



FOREWORD

The coupling of Intelligent Automation with Soft Computing has a special significance. What it reflects is a quantum jump—which took place within the past few years—in the MIQ (Machine Intelligence Quotient) of a wide variety of systems ranging from products such as cameras, microwave ovens, automobile transmissions, and elevators to industrial automation and quality control. What lies behind the rapid progress in our ability to design and build systems which exhibit a high level of intelligence? As usual, there is more than one reason. In the first place, there has been a dramatic enhancement in sensor capabilities and a lowering in cost. Second, for the same cost, it has become possible to process much larger volumes of data at higher speed. And last—and perhaps most important—the growing use of soft computing in the conception and design of high MIQ systems.

What is soft computing? In contrast to the traditional, hard computing, soft computing is tolerant of imprecision, uncertainty and partial truth. The basic premises of soft computing are: imprecision and uncertainty are pervasive, and, precision and certainty carry a cost. The guiding principle of soft computing is: exploit the tolerance for imprecision, uncertainty, and partial truth to achieve tractability, robustness, and low solution cost.

Soft computing is not a single methodology; rather, it is a consortium or a partnership of methodologies. At this juncture, the principal constituents of soft computing (SC) are: fuzzy logic (FL), neurocomputing (NC), and genetic algorithms (GA). The principal contribution of FL is a methodology for approximate reasoning and, in particular, for computing with words; that of NC is curve fitting, and learning and system identification; and that of GA is systematized random search and optimization. The important point is that FL, NC, and GA are, in the main, complementary rather than competitive. Thus, it does not make much sense to argue—as some do—that anything that can be done with Methodology “A” can be done equally well or better with Methodology “B”. This is like arguing that a screwdriver is better than a hammer. A concomitant of the complementarity of FL, NC, and GA is the fact that in many cases the performance of a system can be improved by using FL, NC, and GA in combination rather than singly.

Hybrid systems of this kind are growing in number and visibility. A particularly important combination is that of FL and NC, leading to the concept of a neurofuzzy system. At this juncture, most neurofuzzy systems are fuzzy rule-based systems in which neurocomputing techniques are used for rule induction and calibration. However, we are beginning to see neurofuzzy systems in which fuzzy rules are employed to improve the performance of a neural network or a neural algorithm. Hybrid intelligent systems are definitely the wave of the future. As a partnership of FL, NC and GA, soft computing is playing a key role in the conception and design of hybrid intelligent systems. It is also serving as a foundation for the emerging field of computational intelligence (CI). In this perspective, the difference between traditional AI and computational intelligence is that AI is based on hard computing whereas CI is based on soft computing. The leitmotif of *Intelligent Automation and Soft Computing* (AutoSoft®) is the conception and design of systems with high MIQ. The importance of this objective is hard to exaggerate. Professor Charles C. Nguyen, The Editor-in-Chief and Professor Mo Jamshidi, The Chairman of the International Advisory Committee of AutoSoft® are men of vision. They deserve our thanks and congratulations for conceiving the idea of the *International Journal of Intelligent Automation and Soft Computing* and making it a reality.

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