

*“Multi-Agent Decision Support Systems Applied to Manufacturing and Logistic Optimization Problems”*

This research work includes topics of *Computer Engineering* and *Operational Research* subjects; basically, the most interesting aspect of the research work is the overlapping area of these two subjects. *Multi-Agent Systems* are an innovative subfield of *Artificial Intelligence* dedicated to the development of solutions for complex problems that are not easily solvable with classic algorithmical programs. Multi-Agent systems use distributed and parallel computation; in multi-agent system, autonomous agents live and interact with other agents and the environment. Several computer engineering research activities developed software products for the implementation of information systems based on agent architectures. Agent-based architectures have been used in many software applications, applied to a variety of topics (control, information management, communication, etc.) and scenarios (aerospace, medicine, military, etc.). Although many research works and applications demonstrated multi-agent systems are effective for the development of complex information systems, scarce information about the suitability of agent-based solver for optimization problems is available.

In this talk subject, multi-agent systems are applied to two different scenarios: optimization of *production plans in manufacturing* and optimization of *logistic dispatching activities*. Despite the two problems belonging to very different scenarios, they are characterized by the same difficultness in finding optimal solutions and they can be formalized as combinatorial optimization problems. The investigated scenarios for applying agents to optimization provide an interesting area of research and both scenarios have always been interested in information systems able to cope with complex set of data and business rules. Moreover, manufacturing and logistic are industrial sectors that can benefit from application of new decision support systems for optimization.

For both manufacturing and logistics, a number of case studies for specific optimization problems were chosen and analyzed. An agent-based decision support system for each optimization problem was developed and tested; the research work also included extensive performance tests and comparison with other approaches available in literature.