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基于连续Hopfield型神经网络的QAM信号盲检测

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Blind Detection of QAM Signals Using Continuous Hopfield-type Neural Network

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摘要 该文利用连续Hopfield网络本身特点，提出基于连续复Hopfield网络的多值方形/非方形QAM信号的直接盲检测方法。首先完成多值信号盲检测的优化问题构造和能量函数的映射，设计了一个适用于该问题的激活函数。然后给出能量函数的设计与分析、盲检测信号权矩阵的配置方法及其神经元数目选择的一般规律。最后通过对方形QAM和非方形QAM信号的仿真现象展示和分析，验证了所提方法的有效性和鲁棒性。

关键词： 无线通信　信号处理　连续Hopfield网络　信号盲检测　激活函数　能量函数　正交幅度调制

Abstract： A novel blind detection algorithm of multi-valued square/non-square QAM signals using complex Continuous Hopfield-type Neural Network (CHNN) is proposed. The blind detection issue of multi-valued QAM signals is transformed into solving a quadratic optimization problem firstly. The method of mapping the cost function of this optimization one to the energy function of CHNN is shown. A complex activation function to fit this special issue is designed, and the energy function of CHNN is analyzed. Meantime, a special connective matrix is constructed to ensure the detect signals correctly and the general law of making correct choice of the number of neurons is illustrated. Finally, simulation results using square and non-square QAM signals demonstrate the effectiveness and robustness of this new algorithm.

Keywords： Wireless communication　Signal processing　Continuous Hopfield Neural Network (CHNN)　Blind signal detection　Activation function　Energy function　Quadrature Amplitude Modulation (QAM)

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