AUTOMATIC CONTROL and COMPUTER SCIENCE Section

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A Learning Model for Intelligent Agents Using Radial Basis Function
Neural Networks with Adaptive Training Methods
Irina Diaconiţa and Florin Leon

Full text

Learning is an important ability for the agents, as it increases their flexibility and adaptability. Inductive learning can be a way for intelligent agents to automatically discover knowledge in large datasets. In this paper we describe a learning model based on radial basis function (RBF) neural network and we study adaptive training methods, which are particularly useful for datasets with many training instances, similar to the the situations encountered by intelligent agents acting in complex, open environments.

Key words: learning model, radial basis functions, neural networks, intelligent agents, classification, regression.

2000 Mathematics Subject Classification: 68T05, 68T42.

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Determining the Best Mutation Probabilities of a Genetic Algorithm for Mapping Tasks
Adrian Alexandrescu, Mitică Craus and Ioan Agavriloaei

An important aspect of heterogeneous computing systems is the problem of efficiently mapping tasks to processors. There are various methods of obtaining acceptable solutions to this problem but the genetic algorithm is considered to be among the best heuristics for assigning independent tasks to processors. This paper focuses on how the genetic heuristic can be improved by determining the best probabilities for a three-step mutation operator. By computing the probabilities for selecting a mutation combination we concluded that the most favoured combinations are the ones which select a task from the processor with the biggest total execution time and then move the selected task to the processor which executes it the fastest. Also, the probability of applying the special mutation operator on a chromosome must be much greater than the probability of applying the crossover operator.

Key words: task mapping, genetic algorithm, mutation.

2000 Mathematics Subject Classification: 68M14, 68M20, 68T20.

Performance Evaluation of a Two-Step Clustering Method
Ioan Agavriloaei, Mitică Craus and Adrian Alexandrescu

The exponential growth of the World Wide Web complexity and size in the last two years has involved the need to develop effective methods for organizing, fast information retrieval and filtering the relevant Web content. Within this context, Web clustering has a significant role and remains one of the fields who tries to deal with these new challenges by assisting computers in organizing automatically the Web documents into a hierarchy of clusters for efficient browsing and navigation. In this paper, we study the performance of two-step clustering method that takes into account the site content and hyperlinks structure. To show the efficiency of the proposed approach, different weighting methods were used. To evaluate the performance, experiments were conducted on four datasets with a wide variety of Web documents and terms. To evaluate the quality of clustering solution, four validity indices were used. Experiments proved that our approach significantly improves clustering accuracy.

Key words: Web mining, Web document model, Web clustering, information retrieval, Data mining.

2000 Mathematics Subject Classification: 68U35, 68U15, 65C20.

Power-Aware Adaptive Routing for Wireless Sensor Networks
George-Emil Vieriu, Bogdan-Ioan Aignătoaiei and Radu Ionaşcu

The growing popularity of wireless sensor networks (WSNs) has led to increased interest in the research of different solutions for power management policies for these networks. The paper proposes a power-aware adaptive routing protocol for wireless sensor networks based on the remaining operating time for network's nodes. In contrast with static routing our solution uses reconfigurable routes to balance the power consumption over the whole network. Our network is aware at any moment of the remaining energy capacity and energy drainage for all its nodes. The network uses this information to modify the routing paths for maximizing the operating time.

Key words: wireless sensor network, power management, routing protocol.

2010 Mathematics Subject Classification: 94A99, 94C99

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A Framework Architecture for Easily Designing Applications in Dynamically Partially Reconfigurable Systems
Cosmin Gabriel Popa and Andrei Stan

History proves that software industry evolved from developing sequential applications to dividing application functionality into different and parallel executing modules such as tasks or threads. Inspired from architectural design of hardware circuits, this philosophy was yet to be considered more efficient. But implementing the parallel design into embedded systems showed difficulties in management. Using field programmable gate arrays (FPGAs) alongside the main processor can provide a possible solution for executing several sequential functions as parallel threads. Taking that into consideration this paper proposes a framework architecture which will offer designers the possibility of easily create and maintain custom hardware designs optimized to their needs.

Key words: reconfigurable system, FPGA, reliability, self-maintenance, self-awareness, profiling tools.

2000 Mathematics Subject Classification: 68N19, 68P99.

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Code Quality Assurance by Detecting Clone Expression Removal Opportunities
Denis Bogdănaş and Alexandru Archip

This paper presents a code inspection method for Java programs. The inspection detects and proposes for elimination a particular type of code clones. More precisely, the inspection detects opportunities for "Replace Expression with Existing Variable" refactoring. This refactoring seeks to replace an expression inside a method with a reference to a variable containing the same value. The transformation has not been investigated yet as a clone removal technique. Neither are there code inspection tools aimed to detect opportunities for replacing an expression with an existing variable. Requirements for potential replacements are gathered based on several code samples. The detection algorithm is designed based on those restrictions. The inspection is implemented as a plugin for Java IDE Intellij Idea. Testing is done by running the inspection over several open-source projects. The results contain evidence that detections frequency and the yield of valid detections justifies practical applicability

Key words: refactoring, Java programming, code clone, code quality, abstract syntax tree

2000 Mathematics Subject Classification: 68T05, 68T42

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Image Processing Techniques Used in Microscopic Image Segmentation
Cristian Smochină, Paul Herghelegiu and Vasile Manta

The objective of semantic segmentation in microscopic images is to extract the cellular, nuclear or tissue components. This problem is challenging due to the large variations of features of these components (size, shape, orientation or texture). In this paper we present an overview of the proposed segmentation techniques for microscopic images. This is not a comprehensive study, but rather an analysis of the most used image processing methods in this particular domain. The existing techniques are grouped by their application in one of the following pathological field: cytology vs. histology. Beside a rough description of each method, we present a useful statistic and discussion about the frequency of the most used image processing methods in the problem of microscopic image segmentation. This analysis is helpful for a better use of existing method and for improving their performance as well as for designing new ones.

Key words: image segmentation, biomedical imaging, pathology, microscopy fluorescence microscopy.

2000 Mathematics Subject Classification: *68U10, 92C55*

Comparison Between Two Modulation Techniques for Three Phase Inverters from a Hardware Implementation Point of View
Bogdan Alecsa and Alexandru Onea

This paper presents a comparison between two modern modulation techniques applied to three phase inverters from a hardware implementation point of view. The considered techniques are the sinusoidal pulse width modulation with zero sequence injection and the space vector modulation. Both these techniques conduct to the same result regarding supply voltage usage efficiency and harmonic content of the resulted signals. However, they are based on different approaches and, in consequence, need different algorithms for implementation. Both the modulation algorithms were implemented in hardware on FPGA, and the resulted designs are compared for resource usage efficiency, obtained speed and ease of integration within a complex AC drive control system.

Key words: Sinusoidal PWM, ZSS, SVM, FPGA, System Generator.

2000 Mathematics Subject Classification: 93C83.