Quasi projective synchronization of time varying delayed complex valued Cohen-Grossberg neural networks with mismatched parameters: Direct approach.

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Abstract. In this article the quasi-projective synchronization (QPS) of time-varying delayed complex-valued Cohen Grossberg Neural Networks (CGNNs) with mismatched parameters has been studied. As complete projective synchronization is impossible due to parameters' mismatches and projective coefficient, a drive has been taken to achieve quasi-projective synchronization of distinct complex-valued CGNNs. The purpose of this study is to find a criterion for quasi-projective synchronization of two non-identical CGNNs by constructing a suitable controller and by using direct method. The important contribution is to estimate the bound on the synchronization error. Some sufficient criteria for synchronization between master and response systems are also established. The efficiency of the proposed method is justified through numerical simulation applied to a specific example.

INTRODUCTION

So far numerous synchronization results have been developed such as anti-synchronization, complete synchronization, quasi-synchronization, projective synchronization, and multi-synchronization. Among the existing synchronization schemes, projective synchronization stands out as a significant feature of proportional synchronization of master and response systems. It can be used for the sake of fast communication like an extension of binary digits to M-nary digital communications [1]. The error during the implementation of practical synchronization does not always approach to zero with time, but fluctuate within a small range, which is called QPS [2]. This phenomenon is produced by several unavoidable factors, including non-identical parameters, projective coefficient, controller etc. In the research article [3], two real valued systems were formed separating the real and imaginary parts of complex valued functions and then with the help of these two real valued systems, criteria for stability and synchronization are obtained. The method of converting a complex system into real system not only increases the computational time but also complicates the theoretical analysis and complexity of the results. To avoid this problem it is better to discuss the synchronization problem of CVNNs by using the Direct method.

Results and discussion

A sufficient criterion is established for ensuring QPS between master and response systems with mismatched parameters. The upper bound of the synchronization error is estimated, as well as the connection between it and the controller parameter given in this article. Figs. 1 and 2 show QPS and quasi-synchronization between master and response systems with mismatched parameters, respectively. The article shows that the estimated upper bound depends on the projective coefficient k. As a result, the bound can be regulated by choosing the suitable controller parameter. The relevant evaluation is shown in the reference [1]. In [1], the projective coefficient k is a real positive constant, but in our case projective coefficient k is a complex number and there is no restriction on k. Hence, our conclusions are more generic. Also, Fig. 3 depicts the complete synchronization of two identical systems.

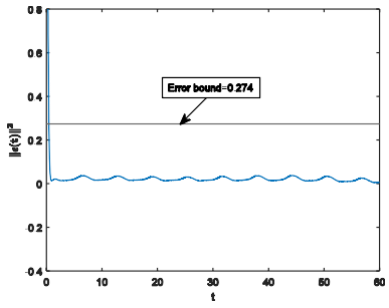

Fig. 1

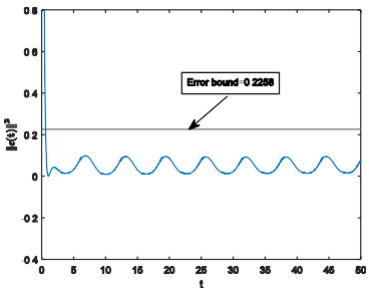

Fig. 2

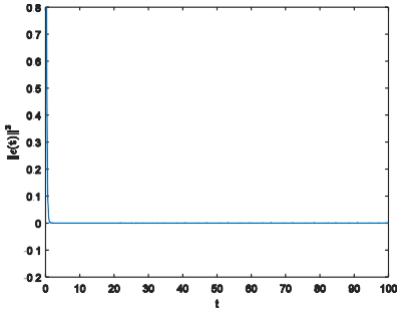

Fig. 3

References

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