MAT JOURNALS

Journal of Embedded Systems and Processing
Volume 3 Issue 3

# A Mathematical model of BELC for learning mental activity

[1]**Mr.punit sharma, [2]Rahul chauhan,[3]Gaurav Verma, [4]Meenu Rai**
*M.tech Student,*
*[1,2,3,4]Department of Electronics & Telecommunication Engineering*
*AnnasahebDange College of Engineering & Technology, Ashta, Kolhapur*
***Email:***[*]*punitsharmaeee@gmail.com,*
***DOI:https://doi.org/10.5281/zenodo.2476945***

***Abstract***

*This paper proposes a brain emotional learning intelligent algorithmic program; beside the training algorithm like neural network, it additionally enclosed the calculation algorithmic program of feeling issue. Beside self-adjust the load trough learning, this algorithmic program will self-judge the feeling issue and includes it into the calculation algorithmic program thus on accomplish additional intelligent algorithmic program. An example, the three-tank system, is incontestable as an example the effectiveness of the projected management methodology. Simulation results show that the projected managementler are able to do satisfactory management performance for the liquid level control of the 3 tank system.*

***Keywords:****Mathematic model, learning controller, nonlinear systems, three-tank system.*

## INTRODUCTION

Many manipulate theories have efficiently solved most problems of the control systems, but proper now manipulate structures have grow to be extraordinarily complicated and non-linear. So many researchers commenced to address this form of hassle the use of some intelligent manipulate algorithms. Plenty of neural networks have been proposed for manipulate problems; however, in these algorithms emotion component is usually omitted [1].

It has an orbitofrontal cortex and an amygdala; the previous is a sensory neural community and the latter is an emotional neural community allows rapid learning for the BELC, The controller has neural community and emotional system; neural network can effectively lessen the tracking blunders, and the emotional system can adjusts theGaining knowledge of mistakes quick [2-5]. Within the beyond, emotion has been omitted for clever manage; but, in latest years, BELC has been used for control systems in numerous literatures[3].

On this take a look at, by using incorporating the parameter updating system right into a BELC, the proposed manipulate machine is applied to nonlinear systems. Finally a tank manipulate system is simulated to illustrate the effectiveness of the proposed BELC [4].

## FORMULATION

A class of n-th order multi-input multi-output nonlinear systems is described by the following equation:

$$x^{(n)}(t) = f(\underline{x}(t)) + G(\underline{x}(t))u(t) + d(t) \quad (1)$$

In the case that the modeling uncertainties and external disturbance are neglected, the nominal system of (1) is:

$$x^{(n)}(t) = f_0(\underline{x}(t)) + G_0\, u(t) \quad (2)$$

the nonlinear system (1) can be reformulated as [6]

$$x^{(n)}(t) = f_0(\underline{x}(t)) + G_0\, u(t) + l(\underline{x}(t), t) \quad (3)$$

The tracking error is defined as

$$e(t) \triangleq x_r(t) - x(t) \in \Re^m \quad (4)$$

and the system tracking error vector is defined as

$$\underline{e}(t) \triangleq [e^T(t), \dot{e}^T(t), \cdots, e^{(n-1)T}(t)]^T \in \Re^{mn} \quad (5)$$

an ideal controller can be designed as [7]

$$u_I = G_0^{-1}[x_r^{(n)} - f_0(\underline{x}) - l(\underline{x}, t) + \underline{K}^T \underline{e}] \quad (6)$$

Substituting the ideal controller (6) into (3) gives the error dynamic equation [8]:

$$e^{(n)} + \underline{K}^T \underline{e} = 0 \quad (7)$$

## CONTROL SYSTEM DESIGN

The BELC can be named a regulated system. A cerebrum enthusiastic learning controller is planned with the accompanying structure:

$$u_{BELC} = a - o = \sum_i \sum_j s_{ij} v_{ij} - \sum_i \sum_j s_{ij} w_{ij}, i = 1,2,\cdots,m, j = 1,2,\cdots,n \quad (8)$$

$$s_{ij} = I_i \times \lambda_{ij} \quad (9)$$

Tracking control system is shown in Figure 1.

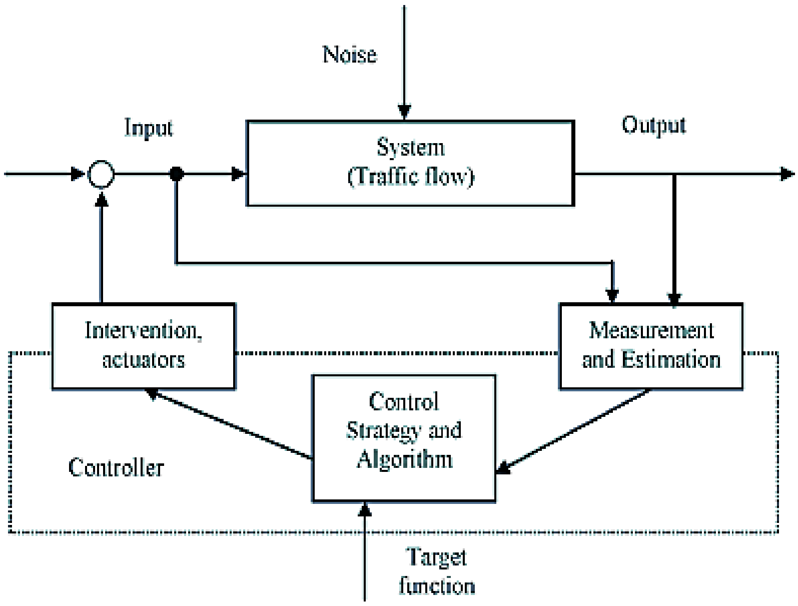


***Fig: 1.****anintelligent control system.*

A three tank system is shown in Figure 2 which is studied in order to illustrate the effectiveness of the proposed design method.

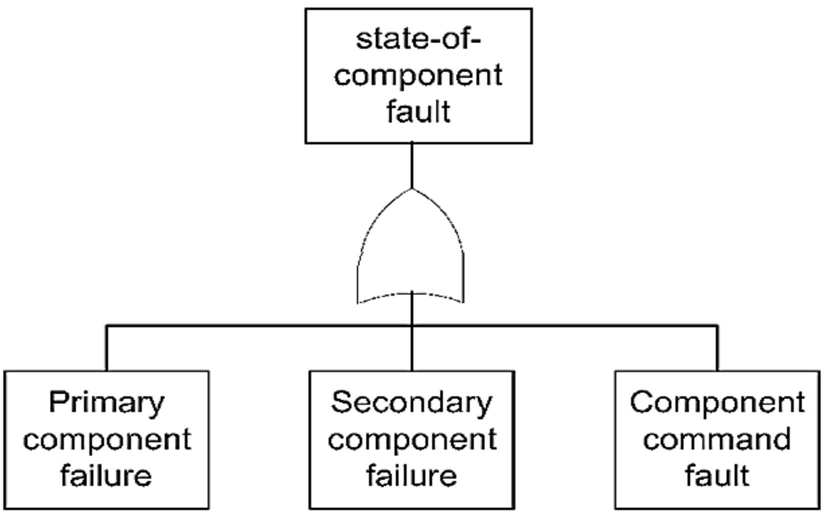


***Fig: 2.****Three tanks system*


 

MAT JOURNALS
Journal of Embedded Systems and Processing
Volume 3 Issue 3

Consider a three-tank compression system as shown in Figure 2, it's dynamic function is given as [8]

**SIMULATION RESULTS**

The simulation results are shown in Figs 3-5. Figure 3 denotes the liquid levels of the three tanks systems; Figure 4 denotes the tracking errors of this system; and Figure 5 denotes the control output of this system.

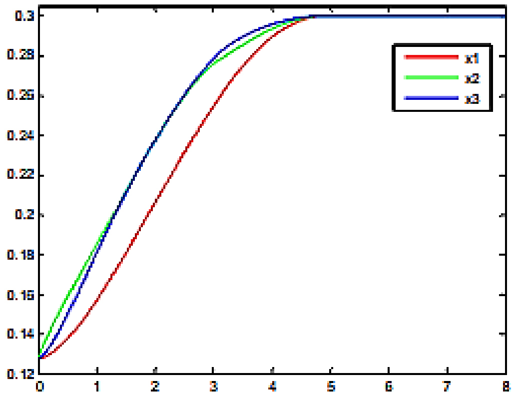


***Fig: 3.****The Liquid level of three tank system*

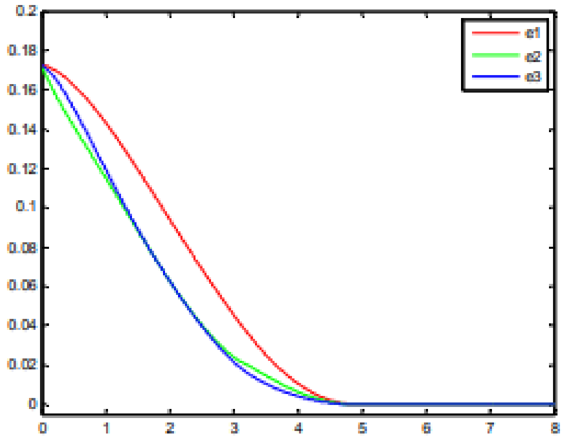


***Fig: 4.****error of three tank system*

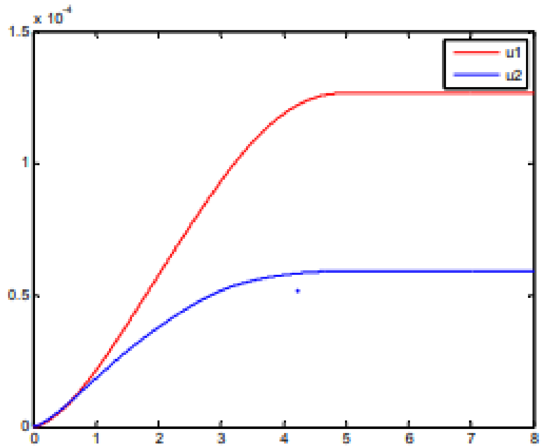


***Fig: 5.****controller output of three tank system*

 

## CONCLUSION

This study has efficiently proposed a BELC for nonlinear structures. The proposed BELC can correctly reduce the tracking error and efficaciously adjusts the getting to know mistakes fast. Then, the advanced BELC is carried out to a 3-tank machine to demonstrate the effectiveness of the proposed manipulate approach. Simulation results display that the proposed controller can correctly manage the liquid stage of the 3 tank machine.

## REFERENCES

1. J. E. LeDoux. The Amygdala: Neurobiological Aspects of Emotion. Wiley-Liss, New York, pp. 339-351, 1992.
2. J. Moren. Emotion and Learning-A Computational Model of the Amygdala. PhD dissertation, Lund University, 2002.
3. H. A. Zarchi, E. Daryabeigi, G. R. A. Markadeh and J. Soltani. Enthusiastic Controller (BELBIC) Based DTC for Encoder less Synchronous Reluctance Motor Drives. 2011 second Power Electronics, Drive Systems and Technologies Conference, pp. 478-483, 2011.
4. M. M. Polycarpou. Blame Accommodation of a Class of Multivariable Nonlinear Dynamical Systems Using a Learning Approach. IEEE Transactions Automatic Control, vol. 46, pp. 736-742, 2001.

**Cite as:**
Mr.punit sharma, Rahul chauhan, Gaurav Verma, & Meenu Rai. (2018). A Mathematical model of BELC for learning mental activity. Journal of Embedded Systems and Processing, 3(3), 25–28.
http://doi.org/10.5281/zenodo.2476945