Mixed-Initiative Interaction for Learning with Instruction

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Outline

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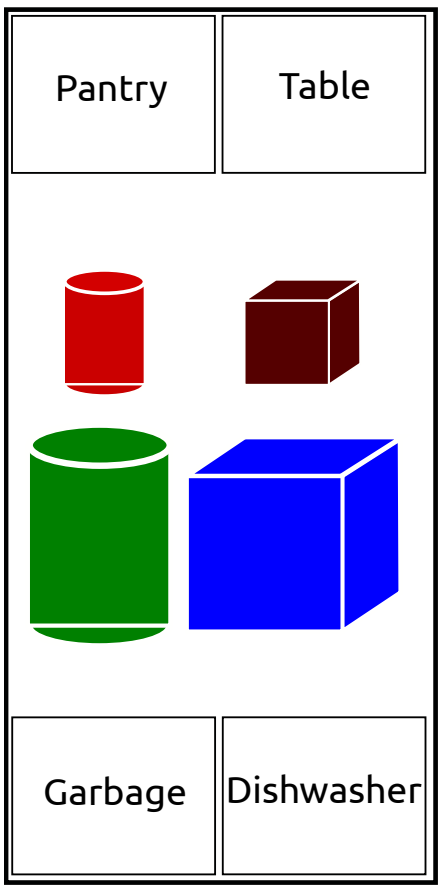
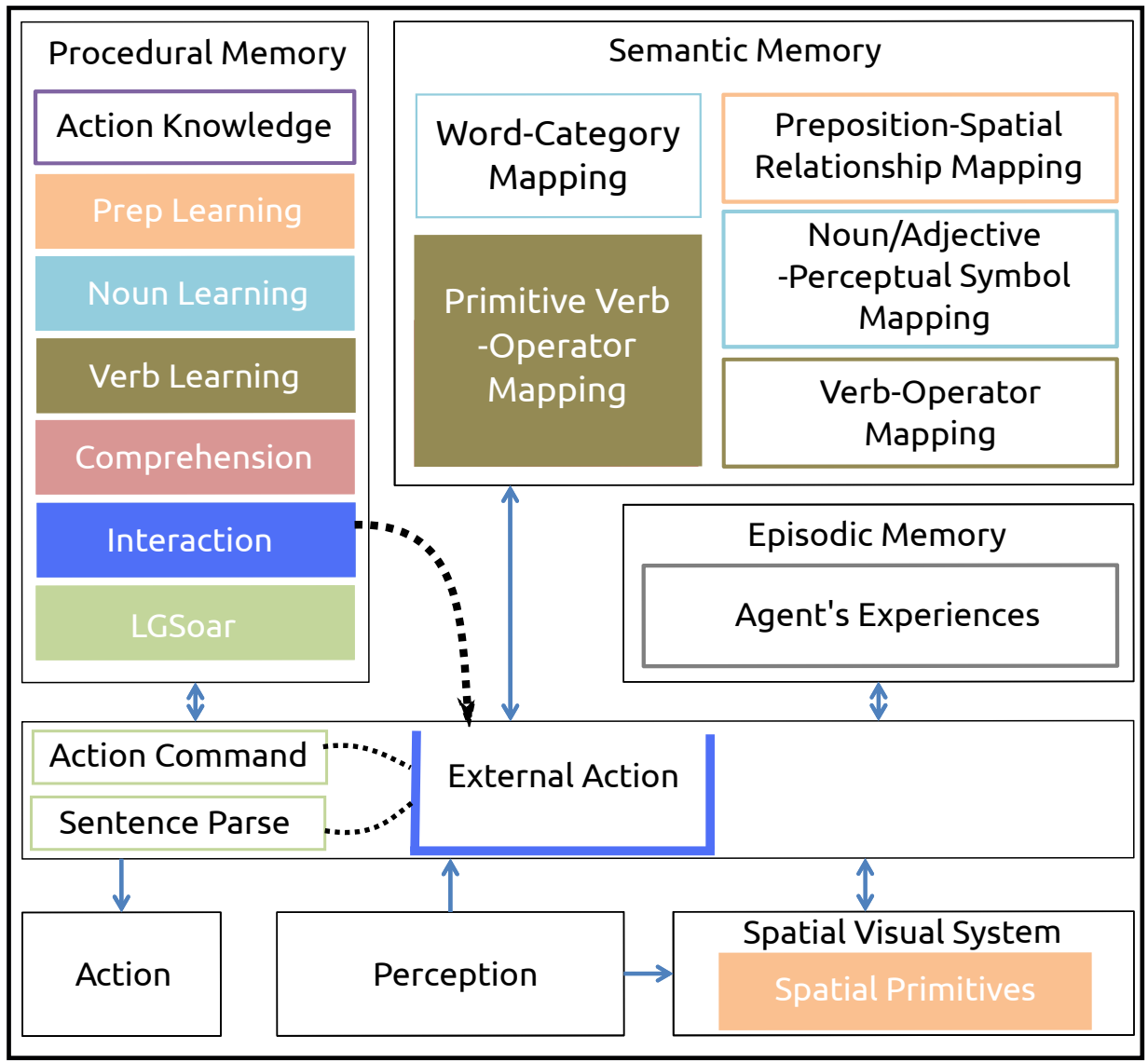
- Implementation
  - State of interaction is maintained as an 'interaction stack'
    - maintained in working memory, **not** state stack
  - Communication, learning, actions change the state of interaction through interaction operators

Interaction Management

← Syntactical Processing Grounded Comprehension →

"Put the red cylinder in the pantry"





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- **Temporal**: The model and the sequence of interactions should inform agent's learning.
  - Agent is able to learn from temporally delayed information

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adapted from Rich and Sidner (1998)
based on Collaborative Discourse Theory (Grosz and Sidner, 1986)

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Events

change the state of interaction

- Action events
  - change in the environment state
- Dialog events
  - instructor/agent elicitation
- Learning events
  - change in agent's knowledge

dialog-event	Human: Move the red block to the pantry.
dialog-event	Agent:I do not know how to perform this action.
dialog-event	Human: Pick up the red block.
action-event	Agent: (picks up the red block)
dialog-event	Agent: What do I do next?
dialog-event	Human: Put the object in the pantry.
action-event	Agent: (puts the red block in the pantry)
dialog-event	Agent: What do I do next?
	.....
dialog-event	Human: You are done.
learning-event	Agent: (learn with forward projection)

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linguistic segment

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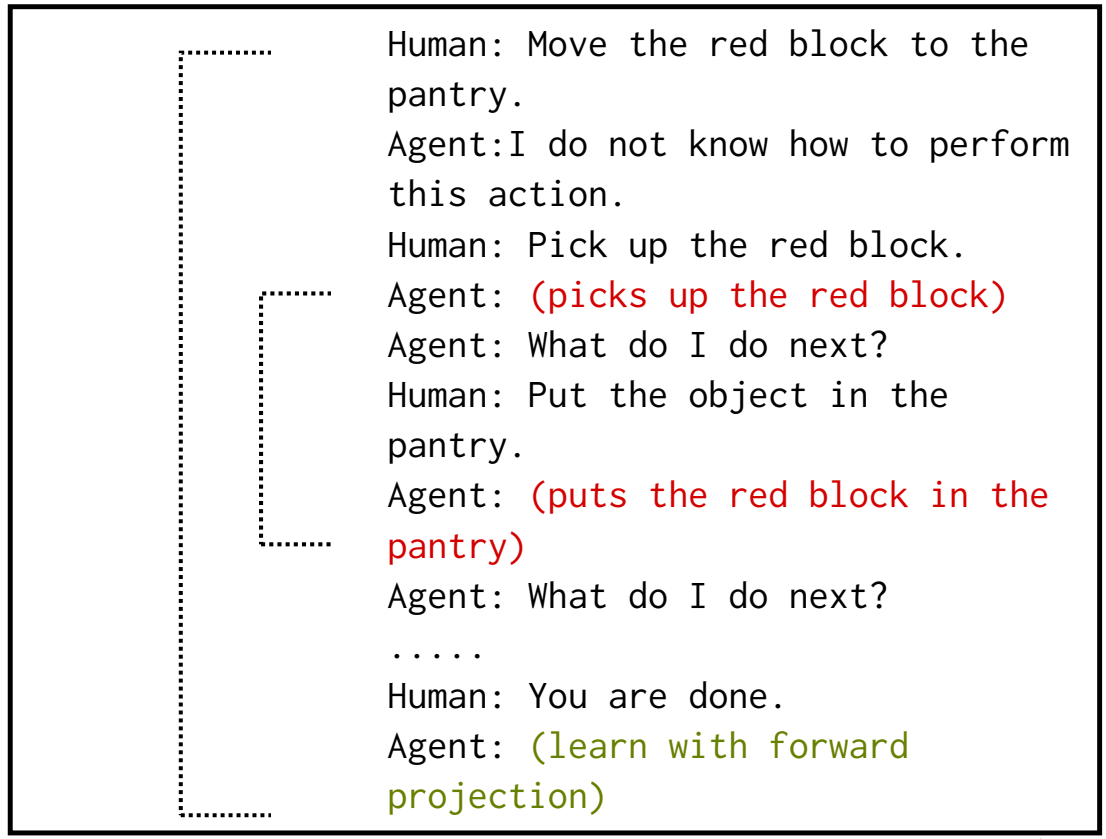
- A question-answer sequence
- A command-action sequence
- Hierarchical



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  - Learning based heuristics
    - learning composite action dominates primitive action execution

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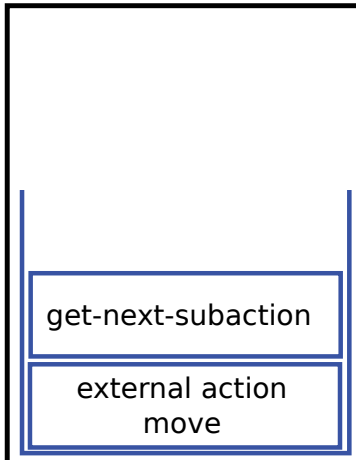
Interaction Stack

contiguous block of events

purpose, *satisfaction*

- Represents the state of dialog between the instructor and the agent
- A stack of open segments (purpose has not been achieved)
- The top segment determines the current focus of dialog.

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Human: Move the red block to the
pantry.
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  - Episodic memory encodes changes in interaction state.

Nuggets and Coal

- Nuggets
  - The interaction model integrates well with other modules
    - in deployment
  - Progress from Huffamn and Laird (1995)
    - Did not allow instructor initiated instructions.
- Coal
  - Limited understanding of ‘initiative’.
  - Intentions are heuristically derived
    - Hard in complex scenarios