Declarative Goals in Motivated Agent Architectures

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Outline

• What and why
  – Declarative Goals
  – Meta-reasoning and Motivations
• Prototypes
  – AgentSpeak-PL and AgentSpeak-MPL
• Results
• Future Work and Work Plan
What and Why

• Existing agent languages and architectures
  – Mostly deal with actions and plans

• Multi-agent techniques
  – Ad-Hoc

• Gap between language expressivity and available techniques
  – Solution: extend existing languages
BDI Agents

• Based on a philosophical model by Bratman
• Describes agents in terms of:
  – Beliefs: information about the world
  – Desires: preferred world-states
  – Intentions: commitments to achieve desires
• Large body of research on BDI agent architectures
AgentSpeak(L)

• Agent language that describes procedural plans

• Based on a series of previous BDI architectures and languages
  – Based on a simplification of the BDI model
  – Main goal was get a responsive system
  – Ties plan execution with goal achievement
Declarative Goals

• World states which an agent intends to hold
• Decouple plan execution from goal achievement
  – Not vulnerable to a poor plan selection strategy
  – More runtime flexibility
AgentSpeak-PL

• AgentSpeak(L) interpreter extended with planning capabilities
• State-space planning is always towards declarative goals
• AgentSpeak-PL supports declarative goals
AgentSpeak-PL (detail)

- Planner encapsulated within an action
- Planning allows the creation of high-level plans
- New plans are added to the plan library improving the agent over time
- Allows for shorter, declarative goal descriptions
Meta-reasoning

• Reasoning about the reasoning process
• Guides the selection of goals and actions
  – Important in declarative agent architectures
• Few current efforts
  – All rely on some static strategy
  – Need a specification language
Motivations

• Root cause of future-directed behaviour
  – Orientation towards certain classes of goals
  – Varying degrees of intensity

• Interesting abstraction for meta-reasoning
AgentSpeak-MPL

- AgentSpeak(L) interpreter extended with a motivations-based meta-level controller
- Includes a motivation specification language
  - Intuitive way of describing meta-reasoning
  - Extensive research on the subject
AgentSpeak-MPL (detail)

• Can be applied to both procedural and declarative agents (e.g. AgentSpeak-PL)
  – Separation of action-directed plans from internal management code (procedural)
  – Enforcement of rationality constraints on goal and plan selection (declarative)
Results

• Journal paper in *Scalable Computing: Practice and Experience*
• Workshop paper in *Declarative Agent Languages and Technologies*
• Written and submitted paper for the *Central and Eastern European Conference on Multi-Agent Systems*
Future Work

- Multiagent AgentSpeak
  - Selection of partners and actions
  - Norms, contracts and commitments
- Apply meta-level reasoning in MA-AgentSpeak
  - How to cooperate
  - When to do so
Future Work (cont)

• Explore possibilities of
  – Joint plans
  – Plan sharing
Work Plan

• 2007
  – April – October
    • Meta-reasoning in multi-agents
  – October – December
    • Planning in multi-agents

• 2008
  – Thesis write up
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