Preface

Underlying most of the IWANN calls for papers is the aim to reassume some of the motivations of the groundwork stages of biocybernetics and the later bionics formulations and to try to reconsider the present value of two basic questions. The first one is: "What does neuroscience bring into computation (the new bionics)?" That is to say, how can we seek inspiration in biology? Titles such as "computational intelligence", "artificial neural nets", "genetic algorithms", "evolutionary hardware", "evolutive architectures", "embryonics", "sensory neuromorphic systems", and "emotional robotics" are representatives of the present interest in "biological electronics" (bionics).

The second question is: "What can return computation to neuroscience (the new neurocybernetics)?" That is to say, how can mathematics, electronics, computer science, and artificial intelligence help the neurobiologists to improve their experimental data modeling and to move a step forward towards the understanding of the nervous system?

Relevant here are the general philosophy of the IWANN conferences, the sustained interdisciplinary approach, and the global strategy, again and again to bring together physiologists and computer experts to consider the common and pertinent questions and the shared methods to answer these questions.

Unfortunately, we have not always been successful in the six biennial meetings from 1991. Frequently the well-known computational models of the past have been repeated and our understanding about the neural functioning of real brains is still scarce. Also the biological influence on computation has not always been used with the necessary methodological care. However IWANN 2001 constituted a new attempt to formulate new models of bio-inspired neural computation with the deeply-held conviction that the interdisciplinary way is, possibly, the most useful one.

IWANN 2001, the 6th International Work-Conference in Artificial and Natural Neural Networks, took place in Granada (Spain) June 13-15, 2001, and addressed the following topics:

1. ***Foundations of connectionism.*** Brain organization principles. Connectionist versus symbolic representations.
2. ***Biophysical models of neurons.*** Ionic channels, synaptic level, neurons, and circuits.
3. ***Structural and functional models of neurons.*** Analogue, digital, probabilistic, Bayesian, fuzzy, object oriented, and energy related formulations.
4. ***Learning and other plasticity phenomena.*** Supervised, non-supervised, and reinforcement algorithms. Biological mechanisms of adaptation and plasticity.
5. ***Complex systems dynamics.*** Optimization, self-organization, and cooperative processes. Evolutionary and genetic algorithms. Large scale neural models.

6. ***Artificial intelligence and cognitive processes.*** Knowledge modeling. Natural language understanding. Intelligent multi-agent systems. Distributed AI.
7. ***Methodology for nets design.*** Data analysis, task identification, and recursive hierarchical design.
8. ***Nets simulation and implementation.*** Development environments and editing tools. Implementation. Evolving hardware.
9. ***Bio-inspired systems and engineering.*** Signal processing, neural prostheses, retinomorphic systems, and other neural adaptive prosthetic devices. Molecular computing.
10. ***Other applications.*** Artificial vision, speech recognition, spatio-temporal planning, and scheduling. Data mining. Sources separation. Applications of ANNs in robotics, economy, internet, medicine, education, and industry.

IWANN 2001 was organized by the Universidad Nacional de Educación a Distancia, UNED (Madrid), and the Universidad de Granada, UGR (Granada), also in cooperation with IFIP (Working Group in Neural Computer Systems, WG10.6), and the Spanish RIG IEEE Neural Networks Council.

Sponsorship was obtained from the Spanish CICYT and the organizing universities (UNED and UGR).

The papers presented here correspond to talks delivered at the conference. After the evaluation process, 200 papers were accepted for oral or poster presentation, according to the recommendations of reviewers and the authors' preferences. We have organized these papers in two volumes arranged basically following the topics list included in the call for papers. The first volume, entitled "Connectionist Models of Neurons, Learning Processes, and Artificial Intelligence" is divided into four main parts and includes the contributions on:

I. Foundations of connectionism and biophysical models of neurons.
II. Structural and functional models of neurons.
III. Learning and other plasticity phenomena, and complex systems dynamics.
IV. Artificial intelligence and cognitive processes.

In the second volume, with the title, "Bio-inspired Applications of Connectionism", we have included the contributions dealing with applications. These contributions are grouped into three parts:

I. Bio-inspired systems and engineering.
II. Methodology for nets design, and nets simulation and implementation.
III. Other applications (including image processing, medical applications, robotics, data analysis, etc.).

We would like to express our sincere gratitude to the members of the organizing and program committees, in particular to F. de la Paz and J. R. Álvarez-Sánchez, to the reviewers, and to the organizers of preorganized sessions for their invaluable effort in helping with the preparation of this conference. Thanks also to the invited speakers for their effort in preparing the plenary lectures.

Last, but not least, the editors would like to thank Springer-Verlag, in particular Alfred Hofmann, for the continuous and excellent cooperative collaboration

from the first IWANN in Granada (1991, LNCS 540), the successive meetings in Sitges (1993, LNCS 686), Torremolinos (1995, LNCS 930), Lanzarote (1997, LNCS 1240), Alicante (1999, LNCS 1606 and 1607), and now again in Granada.

June 2001

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