Requirements Elicitation for MAS with Activity Theory

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Summary

- Introduction
  - Requirements Elicitation
  - Social Theories
- Activity Theory
  - The Activity Checklist
- Social requirements for MAS
  - Adapting the Checklist
  - Elicitation method
- An example
- Conclusions

Requirements elicitation

- Requirements are about:
  - High-goals of the envisioned system
  - their operationalization into specifications
    - With services and constraints
  - and their assignment to humans or devices.
- Modelling techniques influence RE.
  - What can be
    - Modelled
    - Observed
    - Discussed

RE with agents

- Some RE proposals are based on the agent paradigm
  - i*
  - KAOS
  - Albert
- The agent paradigm proposes
  - A different way of thinking about systems.
    - For paying customers, end-users, and developers.
- Why not using agents social features for RE?
  - What models can provide us further details?

Social models: Activity Theory

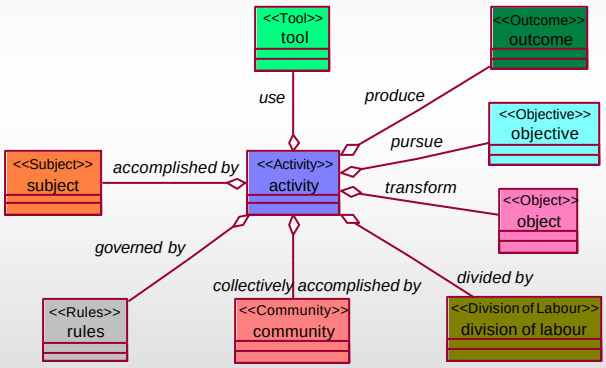
- Activity Theory is a framework to study
  - social activities
  - with a historical-cultural view
  - evolving through contradictions.
- Is it applicable?
  - Human societies and MAS share a common base
    - Social
    - Intentional

Activity Theory for MAS

- Our contribution
  - Formalization of AT concepts.
  - Application of AT to assist AOSE.
  - Support tools.
- This presentation focuses on
  - Requirements Elicitation with Activity Theory.

Activity

- An *activity* is a process.



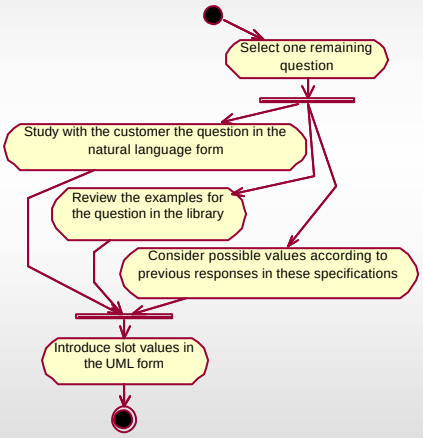
RE with the Activity Checklist (I)

- The Activity Checklist is an AT tool that can be used for RE in MAS.
- The Checklist expresses requirements
  - grouped in *areas*,
  - which contains *aspects*,
  - which are formulated as *questions*
  - in natural language.

RE with the Activity Checklist (II)

- Use our UML formalization for AT to express questions.
- It facilitates further processing.
  - Validation of a specification.
  - Verification of properties.
  - Traceability of requirements.
  - Integration into MAS development tools.

Information gathering



- Collaboration customers-developers.
  - Natural language describes searched information.
  - Library of examples helps to understand the question.
  - Other values in the specification are available.
- Answer recorded in the frame of the question.
  - Less ambiguous.
  - Automated processing.

Example: agents in Robocode

- Robocode
  - http://robocode.alphaworks.ibm.com
  - Simulated tank battles between teams.
  - Tanks.
    - Perceive the environment with sensors.
    - Have primitives for movement and shooting.
  - Goal → Survive team.
- Requirements about modelling the team leader.
- Full specification in http://grasia.fdi.ucm.es/ingenias

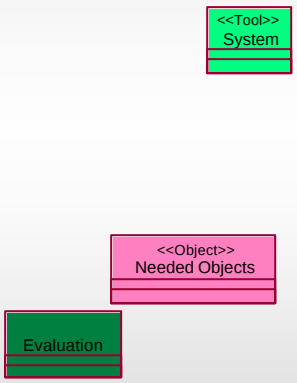
Simulating strategies (I)

- The team leader
  - Conceives the strategy.
  - Gives the commands.
- Requirements.
  - We want to capture aspects of the intelligence of the *team leader* agent.
  - What features we should consider?

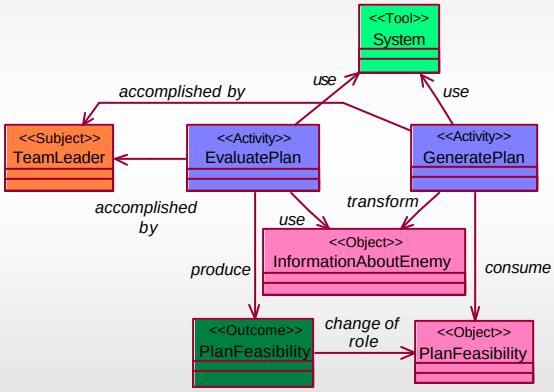
Simulating strategies (II)

- Area → Learning/cognition/articulation.
  - Aspect → Possibilities for simulating target actions before their actual implementation.
    - Question → Should the system analyze that the action can be done before it is really done? For example checking that all the needed resources are available.
    - Question → Does the system provide clues in case of breakdowns/failures that can be used to find a solution?

UML representation of questions

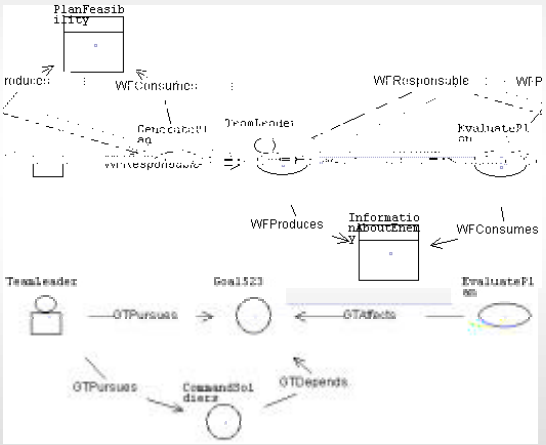


Customer's information



- Answers reusing previous information.
  - TeamLeader
  - GeneratePlan
- Partial answers
  - System
- New entities.
  - PlanFeasibility
  - EvaluatePlan

Translation to INGENIAS



- Automated translation to the agent paradigm.
  - Mappings.
- New requirements generates pending new entities and relations.
  - Goal523
  - GTDepends

Conclusions

- AT is proving its utility in several development tasks for MAS.
  - Requirements elicitation in this case.
  - But also contradictions, properties discovering, development management...
- Activity Checklist as a tool to manage social properties.
  - Social concepts known for users and developers.
  - Dual form
  - Process.
- Results are being integrated within the Ingenias IDK
  - ***http://ingenias.sourceforge.net***
- Future work:
  - Enrichment of the Cheklist.
  - Adaptation to other MAS methologies.