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Abstract: I carry on the study of natural networks (genetic, chemical and immune) evolving according to two levels of change called dynamics and metadynamics. The dynamics is the evolution in time of the concentration of the units currently present in the networks: the genetic, the molecular or the immune species. Their concentration evolves as a function of their network interaction with the other units. However, this evolution is also a function of their "exogenous"fitness so that the fitter units should in principle grow faster than the others. The metadynamics is the only way for innovation, and amounts to the generation of new units on the basis of the genetic or chemical materials constituting the units existing so far in the network. This metadynamics, indirectly subject to the exogenous pressure, tends to selectively favor units that are easier to produce from the existing ones. For instance, the genetic recombination of two species could occur between species presenting particular similar properties and thus generating new species merging these properties. This metadynamics also greatly influences the concentration of the units present in the network. The paper will experimentally show, on chemical, genetic and immune networks, that the interaction between these two levels of change, together with the intricate balance between the "exogenous"and the "network endogenous"selective drift, can induce a hard-to-predict concentration profile, subject to discontinuous changes.

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> **Abstract:** Technology advances allow integrating on a single chip entire system, including memories and peripherals. The test of these devices is becoming a major issue for manufacturing industries. This paper presents a methodology for inducing test-programs similar to genetic programming. However, it includes the ability to explicitly specify registers and resorts to directed acyclic graphs instead of trees. Moreover, it exploits a database containing the assembly-level semantic associated to each graph node. This approach is extremely efficient and versatile: candidate solutions are translated into source-code programs allowing millions of evaluations per second. The proposed approach is extremely versatile: the macro library allows easily changing target processor and environment. The approach was verified on three processors with different instruction sets, different formalisms and different conventions. A complete set of experiments on a test function are also reported for the SPARC processor.

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Abstract: This paper presents a parallel hybrid genetic algorithm (GA) for solving the sum-of-pairs multiple protein sequence alignment. The method is based on a multiple population GENITOR-type GA and involves local search heuristics. It is then extended to parallel to exploit the benefit of multiprocessor system. Benchmarks from the BAliBASE library are used to validate the method.

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the principle of maximizing the similarity between objects of the same cluster while simultaneously minimizing the similarity between objects belonging to distinct clusters. This paper presents a tool for database clustering using a rule-based genetic algorithm (RBCGA). RBCGA evolves individuals consisting of a fixed set of clustering rules, where each rule includes d non-binary intervals, one for each feature. The investigations attempt to alleviate certain drawbacks related to the classical minimization of square-error criterion by suggesting a flexible fitness function which takes into consideration, cluster asymmetry, density, coverage and homogeny.

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Abstract: discusses issues that arise when a redundant genotype-phenotype mapping is used in the context of a real-world application. Previous studies have suggested that a redundant mapping, which introduces neutrality into the search space, can provide a beneficial role. Many of the studies to date have concentrated on relatively abstract search spaces. In this paper we consider these issues in the context of a specific real-world application. We show that redundancy can indeed be useful, but that it must be carefully introduced with due consideration to details of the application being considered, and its associated search space. Although the details of the redundant encoding are specific to the application, we seek to deduce some heuristics that are likely to prove useful for designing genetic encodings for other problems to facilitate search for fitter phenotypes.

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Abstract: This survey covers the broad area of evolutionary computation applications to optimization, model identification, and control in power systems [1]. Due to space limitation, all reviewed papers have been selected since 1996, from the IEEE Transactions only. A total of 85 articles are listed in this survey. It shows the development of the area and identifies the current trends. The following techniques are considered under the scope of evolutionary computation: evolutionary algorithms (e.g., genetic algorithms, evolution strategies, evolutionary programming, and genetic programming), simulated annealing, tabu search, and particle swarm optimization.

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Marrow, and Mark Shackleton, editors, *Proceedings of the 2002 Congress on Evolutionary Computation CEC2002*, pages 1751–1756. IEEE Press, 2002.

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> **Abstract:** Evolutionary algorithms (EA) offer good promise for automated design of analog circuits as well as for adaptation and automatic reconfiguration of programmable devices. In particular, EAs facilitate the design of analog circuits for very specific requirements, such as those related to the implementation of fuzzy operators, or even of complete fuzzy systems. The paper starts with a brief overview of the evolutionary process applied to circuit design and of a family of analog programmable devices that support on-chip evolution. As a case study, we describe the evolutionary design of a fuzzy controller, using re-configurable analog chips models and unstructured representation. We were able to achieve a circuit that approximates the control surface of a 2-input fuzzy controller, mapping thus a full fuzzy system in only seven transistors. The paper presents evidence that EA can provide very compact soluti ons for implementation of fuzzy systems, and that programmable analog devices are an efficient and rapid solution for rapid deployment of fuzzy systems.

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> **Abstract:** Genetic Programming (GP) has been emerged as a promising approach to deal with classification task in data mining. This work extends the tree representation of GP to evolve multiple comprehensible IF-THEN classification rules. In the paper, we introduce a concept mapping technique for fitness evaluation of individuals. A covering algorithm that employs an artificial immune system-like memory vector is utilized to produce multiple rules as well as to remove redundant rules. The proposed GP classifier is validated upon nine benchmark datasets and the simulation results confirm the viability and effectiveness of the GP approach for solving data mining problems in a wide spectrum of application domains.

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> **Abstract:** Self-adaptation is used in all main paradigms of evolutionary computation to increase efficiency. We claim that the basis of self-adaptation is the use of neutrality. In the absence of external control neutrality allows a variation of the search distribution without the risk of fitness loss.

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> **Abstract:** smooth operators for arithmetic expressions as an approach to smoothening the search space in Genetic Programming (GP). Smooth operator GP interpolates between arithmetic operators such as times and divide, thereby allowing a gradual adaptation to the problem. The suggested approach is compared to traditional GP on a system identification problem.

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> **Abstract:** In this paper, a new technique that uses an especially tailored genetic algorithm is proposed for attitude determination via the GPS carrier phase observables. The technique overcomes restrictions due to computational overheads incurred by existing techniques such as the Ambiguity Function Method. We present experimental results which show that the algorithm is able to efficiently search the complex search space imposed by the problem in addition to being immune to cycle slips compared to other conventional methods.

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