# Emotions in Hybrid Social Aggregates

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**Abstract**

Research on emotion has just started to investigate emotions on higher levels of social interaction and aggregation, e.g. organizations or distributed work environments. For a long time the focus has been on the interrelation of cognition and emotion in individuals. But as more and more research is conducted on emotional effects in social interaction, aggregation, and emergence, it becomes obvious that the results are also important for emotional agents (both, natural and artificial) in human-computer interaction. Until now, computer scientific studies – mainly inspired by cognitive science – have designed sophisticated emotional architectures for dyadic interactions. But as emotional agents are increasingly required to engage in social interactions within larger aggregates, either as embodied systems or via multimodal interfaces, the need arises to precisely consider the social-structural peculiarities of emotion. Unfortunately, within the social sciences there is no integrative theory of emotion that interrelates various cognitive and sociological aspects and that computer scientists could use to design improved emotional agents and emotion supporting systems. Therefore, we propose a way to integrate sociological and cognitive theories to analyze emotions on three levels of abstraction: cognitive, interactional, and social structural. We illustrate various reciprocal causes and effects of emotion on the different levels and relate them to urging questions in emotional agents design and human-computer interaction.

## 1 Introduction

It is now widely accepted that emotions and corresponding mechanisms could play a major role in the design and construction of software agents. Expected advantages are manifold: Emotion as a prerequisite of (artificial) intelligence, the well-known interrelation between cognition and emotion, and emotion expressions as a crucial part of human-like respectively believable behavior. Still, the focus of attention in developing emotional agents for all kinds of purposes and applications is on cognitive theories of emotion. Following a bottom-up approach to modeling, it seems reasonable to start constructing agents with one individual agent in mind, to equip singular entities with capacities to “simulate” emotional behavior or to develop different kinds of emotional heuristics for improved decision-making, plan generation or action selection.

But in conjunction with the turn artificial intelligence (AI) took towards distributed artificial intelligence (DAI), new questions and requirements for emotional agents design arise. As emotional architectures of isolated agent-entities become more and more sophisticated (see Trappl/Petta (2001) for an overview), the challenges widen from dealing with emotions in a single agent-entity toward investigating emotional phenomena in multi-agent systems, hybrid systems or distributed agencies.

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