

# Abstract

This study presents an improved numerical method for the approximate solution of linear delay differential equation. We have used orthogonal neural network technique by utilizing the basis of orthogonal polynomial as activation functions in the hidden layer. To train the weights of the output layer of the orthogonal neural network, we use extreme learning machine algorithm. For this we randomly select input weights, apply activation function and then convert it into system of linear equations. By using Moore-Penrose generalized inverse, we solve the system and find the output weights. The choice of orthogonal polynomial is Vieta-Lucas polynomial as it ensures optimal orthogonality and minimum computational error. Various neutral delay differential equations have been solved to validate the proposed method. The results obtained in these numerical examples illustrate the accuracy of the method. The proposed method shows significant improvement over the traditional numerical methods and provides a reliable tool for the researchers working in this field.