Actions and plans
(Area 3)

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Summary

– What **Actions and Plans** are about

– How ILIKS members are involved in this area.

– Sample joint work : *Action and agency*, presented by Robert Trypuz (joint work with Nicolas Troquard and Laure Vieu)

– Panel and discussion.
  Panelists : Johan van Benthem, Stefano Borgo, Andreas Herzig, Jérôme Lang, Giovanni Pezzulo, Laure Vieu.

Original description (1/2)

As agency is based on the capacity of agents to perform actions, representing and reasoning on actions is necessary. Actions, goals and intentions to act are tightly related, therefore this topic is developed in synergy with the first two. Work in this topic starts with an ontological study of actions, a special kind of eventualities with a special kind of participation relation between agents and actions. The ontology of action provides in particular an analysis of epistemic actions, such as speech acts and other communicative acts, and characterizes the various composition modes of single actions into collective actions, complex actions and action sequences or plans. Existing and new logics of action are developed, and their semantic aspects ontologically analyzed.

Original description (2/2)

The reasoning dimension of plans is studied as well, with work on goal dependencies and goal conflicts, on planning in multi-agent environment with epistemic actions, and planning with model checking techniques under partial observability and graded beliefs. The topic finally addresses the formal and algorithmic study of the off-line vs. on-line trade-off, i.e. interleaving planning and execution, for knowledge-based plans.

Towards an ontological study of actions

– What is an action ? (actions vs. non-actions)
  – events vs. agent-driven actions
  – different kinds of actions : physical, epistemic, communicative
    etc.

– What are the essential properties of actions ?
  – intentionality $\hookrightarrow$ *area 1*
  – deterministic vs. nondeterministic
  – instantaneous actions vs. actions with durations
    (accomplishments, achievements, processes etc.)
  – granularity
  – concurrency
  – etc.

$\Rightarrow$ PhD thesis of Robert Trypuz (LOA-ISTC)

Developing existing and new logics of action

for some of the latter specific features of actions

– actions with durations [Troquard & Vieu : LOA-ISTC & IRIT] ;

– concurrent actions, group actions [Borgo : LOA-ISTC]

– fully executable vs. partially executable actions : logic of attempt
   [Lorini, Herzig and Castelfranchi : IMACI-ICST & IRIT]

– analysis of epistemic actions : [Lorini & Castelfranchi :
   IAMCI-ISTC]

– analysis of speech acts and other communication actions
   $\hookrightarrow$ *area 4*

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Agency and action (1)

Revisiting and enriching STIT logic

$\mathsf{Stit}_i\varphi$: agent i sees to it that φ

– enriching STIT with a PDL-like logic of action [Troquard &Vieu : LOA-ISTC & IRIT] ;

– first-order translation of STIT (better suited to ontological investigations) + integrating actions [Troquard, Trypuz & Vieu : LOA-ISTC & IRIT]

– enriching STIT with knowledge [Herzig & Troquard : LOA-ISTC & IRIT]

– embedding CL and ATL in STIT [Broersen, Herzig & Troquard : Univ. Utrecht & LOA-ISTC & IRIT]

⇒ PhD thesis of Nicolas Troquard (IRIT & LOA-ISTC)

Agency and action (2)

– how actions are related to goals, and how goals are related to
  expectations [Tummolini, Castelfranchi & Lorini : IAMCI-ISTC]
– models of action selection and goal-oriented behaviour
  (psychological & neurobiological models) [Pezzulo et al. :
  T3-ISTC & IAMCI-ISTC]
– from deliberation to actuation : bridging the gap between the
  intentional and the 'actuation' level [Pezzulo, Calvi &
  Castelfranchi : T3-ISTC & IAMCI-ISTC]

↪ *area 1*

Reasoning about action and belief

– modularity in action description [Herzig & Varcinczak : IRIT]

– linking reasoning about action and Katsuno-Mendelzon's belief
update [Lang : IRIT]

– linking reasoning about action and Veltman's updates [Herzig :
IRIT]

– reasoning about action and graded belief [Laverny & Lang : IRIT]

– reasoning about action in multiagent belief structures [Aucher,
van Ditmarsch, Herzig, Lang & Marquis : CRIL-Univ. d'Artois &
Univ. Otago (NZ) & IRIT]

Reasoning about plans

– logics for planning under partial observability ; belief-based
    programs [Laverny & Lang : IRIT]

– uniform choices in logics of agency [Herzig & Troquard :
    LOA-ISTC & IRIT]

– plans formed from individual and group actions [Borgo :
    LOA-ISTC]

Connections to planning under partial observability via model
checking ⇒ contacts with Traverso et al. (IRST)