Extracting requirements on a cognitive architecture from research in human cognitive development

euCognition Workshop

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Minutes from the Workshop

- 9:30 – 9:45 Admin
  - Sign release forms
  - Transfer powerpoints
- 9:45 - 10:00 Outline strategy, then test on two case studies
- 10-11:30 Case study 1
  - Cooperative Behavior
- 11:30 – 12:30 Case study 2
  - Language construction acquisition
  - Development of verb island
- 12:45 – Lunch near the hotel
- 13:30 - Terminus

9:45 – 10:00 Outline strategy

- Identify the behavior in question
- Place it in a scenario
  - Time scale may vary (lang devo vs. Cooperative behavior)
- Analyze scenario
  - Identify processes (learning, transformation, perception, etc.)
- Extract and specify functional requirements
  - Specify what the system should do, as specific as possible
- Identify additional constraints
  - E.g. neuroanatomy, neurophysiology
- Regarding implementation
  - requirements do not necessarily specify the *implementation*
  - But they can suggest (e.g. Bayesian, HMM, recurrent network, etc.)

10-11:30 Case study 1 Cooperative Behavior

- Identify the behavior in question: Door opening / helping
- Place it in a scenario
  - Prior experience
    - Walk, open door, go get magazines, put magazines, close door
  - Test:
    - Get magazines, fail because door is closed
  - Helping behavior
    - Kid opens door
  - Control task:
    - Bump into door but clearly indicating that trying to put the things up. (stimulus enhancement control)
- Analyze scenario
  - Identify processes (learning, transformation, perception, etc.)
  - Keep focused, and away from what is not involved?
- Possible « robotization » of task
  - E.g. fixed robot in its workspace
- Extract and specify functional requirements
  - Specify what the system should do, as specific as possible

Identify the behavior in question:Door opening / helping

- Identify additional constraints
  - E.g. neuroanatomy, neurophysiology
  - Generalization:
    - Within the task to different objects
- Regarding implementation
  - requirements do not necessarily specify the *implementation*
  - But they can suggest (e.g. Bayesian, HMM, recurrent network, etc.)
  - We hypothesize that these tasks can be represented in a Bayesian network formalism. If inference necessary for « helping » can be characterized in terms of well understood operations on Bayesian networks, then generalization of « helping « comes for « free ».

11:30 – 12:30 Case study 2 Language construction acquisition Development of verb island

- Identify the behavior in question
- Place it in a scenario
  - Time scale may vary (Lang deco vs. Cooperative behavior)
- Analyze scenario
  - Identify processes (learning, transformation, perception, etc.)
- Extract and specify functional requirements
  - Specify what the system should do, as specific as possible
- Identify additional constraints
  - E.g. neuroanatomy, neurophysiology
- Regarding implementation
  - requirements do not necessarily specify the *implementation*
  - But they can suggest (e.g. Bayesian, HMM, recurrent network, etc.)

11:30 – 12:30 Case study 2 Novel object

- Identify the behavior in question: Novel object ‘oh look’ Ahktar
- Analyze scenario
  - Child parent and experimenter play with three novel objects
  - Parent leaves, 4th object brought out, child and experimenter , mother’s absence is noted.
  - Mother comes back « Oh look, a mogi »!
  - Child is then able to select the named « mogi » from an array that avoids any possible gaze following.
- Extract and specify functional requirements
  - Similar object manipulation plus,
  - visually distinguish between and identify 3 (known) objects and learn one new one.
  - Associate the name modi with the novel object
    - attribute to someone a lack of knowledge (knowledge ignorance –; vs false belief where you attribute to them “false” knowledge) –
    - Use that knowledge to link the name to the novel object
    - Or, simply associate the name to the most salient (novel) object –
    - related to mutual exclusivity
      - Object differentiated because it has no name (mutual exclusivity)
      - Current task: Object differentiated because Because it is new
- Regarding implementation
  - Model other’s knowledge state (C Brazeal Sally Anne task)
  - Follow the exchange with L Smith – can robots help?
  - Tomasello and Haber – “Oh cool” for new object,
  - Moll – devo progression; manipulate, see, …

- Whats next?
- Wizard of Oz walkthrough
- Next level of detail.