Energy-to-Peak State Estimation for Static Neural Networks With Interval Time-Varying Delays

ABSTRACT

- This paper is concerned with energy-to-peak state estimation on static neural networks (SNNs) with interval time-varying delays. The objective is to design suitable delay-dependent state estimators such that the peak value of the estimation error state can be minimized for all disturbances with bounded energy. Note that the Lyapunov–Krasovskii functional (LKF) method plus proper integral inequalities provides a powerful tool in stability analysis and state estimation of delayed NNs. The main contribution of this paper lies in three points: 1) the relationship between two integral inequalities based on orthogonal and nonorthogonal polynomial sequences is disclosed. It is proven that the second-order Bessel–Legendre inequality (BLI), which is based on an orthogonal polynomial sequence, outperforms the second-order integral inequality recently established based on a nonorthogonal polynomial sequence.

CONTINUE

- 2) the LKF method together with the second-order BLI is employed to derive some novel sufficient conditions such that the resulting estimation error system is globally asymptotically stable with desirable energy-to-peak performance, in which two types of time-varying delays are considered, allowing its derivative information is partly known or totally unknown; and 3) a linear-matrix-inequality-based approach is presented to design energy-to-peak state estimators for SNNs with two types of timevarying delays, whose efficiency is demonstrated via two widely studied numerical examples.

EXISTING SYSTEM

- Due to uesuccessful applications in a number of fields, such as image recognition, signal processing, and associate memory, a neural network (NN) has shown its powerful nonlinear processing capacity in nature. With changeful artificial synaptic weights, which are realized by resistors or memristors in circuits, an NN is often designed to mimic human brains to carry out some specific tasks.
- In engineering applications for instance signal processing and system modeling, the acquisition of neuron states is important but challenging since it is impractical to measure each electronic component directly in an NN.
- For this reason, neuronal state estimation becomes a fundamental issue that has been paid great attentions in the last decades .

PROPOSED SYSTEM

- The main contribution of this paper lies in three points: 1) the relationship between two integral inequalities based on orthogonal and nonorthogonal polynomial sequences is disclosed. It is proven that the second-order Bessel –Legendre inequality (BLI), which is based on an orthogonal polynomial sequence, outperforms the second-order integral inequality recently established based on a nonorthogonal polynomial sequence; 2) the LKF method together with the second-order BLI is employed to derive some novel sufficient conditions such that the resulting estimation error system is globally asymptotically stable with desirable energy-to-peak performance, in which two types of time-varying delays are considered, allowing its derivative information is partly known or totally unknown;

CONTINUE

- And 3) a linear-matrix-inequality-based approach is presented to design energy-to-peak state estimators for SNNs with two types of timevarying delays, whose efficiency is demonstrated via two widely studied numerical examples.
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HARDWARE REQUIREMENTS

- Processor - Pentium –III
- Speed - 1.1 Ghz
- RAM - 256 MB(min)
- Hard Disk - 20 GB
- Floppy Drive - 1.44 MB
- Key Board - Standard Windows Keyboard
- Mouse - Two or Three Button Mouse
- Monitor - SVGA

SOFTWARE REQUIREMENTS

- Operating System : Windows 8
- Front End : Java /DOTNET
- Database : Mysql/HEIDISQL

CONCLUSION

- The problem of energy-to-peak state estimation for SNNs with interval time -varying delays has been investigated by employing the LKF method. The relationship between two integral inequalities based on orthogonal and nonorthogonal polynomial sequels has been disclosed. It has been shown that the second-order BLI, which is based on an orthogonal polynomial sequence, can provide tighter bound than that based on a nonorthogonal polynomial sequence. The secondorder BLI has been used to obtain some novel conditions such that the estimation error system can achieve desirable energy-to-peak performance.

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