Tropos at the Age of 10 months

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Tropos*

Ontology  Actors, social dependencies, goals, resources,...

Structuring  Contexts (+generalization, aggregation, classification and attribution)

Application area  (Requirements-driven) Software development

Tools  Software development, process analysis, enactment support, goal and softgoal analysis

*Tropos, in Greek, means manner (as in “manner of doing things”)
Where Are We??

Where Do We Want To Be??

Guiding Principle: Push concepts as far down as possible (...and see what happens!)
**Our Research Baseline**

- People: Jaelson Castro, Ariel Fuxman, Manuel Kolp, Eric Yu (University of Toronto); Paolo Bresciani, Paolo Giorgini, Fausto Giunchiglia, Anna Perini, Marco Pistore, Paolo Traverso (University of Trento/IRST)
- Our baseline is defined by /\*, nuSMV, but also CONGOLOG.
- nuSMV is IRST’s extension of the SMV model checker.
- CONGOLOG offers a logic-based framework for modelling actions (but also activities, processes, goals, and agents)
- We hope to use nuSMV and CONGOLOG in order to support different forms of formal analysis for Tropos specifications.

**A Multi-Perspective View of Software**

- We are working towards an agent-oriented software development methodology, founded on the key concepts of actor, goal, task, resource, dependency, etc.
- Software is viewed from four perspectives:
  - **Organizational** -- who are the relevant actors, what do they want? What are their obligations? ...capabilities??
  - **Intentional** -- what are the relevant goals and how they interrelate? How are they being met? ... by whom??
  - **Process-oriented** -- what are the relevant business/computer processes? Who is responsible for what?
  - **Object-oriented** -- relevant objects
- We are focusing on organizational and intentional perspectives because they are novel.
From Diagrams to Formal Specs

- Diagrams are not complete nor formal as software specifications.
- We propose to offer three levels of software modelling:
  - Diagrams, as proposed in i*.
  - Partially formal annotations, to complement diagrammatic notations, e.g., annotations may specify that some obligation takes precedence over another.
  - Formal specs, using some form of logic, which are amenable to analysis.
- Diagrams are great for communication, partially formal annotations can help in defining some forms of analysis, formal specs can serve as foundation for a range of analysis techniques, including proofs of correctness, process simulation, goal analysis etc.
- We propose to use UML-type modelling techniques, where possible, at the diagrammatic level.

Research Issues

- An agent-oriented software development methodology with clear guidelines on what decisions are made when.
- Applications of planning paradigms to agent-oriented software development.
- Modeling (multi-agent) processes with coordination and exceptions.
- Simulation and invariant analysis for agent and goal models.
- Viability and workability analysis for dependencies.
- Filling and managing positions and roles.
- Goal and softgoal means-ends analysis.
- Exception handling (note: this should be interesting).
- Management of commitments and obligations, individual and global issues.
Research Tasks

- Case studies -- doing early and late requirements, architectural and detailed design in Tropos;
- Modelling issues for late requirements, architectural design, detailed design: diagrams, annotations, formal specs;
- Forms of analysis at any of the 4x3 levels of specification;
- Language design for Tropos;
- An environment for building and analyzing Tropos specs;
- …more…