

## Description for the General Public

Multiagent systems (MAS), developed for the last thirty years, constitute a research field closely related to distributed artificial intelligence. MAS consists of loosely-coupled software agents (for example robots) that are capable to flexibly solve problems that are beyond their individual reach. Typically, an agent is understood as a computer system that is situated in some environment, and that is capable of autonomous action in this environment in order to meet its delegated objectives. Such systems demand an adequate modeling of informationally-complex, dynamic and open environments. However, due to limited accuracy of sensors, time restrictions, unpredictable environmental conditions and limited reliability of physical devices available information is imprecise, incomplete and unsure. This complex and unfortunate combination of features leads to *inconsistencies* and *incomplete information* that may appear at different levels of agency: individual, between agents, between agents and groups and/or between different groups. Moreover, in real-world scenarios inconsistencies and missing information invoke nondeterminism in agents's activities, even when their decision processes are deterministic.

Thus, rather than fighting with inconsistencies we will treat them as first-class citizens when building a paraconsistent (that is tolerating inconsistencies) logical framework. This allows us to properly deal with inconsistencies and ignorance. It is worth emphasizing that inconsistencies are forbidden in the classical logic and other formalisms with truth values restricted to classical ones, *true* and *false*. Importantly, from inconsistency one can deduce any property what trivializes reasoning. On the other hand, ignorance leads to nonmonotonicity of reasoning: new information may defeat previously derived conclusions. It is then also problematic for classical and many other, more traditional logics, since such logics are monotonic and do not provide means supporting nonmonotonic reasoning.

The current grant proposal is a continuation of a research program concerning novel perspective on modeling agents' individual and groups' informational stance in informationally-complex environments. This multidimensional program, initiated by Dunin-Kęplicz and Szalas and further applied by them in various contexts, will be developed by addressing, among others, the following research areas:

- Beliefs, Goals and Intentions multiagent systems.
- Group reasoning techniques.
- Conflict resolution, including dialogues like persuasion.
- Reasoning about actions and change.

We plan the following objectives to be realized in the proposed project with the use of belief structures and related methodology.

1. Paraconsistent formalization of goals and intentions.
2. Organization of dynamics in group reasoning.
3. Resolving conflicts by dialogues like persuasion.
4. Formalizing actions in the presence of incomplete and inconsistent information.

The main emphasis will be laid on the tractability of proposed approaches. This will allow one to apply our results in many practical, complex applications, including autonomous robotics systems.