



SOUTENANCE DE THESE THESIS DEFENSE

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soutiendra sa thèse de **Doctorat** sur le sujet :

Collective activities and autonomous virtual characters: trust-based decision-making system

A l'Université de Technologie de Compiègne

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Amphi L103 – Centre Pierre Guillaumat

Devant le jury composé de :

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Abstract :

When working in teams, humans rarely display optimal behaviors: they sometimes make mistakes, lack motivation or competence. In virtual environments or in multi-agent systems, many studies have tried to reproduce human teamwork: each agent acts as a team member. However, the main objective in those studies is the performance of the team: each agent should display optimal behavior, and the realism of those simulated behaviors is not a concern. To train someone in a virtual environment to pay attention to and to adapt to their teammates, we built a decision-making system for agents to display realistic and non-optimal behaviors. More specifically, we are interested in self-organized teams (i.e. teams where the decision power is decentralized among its members) and in implicit organization (i.e. when team members do not interact through communications but rather through the observation of others' behaviors). In such a team, each agent has to think about what it should do given what others could do. Agents then have to ask themselves questions such as *Do I trust my teammate's competence to perform this task?* Trust relationships therefore allow agents to take others into account.

We propose a system that allows agents to reason, on the first hand, on models of the activity they have to do, and on the other hand, on trust relationships they share with others. In that context, we first augmented the Activity-Description Language so that it supports the description of collective activities. We also defined mechanisms for constraint generation that facilitates agent reasoning, by giving them the answer to questions like *Do we have the required abilities to perform the task which will achieve our goal?* We then proposed an agent model based on the model of interpersonal trust of [Mayer et al. 1995], that we selected after a study of trust in social science. This model describes trust relationship with three dimensions: the trustor trusts the trustee's integrity, benevolence and abilities. An agent is therefore defined through those three dimensions, and has a mental model of each other agent; i.e. has trust beliefs about others' integrity, benevolence and abilities. Moreover each agent has both personal and collective goals (i.e. goals that are shared with other members of the team), and thus will have to decide which goal to focus on. Finally we proposed a decision-making system that allows an agent to compute the importance it gives to its goals and then to select a task. When computing goal importance, the agent is influenced by its trust beliefs about others, and to select a task, it reasons on the activity models and on its expectations about what others could do. Those expectations are generated from the agents' trust beliefs. We implemented our system and observed that it produces realistic and non-optimal behaviors. We also conducted a preliminary perceptive evaluation which showed that participants were able to recognize one agent's trust or lack of trust in another through the behaviors of the first one.