An Industrial Application to Neural Networks to Reusable Design

Donald C. Wunsch
Missouri University of Science and Technology, dwunsch@mst.edu

R. Escobedo

T. P. Caudell

S. D. G. Smith

et. al. For a complete list of authors, see *https://scholarsmine.mst.edu/ele_comeng_facwork/877*

MULTIMODULAR NEURAL ARCHITECTURE FOR TELEDETECTION

Sylvie Thiria[1,2], Carlos Mejía[1], Fouad Badran[1,2] and Michel Crepon[3]

[1] Laboratoire de Recherche en Informatique
Université de Paris Sud, B 490 - 91405 ORSAY Cedex

[2] CEDRIC, Conservatoire National des Arts et Métiers
292 rue Saint Martin - 75 003 PARIS

[3] Laboratoire d'Océanographie et de Climatologie (LODYC)
T14 Université de PARIS 6 - 75005 PARIS (FRANCE)

Abstract : In order to solve complex tasks, a «machine» made with three levels of non-linear multi-layer networks has been designed. Each level works in parallel and is dedicated to a specific task. On each level all networks are of the same type. This «machine» is applied to compute wind direction and wind speed measured by satellite scatterometers. Performances prove that such an approach is powerfull.

Keywords : parallel process, multi-layer networks, learning, back-propagation, teledetection.

"A Data Compressed ART-1 Neural Network Algorithm"

Thomas P. Caudell and Scott D. G. Smith
Engineering Computing and Analysis
Boeing Computer Services
MS 7L-22
P.O. Box 24346
Seattle, WA. 98124-0346

Abstract

Adaptive resonance theory (ART) neural networks are being developed for application to the industrial engineering problem of group technology. Two and three dimensional representations of engineering designs are input to ART-1 networks to produce groups or families of similar parts. These representations, in their basic form, amount to bit maps of the part, and can become very large when the part is represented in high resolution. This paper describes an enhancement to the algorithmic form of ART-1 to allow it to operate directly on compressed input representations and to generate compressed memory templates. The performance of this compressed algorithm is compared to that of the regular algorithm on real engineering designs. A significant savings in memory storage as well as a speed up in execution is observed.

"An Industrial Application of Neural Networks to Reusable Design"

Thomas P. Caudell, Scott D. G. Smith, G. Craig Johnson, Donald C. Wunsch II, and Richard Escobedo
Engineering Computing and Analysis
Boeing Computer Services
MS 7L-22
P.O. Box 24346
Seattle, WA. 98124-0346

Abstract

The feasibility of training an adaptive resonance theory (ART-1) network to first cluster aircraft parts into families, and then to recall the most similar family when presented a new part is demonstrated. ART-1 networks are used to adaptively group similar input vectors. The inputs to the network are generated directly from CAD designs of the parts and consist of binary vectors which represent bit maps of the features of the parts. This application, referred to as group technology, is of large practical value to industry making it possible to avoid duplication of design efforts.