

Multi-Agent Systems

Lecture IV

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Lecture IV Learning Objectives

❑ Review the difference between reactive and deliberative agent architectures

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❑ To understand the Belief-Desire-Intention Architecture

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❑ To understand the different classes of Agent Communication.

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❑ To understand the different classes of Commitment Strategies.

❑ To understand the principles and importance of Speech Acts



Why Deliberative Architectures

- Agents with reactive architectures:
 - Can't reason over hypothetical elements or situations.
 - Perform poorly in environments where actions can't be ignored if proven to
 - Can't organize act to coordinate with other agents.
 - Represents simple behaviour.
- It's complicated to present an “intelligent” behaviour from a purely reactive architecture.

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Simple Reactive Structure

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Another Example... (MES)

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Mars Explorer System

- Implements Brooks' Subsumption Architecture
- Hierarchy of task accomplishing behaviours
- Follows simple-rule structure
- Competing for control
- represented as augmented state machines (AFSM)
- Triggered when an input surpasses a threshold
- lower level modules can inhibit those in higher levels
- modules are grouped and placed into layers

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Deliberative Architectures

- BDI - Belief Desire Intention

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- PRS- Procedural

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Systems

- IRMA - Intelligent Resource-Bounded

Machine Architecture



Belief Desire Intention Architecture

- Employed in the development of Reflective Systems.
- Based on Michael Bratman's philosophical model of human practical reasoning.
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- The term BDI is attributed to Bratman and Georgeff (1992).
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- Models the reflective process in terms of the interplay between these three mental attitudes.
- Implemented model of practical reasoning agents



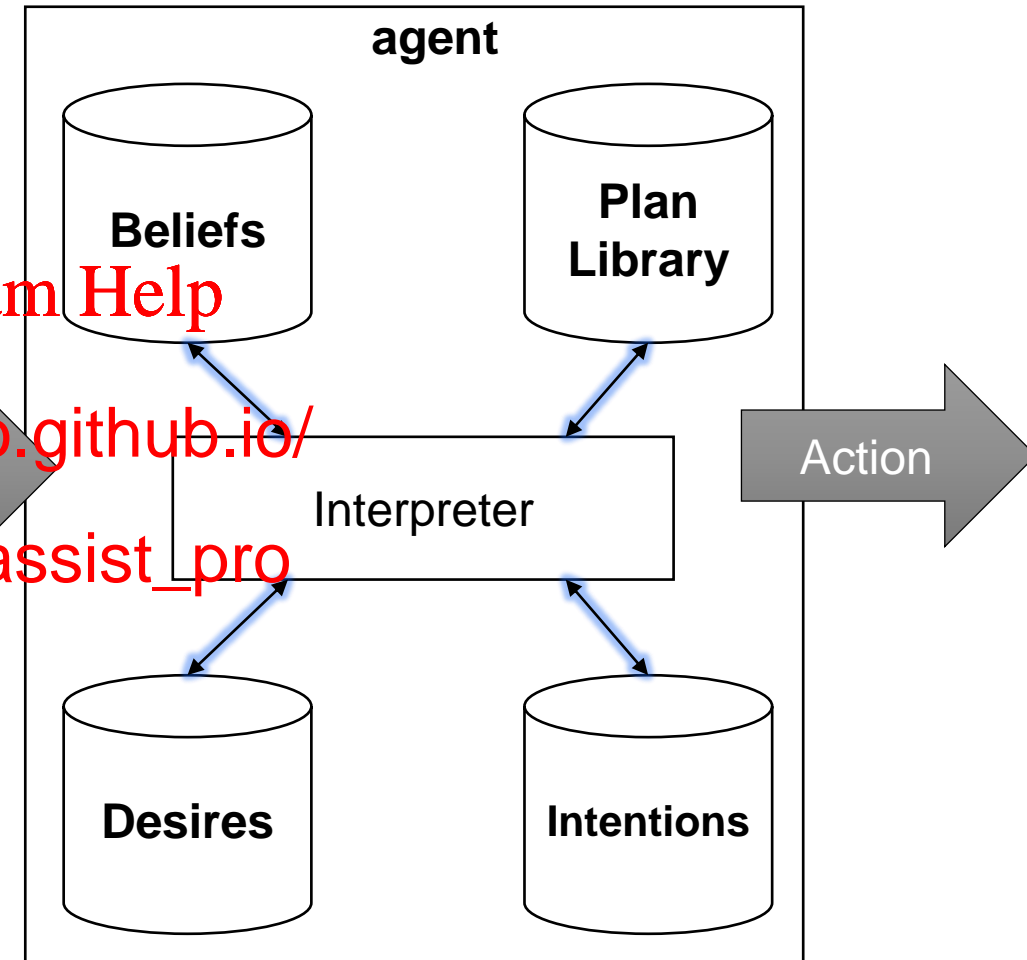
Procedural Reasoning Systems (PRS)

- Each agent is equipped with a **plan library**
- Such library represent procedural knowledge.
- No plans == No Options
- Agents with PRS posses explicit BDIs

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Intelligent Resource-Bounded Machine Architecture (IRMA)

- Based on the following data structures:
 - Plan library
 - Beliefs
 - Desires
 - Intentions
- But also:
 - Reasoner
 - means-end analyser
 - Opportunity analyser (environment monitor & Option generator)
 - Filtering process (compatibility)

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