Representing and Reasoning about Complex Human Activities - an Activity-Centric Argumentation-Based Approach

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Dissertation

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Abstract

The aim of this thesis is to develop theories, methods and instruments that can identify, represent and evaluate complex activities based on information, which includes information about an individual's needs, goals, motives, preferences and environment, and which is inconsistent and incomplete.

The purpose is to develop computer-based systems to be utilized in domains such as ambient assisted living, assistive technology, activity assessment and self-management systems for improving health. These domains have the potentials to advance the treatment of information for the purpose of making decisions and reasoning about complex human activity in daily life. Furthermore, based on sound interpretations of activity and evaluation of activity performance, tailored recommendations can be provided to the individual. This is achieved by adopting an activity-centric approach to address the complexity of human purposeful activity, integrating theoretical models of human activity with a formal language of knowledge representation, in order to endow the activity-centric perspective to intelligent agent-based systems. The notion of an argument under semantics-based inferences was introduced, allowing to build structured arguments to infer a consistent conclusion. Structured arguments were used as computational model for introducing the notion of fragments of activity. By resembling the kind of deductive analysis that a therapist or a clinician performs in the assessment of activities, two quantitative measurements for evaluating activities *Performance* and *Capacity qualifiers* were introduced.

Results were empirical evaluated in different proof-of-concept systems designed for evaluating complex activities and improving individual's health in daily life. These systems were tested with the purpose of evaluating theories and methodologies with potential users.

Keywords:

Complex activity, Argumentation Theory, Activity Theory, Logic programming, Knowledge representation, Common-sense reasoning, Artificial Intelligence

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