

# CS 369: Introduction to Robotics

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**Haverford**  
COLLEGE

# Outline for today

- Human-robot interaction

# Human-robot communication

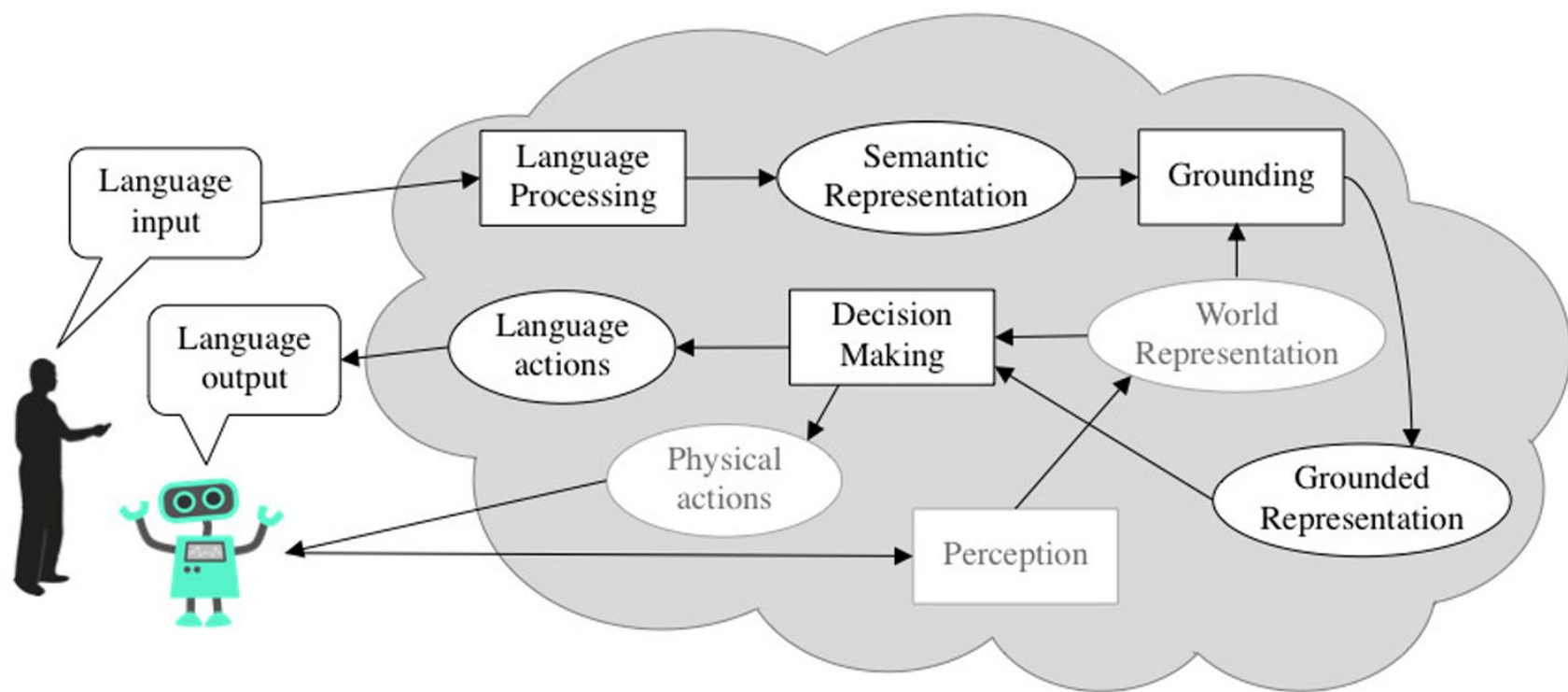
- Interface should require minimal user training while being expressive
- Natural language is a rich and intuitive communication modality
  - Language understanding
  - Language generation

# Language grounding

Connecting language to the physical world

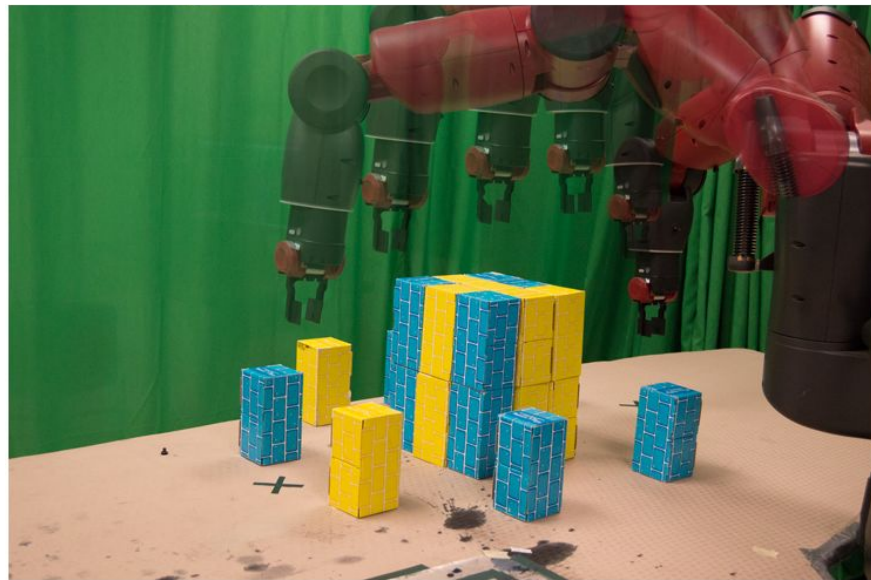


# Language generation



# Two-way communication

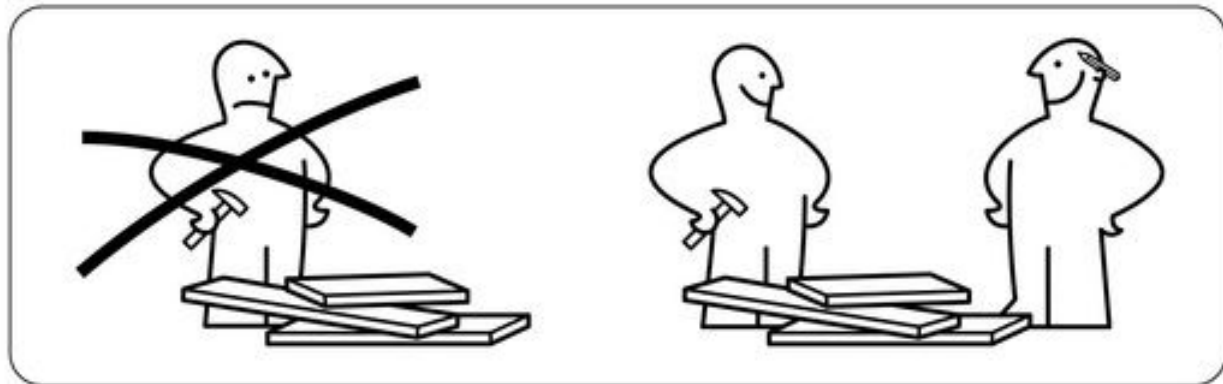
- Real-time processing
- Turn-taking
- Retain conversational state
- Multimodal: gesture, gaze, tone, visual, etc.



Communicating Robot Arm Motion Intent

# Human-robot collaboration

- Task delegation
- Perceiving humans:
  - State-tracking
  - Intent inference



# Human-robot interaction



# Cobots

- Collaborative robots: intended for safe human-robot interaction within a shared space
- Characteristics:
  - Lightweight materials, rounded edges
  - Speed and force limits
  - Safety sensors
  - Compliant

