

# Task Force on Nature Inspired Cooperative Strategies for Optimization: A Summary of Activities and Results

David Pelta <sup>♦</sup>, Jose A. Moreno, José Manuel Cadenas, Natalio Krasnogor, Xiao-Zhi Gao

<sup>♦</sup>Models of Decision and Optimization Research Group  
Dept. of Computer Science and AI  
University of Granada, 18071, Spain  
email: dpelta@decsai.ugr.es

**ABSTRACT:** Biological entities (ranging from bacteria to humans) can engage in many and varied types of social interaction, ranging from altruistic cooperation through to open conflict. A paradigmatic case of social interaction is “cooperative problem solving” (CPS), where a group of autonomous entities work together to achieve a common goal. For example, we might find a group of people working together to move a heavy object, play a symphony, build a house, or write a joint paper. CPS have been studied by researchers from Distributed A. I., Soft Computing, Economics, Philosophy, Organisation Science, and the Social and Natural Sciences. In the context of optimization problem, this situation can be seen as follows: the goal is to find the “best” solution for the problem at hand, while the “entities” can be thought as optimization algorithms. The idea of having a portfolio of solving strategies and use all of them in a parallel and coordinated fashion to solve the problem is justified because of the following fact: no algorithm outperforms another one in all circumstances. Besides, experiences in the field of optimization show that problem instances can be grouped in classes and there exists an algorithm for each class that solves the problems of that class most efficiently.

The rationale behind this task force is to analyze if the use of nature inspired cooperation/coordination mechanisms within the context of CPS strategies can endow optimization technologies with the ability to adapt and re-configure with minimum (ideally none) human intervention making them more general and ultimately cheaper to install, use and maintain. These last characteristics are very relevant from the point of view of decision support systems (and thus, information systems) because they may help to obtain a better set of algorithmic tools that, in turn, will lead to better solutions for the problem at hand.

In this presentation, I will:

- Review the main aims of the task force and the activities performed
- Present one of the prototypes developed
- Outline the main conclusions

**KEYWORDS:** cooperative strategies, optimization, problem solving

**Task Force Responsible:** David Pelta

**Participants:**

Jose A. Moreno, University of La Laguna, Spain

José Manuel Cadenas, University of Murcia, Spain

Natalio Krasnogor, ASAP Group, University of Nottingham, UK

Xiao-Zhi Gao, Institute of Intelligent Power Electronics, Department of Electrical and Communications Engineering, Helsinki University of Technology