

Action Grammar

for Grounding of Object-oriented Actions

Institute for Neural Computation

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DFT Summer School 2021



RUHR-UNIVERSITÄT BOCHUM
INSTITUT FÜR NEUROINFORMATIK

Grounding of Everyday Actions



Action Roles

Pastra&Aloimonos: The Minimalist Grammar of Action, 2012



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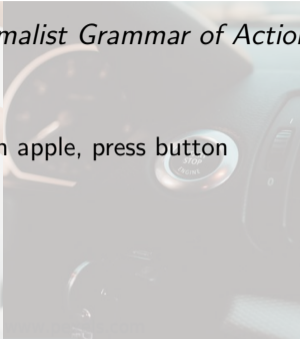
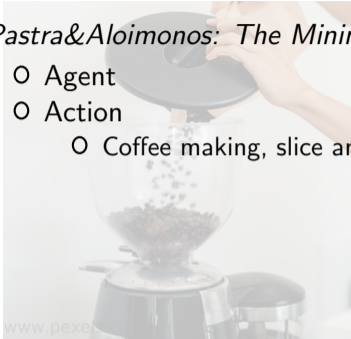
○ Agent



Action Roles

Pastra&Aloimonos: The Minimalist Grammar of Action, 2012

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- Action
 - Coffee making, slice an apple, press button



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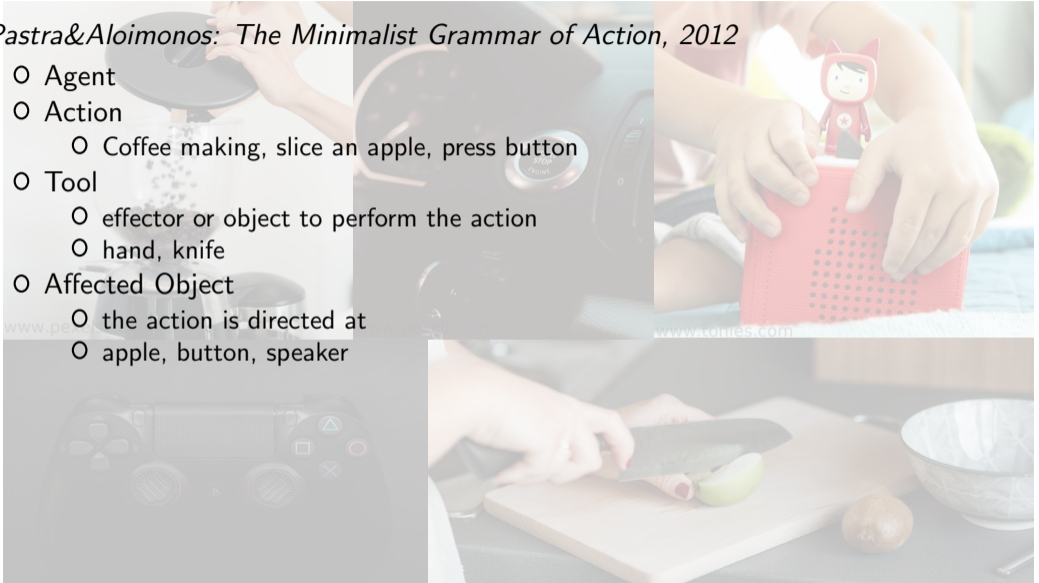
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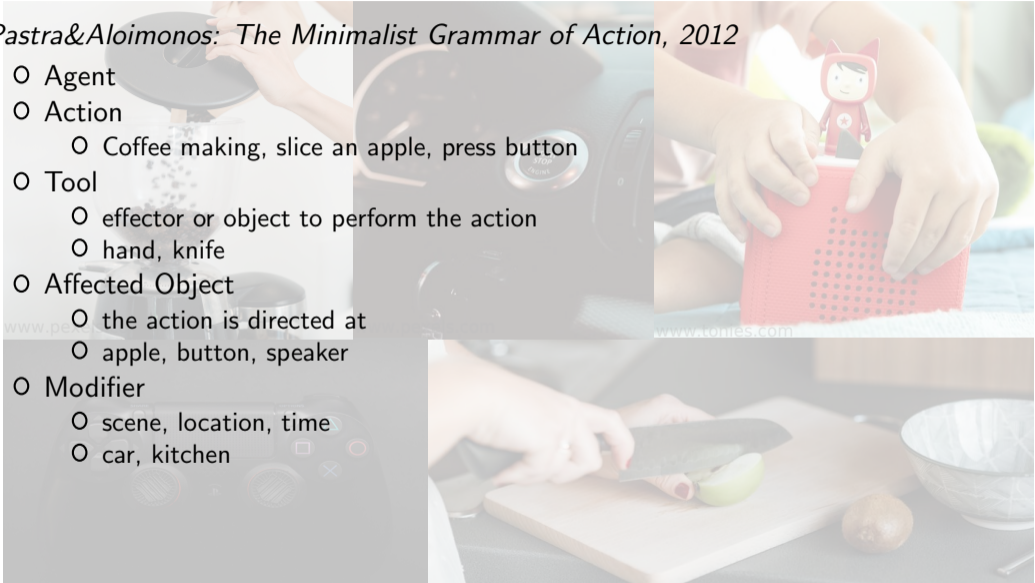
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 - the action is directed at
 - apple, button, speaker



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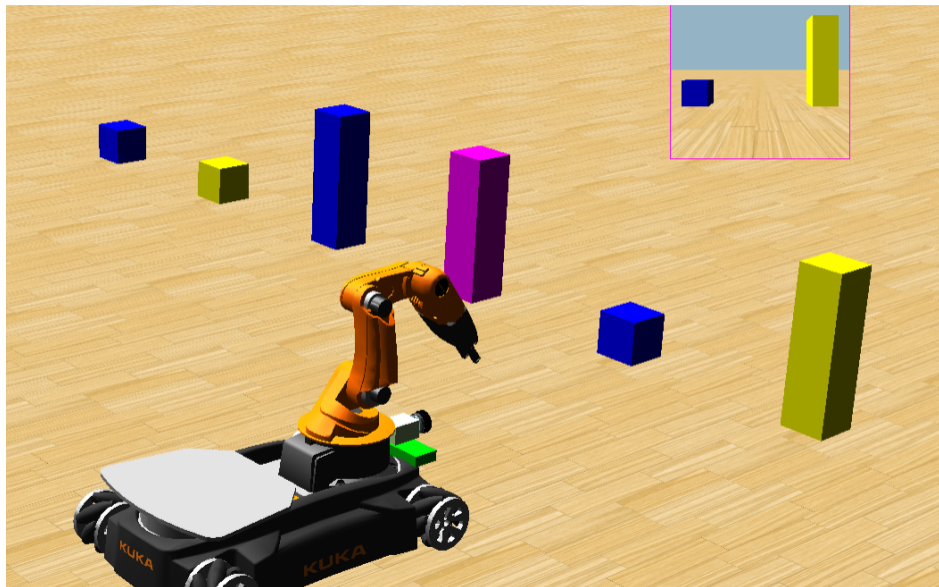
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 - scene, location, time
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- Outcome
 - change in the world
 - cup of coffee, sliced apple, music playing



Action Roles in the Color Scenario



Action Roles in the Color Scenario

○ Agent

○ Robot



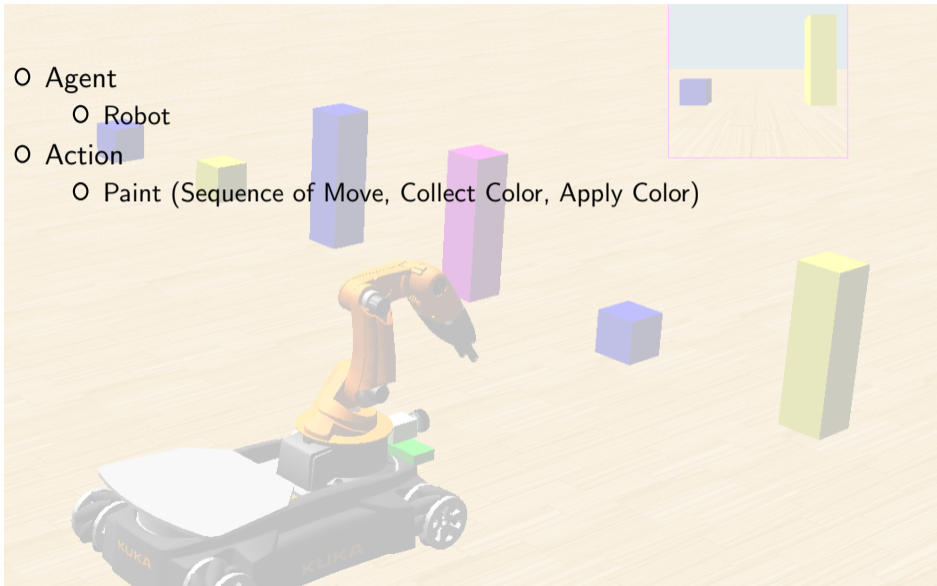
Action Roles in the Color Scenario

○ Agent

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○ Paint (Sequence of Move, Collect Color, Apply Color)



Action Roles in the Color Scenario

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 - Robot
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- Tool
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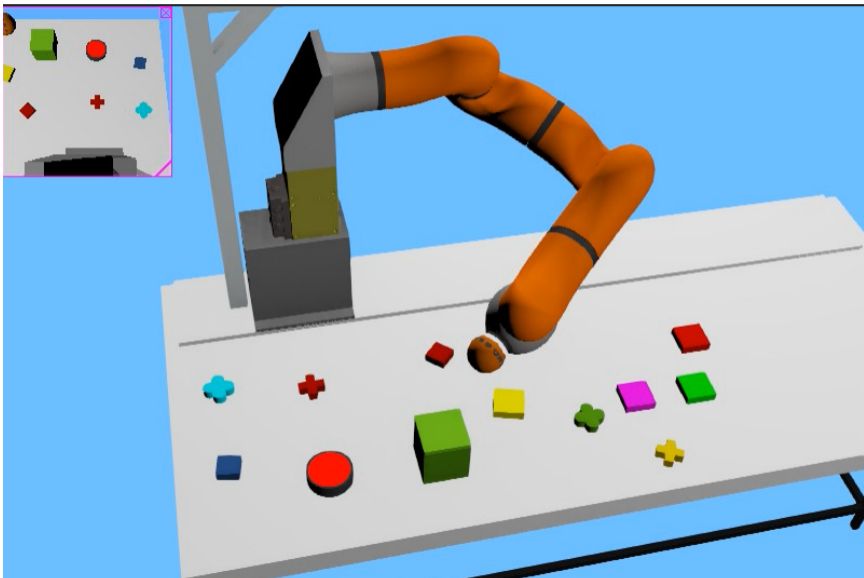
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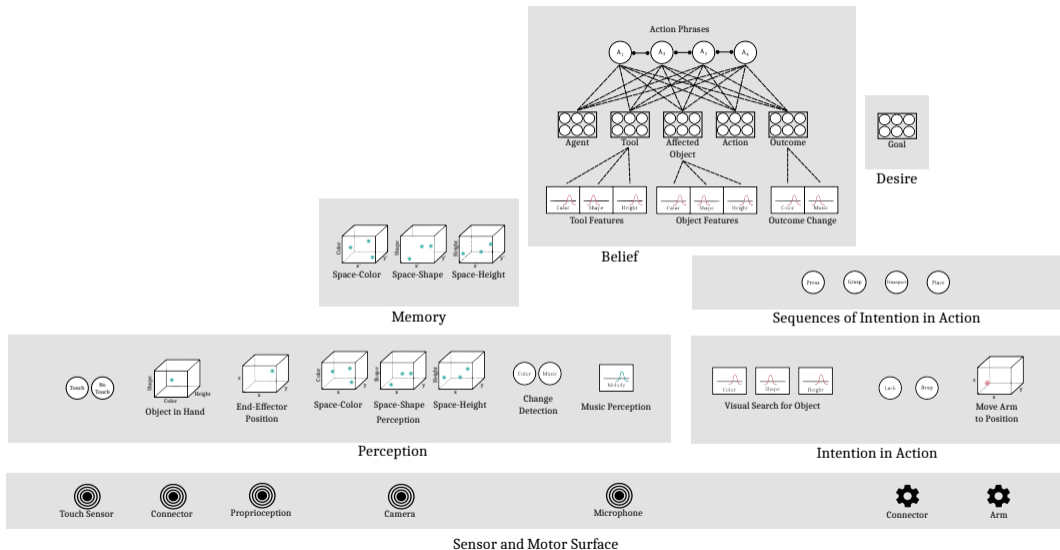
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- Flexible when something goes wrong

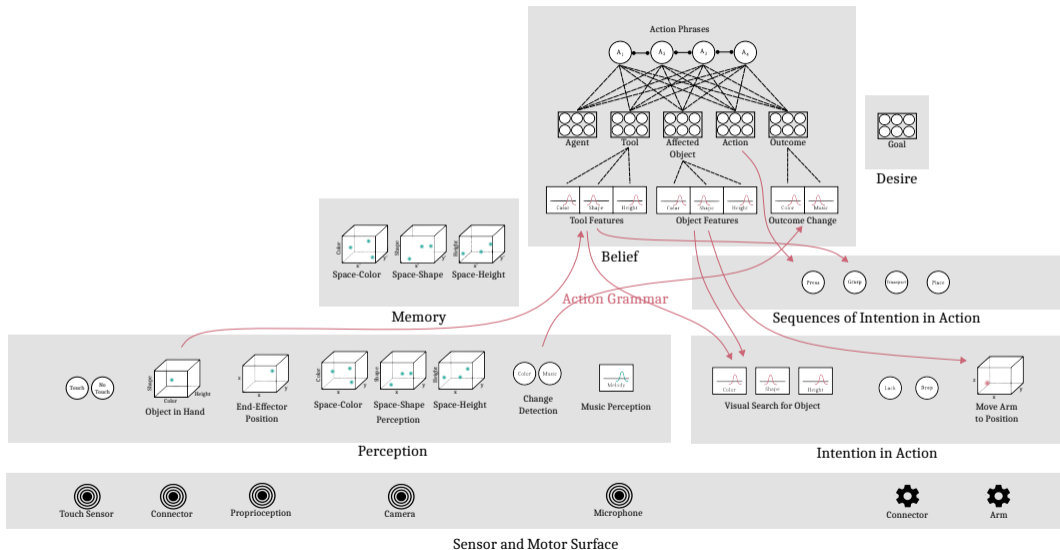
Table Top Scenario



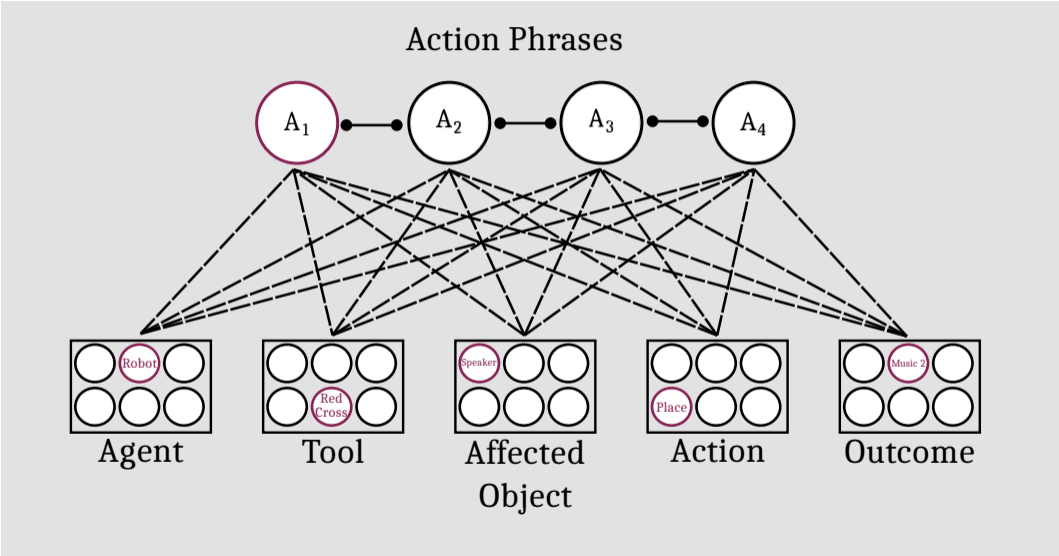
Intentional States Architecture



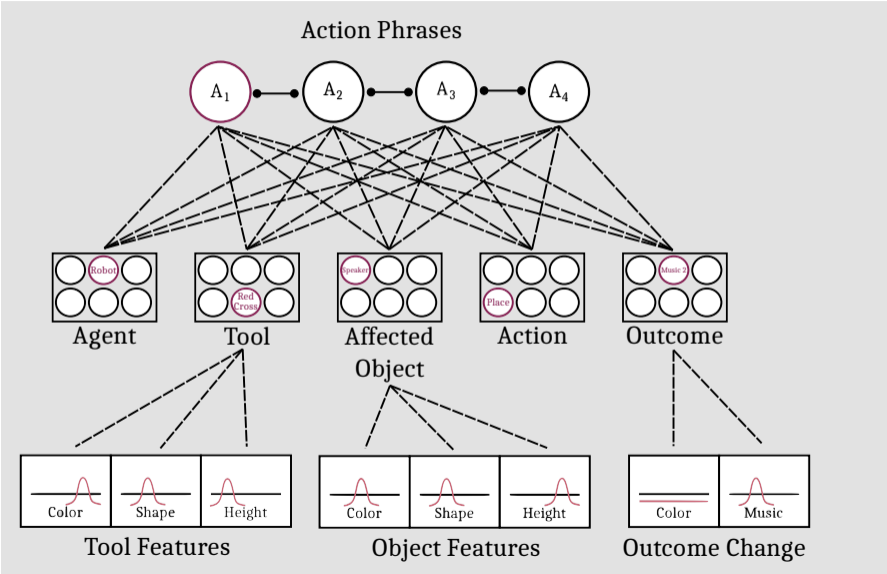
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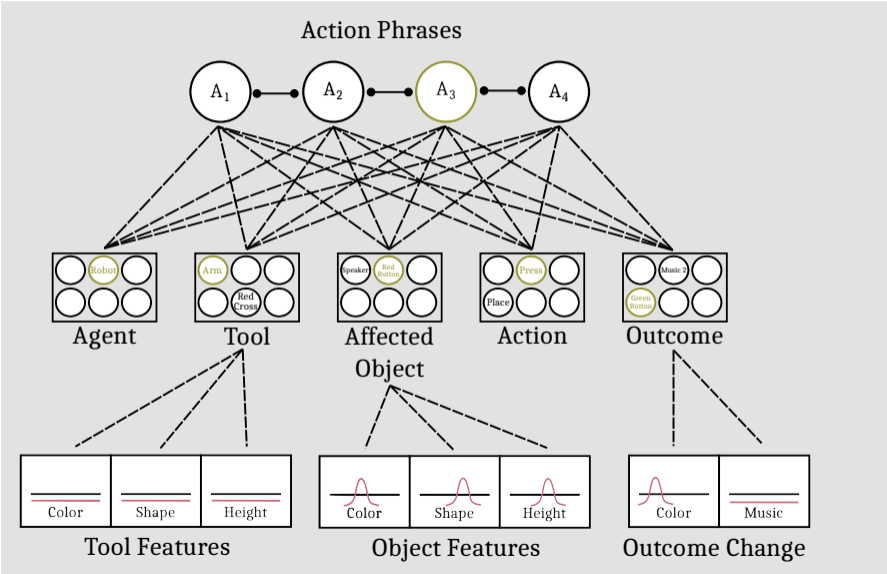
Action Phrases - Belief about Action and Expected Outcome



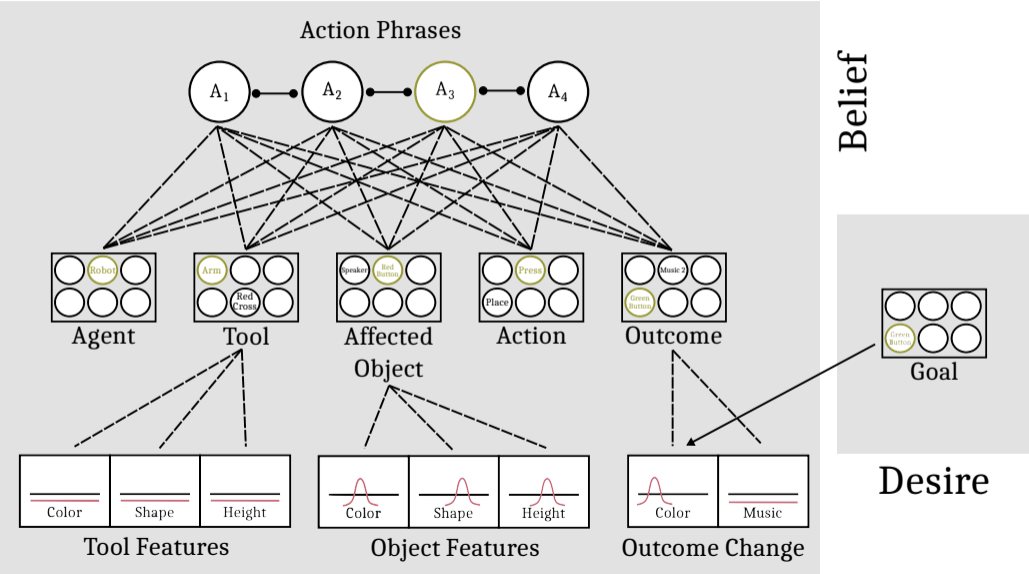
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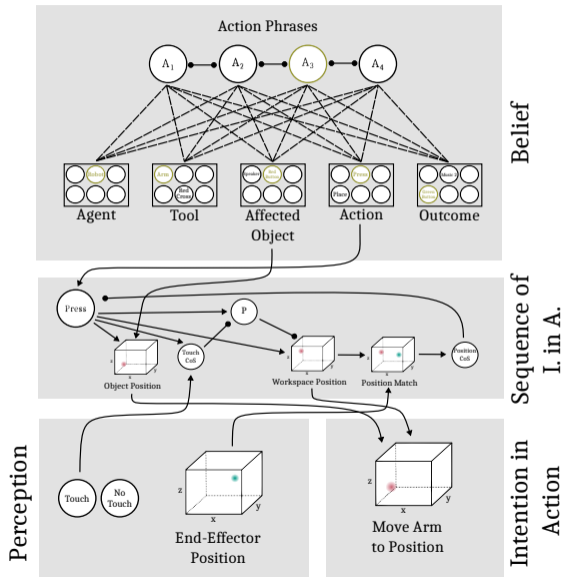
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Activation of an Action Phrase



Prior Intention and Intention in Action



Action Roles Define Preconditions

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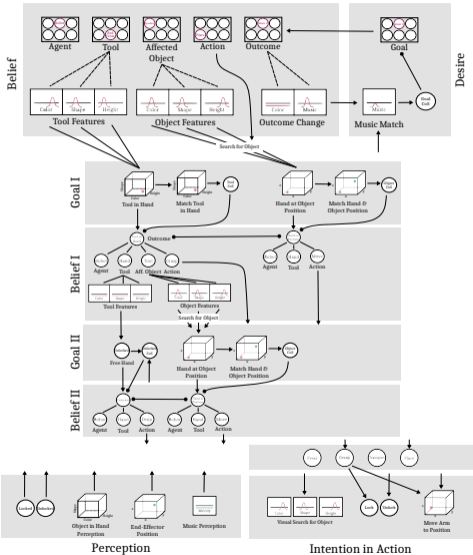
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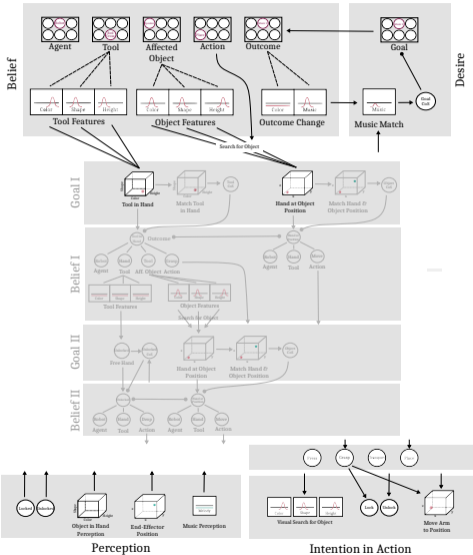
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 - "Grasp tool with hand", "move to object"
- Action tree with activated action phrase on top

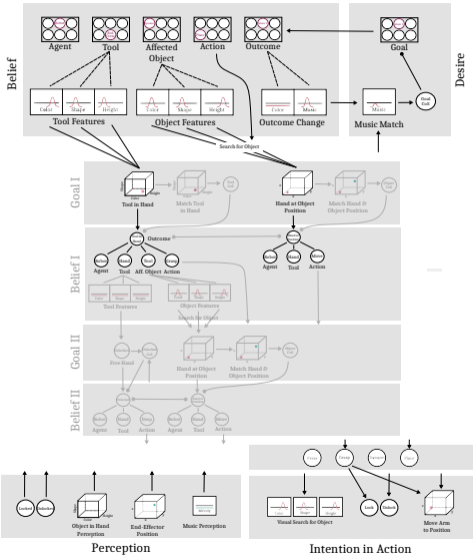
Action Grammar - Hierarchy



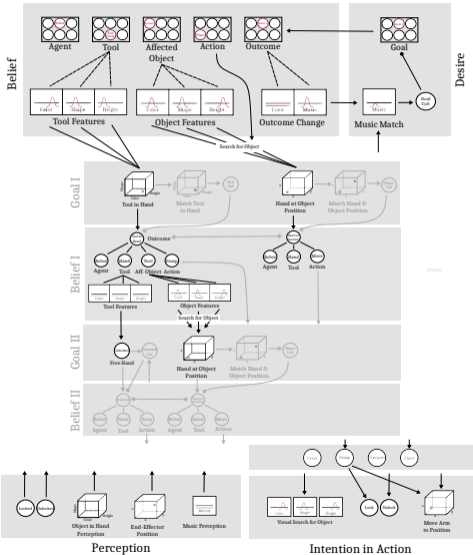
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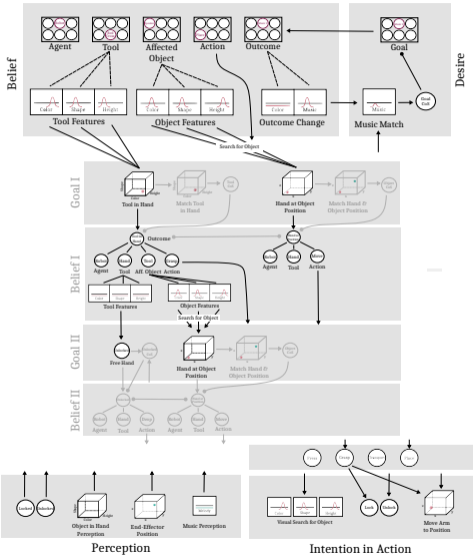
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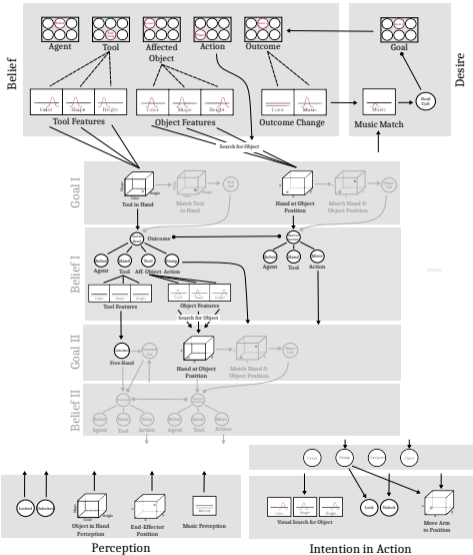
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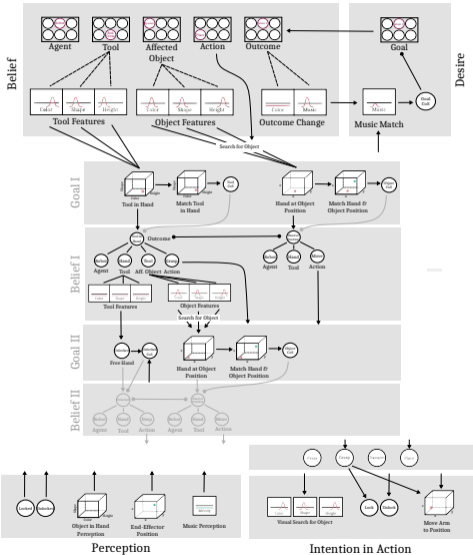
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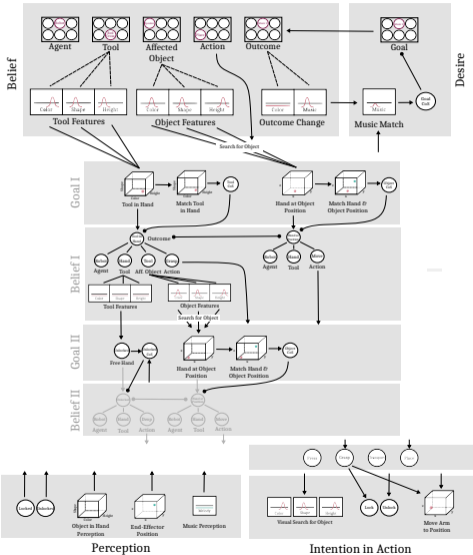
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Videos

1.1

1.2

1.3

1.4

1.5

1.6

1.7

1.8

1.9

1.10

1.11

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- Outlook: for complex action planning the action tree cannot be represented completely, use Belief structure to find new action phrase and form an action plan without forgetting previous goals

Thank you for your attention!