Human Agent Collective Systems

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This work will be a collaboration with RMIT institute in Melbourne, Australia

Nowadays we live in a world where many objects, computer systems of course but not only them, are connected and distributed throughout our physical and information environments, and these objects are increasingly implicated in our everyday actions. For example: connected watches, tablets, phones and more generally Internet of Things. Data and information issued from all these devices are generated at unprecedented speeds and volumes from an increasingly diverse range of sources and via ever more sensor types. It is then combined in unforeseen ways, limited only by human imagination. People's activities and collaborations are becoming ever more dependent upon and intertwined with this ubiquitous information substrate.

In this PhD we are interested in a class of systems called Human-Agent Collectives (HACs) where there is a close partnerships and flexible social interactions between the humans and the computers. As well as exhibiting increased autonomy, such systems are inherently open and social. This openness means participants need to continually and flexibly establish and manage a range of social relationships. For example, transport management systems such as Waze (http://www.waze.com/) blend citizen and (electronic-) sensor generated content to aid the user.

However, due to the inherent characteristics of these HAC systems (openness, non predictability, numerous components in interactions, …), their engineering is not an easy task. The goal of this PhD is to define a methodology that helps HAC system engineers. This methodology should rely on distributed artificial intelligence and multi-agent systems. Organizational concepts and model elements that can take into account team working are envisioned in order to specify joint actions between humans and agents. The idea is to give agents a sufficient level of autonomy so that they are able to fulfil specific goals without direct human interventions. Obviously, agent behaviors have to be able to interact with humans in a pertinent way in the context of HAC systems.

The application case study chosen for this PhD will be the development of HAC systems for modern attraction parks that integrate immersive and interactive devices so that artificial characters can interact with park visitors.

The starting point of this work is the study of existing organizational-based agent oriented software engineering methodologies and more specifically: Aspecs (http://aspecs.org/Home), TDF (http://www.tdfagents.com/) and MOISE. These methodologies deal with agent oriented software engineering at different levels and with different approaches. The ultimate goal would be to propose a unification framework that allows team behavior modelling in an agile fashion so as to develop quickly HAC systems elements. The envisioned development platform is the SARL (http://www.sarl.io/) agent-oriented programming language.