identification approach. In International Journal on Smart Sensing and Intelligent Systems
- .[5] Dahunsi, O. A., Pedro, J. O., & Nyandoro, O. T. (2010). System identification and neural network based PID control of servo-hydraulic vehicle suspension system. SAIEE Africa Research Journal, 101(3), 93-105.
- [6] Liu, G. P., & Daley, S. (2000). Optimal-tuning nonlinear PID control of hydraulic systems. Control Engineering Practice, 8(9), 1045-1053.
- [7]. Kim, B. S., & Calise, A. J. (1997). Nonlinear flight control using neural networks. Journal of Guidance, Control, and Dynamics, 20(1), 26-33.
- [8]. Sha, W., & Edwards, K. L. (2007). The use of artificial neural networks in materials science based research. Materials & design, 28(6), 1747-1752.
- [9]. Aggarwal, V., Mao, M., & O'reilly, U. M. (2006, June). A self-tuning analog proportional-integral-derivative (pid) controller. In First NASA/ESA Conference on Adaptive Hardware and Systems (AHS'06) (pp. 12-19). IEEE.
- [10]. Wang, Y. G., & Cai, W. J. (2002). Advanced proportional− integral− derivative tuning for integrating and unstable processes with gain and phase margin specifications. Industrial & engineering chemistry research, 41(12), 2910-2914.
- [11]. Paukštaitis, V., & Dosinas, A. (2009). Pulsed neural networks for image processing. Elektronika ir elektrotechnika, 95(7), 15-20.

- [12]. R. Saindane and A. Thakur, “Review of Series – Parallel Hybrid Electric Vehicle using PI / PD / PID Controller,” Int. J. Sci. Dev. Res., vol. 1, no. 7, pp. 222–224, 2016.
- [13]. Pedro, J., & Dahunsi, O. (2011). Neural network based feedback linearization control of a servo-hydraulic vehicle suspension system. International Journal of Applied Mathematics and Computer Science, 21(1), 137-147.
- [14].Dahunsi, O. A., Pedro, J. O., & Nyandoro, O. T. (2009, September). Neural network-based model predictive control of a servo-hydraulic vehicle suspension system. In AFRICON 2009 (pp. 1-6). IEEE.