CONVERGENCE AND OPTIMIZATION STUDY OF A GROWING PARALLEL SOM THROUGH A GENETIC ALGORITHM

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Abstract

A self-organizing map (SOM) is a type of unsupervised Artificial Neural Network (ANN) that can be used in applications of pattern recognition, and classification. A SOM is a viable approach to many avionics problem domains that include threat identification (classification), air traffic flow management (pattern recognition) and intelligent systems for vehicle autonomy (classification and pattern recognition). An implementation of a parallelized SOM entitled ParaSOM, was developed which allows for a more accurate mapping of inputs and far less iterations (hundreds, as opposed to tens or hundreds of thousands) are required in this implementation versus a classical SOM [1] and many of its variations – including but not limited to: growing cell structures [2]; growing grid [3]; hierarchical [4]; and growing hierarchical [5].

In a recent advancement to ParaSOM a Genetic Algorithm (GA) implementing evolutionary computation was created that quasi-randomly generates (OR randomly selects) values for ParaSOM parameters from a lower and upper bound pairing of values for each ParaSOM parameter elected for use during execution. When used in conjunction with a convergence test, the GA identifies parameters of ParaSOM that will bring execution and performance as close to optimum as possible, without human interaction.

An automated generation of parameters for optimum performance of ParaSOM allows for a more accurate use of ParaSOM and therefore more accurate use in the problem domains discussed. Optimum performance is defined as highest accuracy of classification with least amount of iterations prior to convergence.

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