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Is it Possible to Use Back Propagation Neural Network (BPNN) as Predictor when Tracing the Brain Waves: A Case Study

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Abstract

Back propagation neural network (BPNN) was performed to trace the brain waves with. Both modified Levenberg–Marquardt Algorithm (M-LMA) and Levenberg–Marquardt Algorithm (LMA) were simultaneously used to minimize back propagation errors when tanning BPNN under the same learning rates of 0.05. Resulted shown M-LMA was better. The presented time of the outputs through BPNN were a before the brain waves that are heterochronous. Therefore, this traced method could serve as a predictor in this case.

Keywords: Back Propagation Neural Network (BPNN); Brain Waves; Modified Levenberg–Marquardt Algorithm (M-LMA); Levenberg–Marquardt Algorithm (LMA);, Predictor

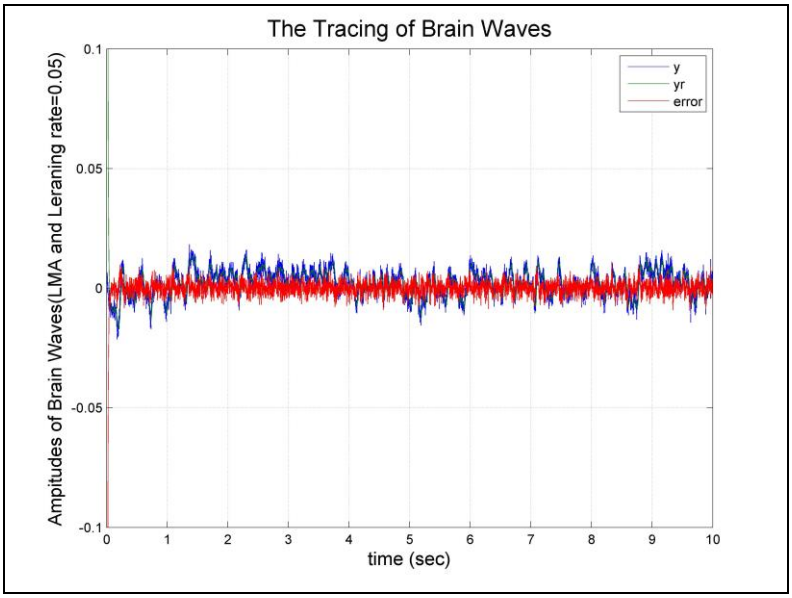
1. Introduction

Back-propagation neural network (BPNN) [3] will be used to trace an example of the brain waves. In this paper, the Levenberg–Marquardt Algorithm (LMA) [2]

and modified Levenberg–Marquardt Algorithm (M-LMA) [1] are used to decide desired minimum error to update weight and bias. The traced results of LMA and M-LMA will be compared each other. In this study, the theories of LMA and M-LMA [1] are followed when tracing an example of brain waves.

2. Tests and Results

The brain waves are traced by BPNN with both LMA and M-LMA of 2 hidden layers with 10 neurons in each layer to update the weight and bias with the same learning rates of 0.05 to minimize back propagation Errors which is the best learning in the range between 0 and 1. The results of LMA and M-LMA are shown in Figure 1. The traced results of M-LMA were better shown in bottom figure of Figure 1. The blue lines indicate the real brain waves. The green lines indicate the outputs of BPNN. The red lines indicate the tracing errors. The presented time of the outputs by BPNN are before the brain waves that the both signals are heterochronous and it is possible that this tracing method could serve as a predictor.



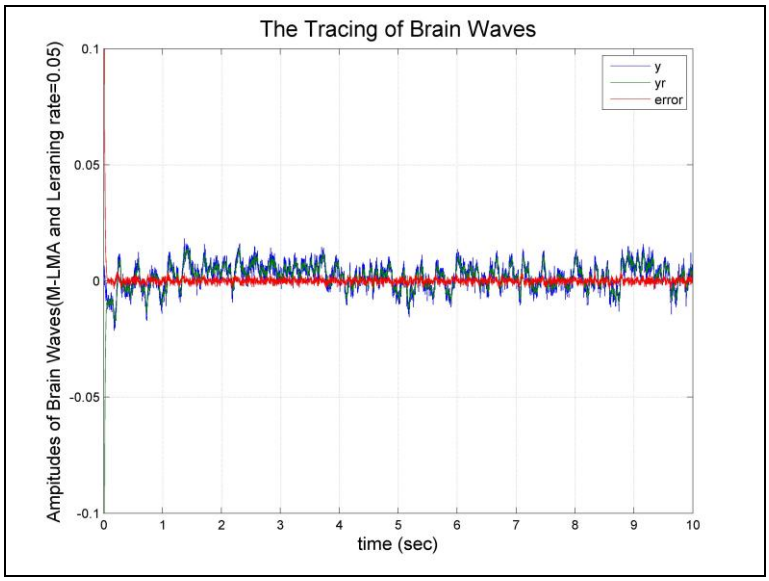


Fig.1 This figure shows the traced results of LMA (top figure) and M-LMA (bottom figure) to the brain waves with the same learning rate of 0.05. The traced errors of M-LMA are smaller. The blue lines indicate the real brain waves. The green lines indicate the outputs of BPNN. The red lines indicate the tracing errors.

3. Conclusion

The M-LMA is better for tracing the bracing the brain waves with the learning rate of 0.05. The presented time of the outputs of BPNN are before the brain waves and therefore this tracing method could serve as a predictor.

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References

[1] J. W. Lin, Back propagation neural network (BPNN) as tracing method to trace physionet EMG signals: a case study, *Advanced Studies in Medical Sciences*, **5** (2017), no. 1, 63 -69. https://doi.org/10.12988/asms.2017.784

[2] D. W. Marquardt, An Algorithm for Least-Squares Estimation of Nonlinear Parameters, *Journal of the Society for Industrial and Applied Mathematics*, **11** (1963), no. 2, 431–441. https://doi.org/10.1137/0111030

[3] W. McCulloch, W. Pitts, A Logical Calculus of Ideas Immanent in Nervous Activity, *Bulletin of Mathematical Biophysics*, **5** (1943), no. 4, 115–133. https://doi.org/10.1007/bf02478259

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