Learning by Interaction: A Developmental Methodology for Robot Action Learning

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Introduction

“Learning by Interaction” beyond “Learning from Demonstration”

- Teachers scaffold learning.
  - Exaggerate action
  - Highlight important aspect
- Learners induce scaffolding.
  - Respond to action demonstration
  - Show their understanding

⇒ Addressing “what to imitate” issue

Key Factor in “Learning by Interaction”

Bottom-up visual attention based on saliency:

- yields infant-likeness of learners.
- induces action modifications of teachers.
- enables learners to detect important aspects of actions highlighted by teachers.

⇒ Addressing “what to imitate” issue

Study 1: Analysis of Parent-Infant Interaction

Questions

- How do parents demonstrate actions to infants?
- How do they highlight important aspects of actions?

Our Approach

Analyze parental action demonstrations employing a saliency-based attention model

Study 2: Design of Human-Robot Interaction

Questions

- How do people want to teach and accept robots?
- How can robots induce parent-like teaching of human partners?

Our Approach

Equip a robot with a saliency-based attention model and investigate partner’s responses focusing on when the robot’s attention is distracted

Results: People’s Responses to Robot’s Distracted Attention

- Modifying their actions as parents do for infants
  - Amplifying their body movement & making noise
  - Approaching the robot & closely showing objects
- Accepting the robot as a social agent
  - Following the direction of the robot’s gaze
  - Moving into the line of the robot’s gaze

References


http://www.techfak.uni-bielefeld.de/~yukie/