Foreword

When the book editors asked me to write this foreword, it was clear for me that I would need to talk about why a book on exploring innovative applications of soft computing could be of interest.

And the answer needs a bit of context…

If we need to indicate some relevant features about problems emerging today in the current socio-technological context, we may find a general agreement on mentioning these two: firstly, the real world is not static and, secondly, there exist uncertainties, vagueness, unknowns, that pose at least two challenges: how to understand, describe, and model them, and how to solve the problem taking them into account.

In order to deal with those features of such problems, soft computing (or the closer concept of computational intelligence) is the way to go; moreover, if we consider it a step beyond its constituting elements (fuzzy logic, neural networks, metaheuristics, and probabilistic reasoning to cite the usual ones), we observe the potential for hybridization among them.

At the beginning of May 2013, I conducted a quick search on research articles (using Scopus database, www.scopus.com) and patents (through the European Patent Office’s Espacenet tool, www.epo.org/searching/free/espacenet.html) where soft computing-based hybrids were applied. As metaheuristics is a quite general term, I have considered either genetic or evolutionary algorithms in the search.

In the case of research articles, the query was searched only in the title of articles or reviews (no conference proceedings) published in English since year 2000 until now in all the research areas covered by Scopus. Regarding the patents, the query was searched in the title and the abstract and no time limits or languages criterion were set. Table 1 collects the results.

These illustrative results allow one to conclude that soft computing-based methods are being widely used and applied, and the experience indicates that its usefulness emerges at two levels: as a way to obtain more appropriated models of the world, and/or to provide good enough, soon enough solutions to the problem at hand.

So the relevance of soft computing is clear. Now, why do we need to look at innovative applications or, maybe better said, interesting scenarios for the use of soft computing?

We may agree that the concept of “optimization” appears at the core of many applications as there is a need to obtain the best possible solution to the problem at hand. This idea led to a sort of algorithmic “race” where the focus was more on the methods than on the applications, trying to provide a fine tuning

Table 1. Search results

<table>
<thead>
<tr>
<th>Query</th>
<th>Results in Scopus</th>
<th>Result in Espacenet</th>
</tr>
</thead>
<tbody>
<tr>
<td>fuzzy AND (genetic OR evolutionary)</td>
<td>742</td>
<td>111</td>
</tr>
<tr>
<td>fuzzy AND (neural OR neuro)</td>
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<td>1013</td>
</tr>
<tr>
<td>(genetic OR evolutionary) AND (neural OR neuro)</td>
<td>935</td>
<td>221</td>
</tr>
<tr>
<td>fuzzy AND (genetic OR evolutionary) AND (neural OR neuro)</td>
<td>146</td>
<td>27</td>
</tr>
</tbody>
</table>
of the former to obtain (many times) a micro-improvement in the solutions for the later. Please note that this is not related with the fact that we need more efficient algorithms to deal with bigger problems or to take more advantage of parallel computers.

Many people, including myself, did research like the previous one, but for several years now, it seems that the focus on “optimization” is varying, mainly due to the mentioned features of the problems that need to be solved. Nowadays, a different perspective and new opportunities emerge if we consider that it is better to satisfy than to optimize, and this claim puts the potential user in the cycle of the problem resolution.

In my opinion, there is a need to foster the connection among different areas of research where people are eager to find solutions to their problems, or to explore novel solutions beyond those provided by, let’s say, standard techniques. Moreover, from my experience, there is no need to apply the last-ultimate-cool version of method $M$ to produce satisfactory solutions for the problem that, for example, my colleagues in the Chemistry Department have. Many times, being able to deliver a set of solutions (like the ones given by a population-based heuristic) instead of just one, or to have a set of fuzzy rules able to explain certain phenomena may produce an impact from the user’s point of view that is hardly achieved just observing from the methods’ side.

It is clear that there are still many areas and applications where soft computing techniques can show their potential and some examples are provided in this book. One can find here applications ranging from scheduling, routing problems, software project planning, demand forecasting, to decision making in different contexts, quality of service evaluation, and even the study of Azorean proverbs. Regarding the applied methods, genetic algorithms, fuzzy modeling, fuzzy non-linear optimization, fuzzy rules, neuro-fuzzy methods, rough sets, etc. are used either as a solving or as a modeling tool in the problem at hand.

Of course, I would like to say a few words about the editors. First of all, the reader should be aware that I know them personally. I belong to the same research group, and I work closely with some of them. Nevertheless, from the (not so) oldest to the youngest editors, they are recognized researchers in the field of soft computing, with wide academic experience and internationally renowned. The best I can suggest is to look at their CVs to observe their qualifications to edit a book like this.

Finally, I definitely consider this book useful not only for practitioners and researchers already working in the field, but also for students in their first stages of research as they can observe how soft computing techniques can be applied in novel scenarios.

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