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From Discovery to Innovation...

Exploring the usability of adaptive menus with a simple object system

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Overview

- The ACT-R simulation tool space.
- Simple Object System - ACT-R/SOS.
- An example: Modelling user interactions with adaptive menus.

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The ACT-R simulation tool space

- Interaction with external applications or environment
  - ACT-R/IF, sim-eye, sim-hand, SegMan, VisMap, ACT-R robots, and Intelligent Human Computer Interfaces
- High fidelity simulated task environments
  - ACT-R/PM
- Low fidelity simulated task environments
  - ACT-R/SOS

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Simple Object System - ACT-R/SOS

- What is it?
  - Tool to build low fidelity simulated environments to run against ACT-R cognitive models.
  - Assumes a perceptual index mechanism.
  - Definition of object classes and declarative chunks

```
(define-sos-object-class class2
         :inherit-from (class1)
         :chunk-slots (c1 c2 c3)
         :application-slots (a1 a2))
```

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Simple Object System - ACT-R/SOS

- What is it?
  - Buffer based

```
(defparameter *perception* nil)
(define-perception-function find-object
   :selection-function
        #'(lambda (finst-ob found-obs)
             (if finst-ob finst-ob
                 (nth (random (length found-obs)) found-obs)))
   :cost-function
        #'(lambda (finst-ob found-obs)
             (if finst-ob 0.05 (* 0.05 (length found-obs)))))
(define-buffer perception *perception*
          :plus-rhs find-object)
```

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Simple Object System - ACT-R/SOS

- Why bother?
  - Cognitive modelling and simulation development through successive refinements.
  - Minimize development time.
  - Make mechanisms of perception and motor action as explicit as possible in the model.
  - Learning ACT-R.
  - Link to ACT-R/PM as a device plugin.

```
(yet-another-task23
          isa         to-do-list-item
          list        to-do-list45
          description sos-as-an-ACT_R/PM-device-plugin)
```

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Simple Object System - ACT-R/SOS

- Who would be interested anyway?
  - People who want to learn ACT-R.
  - People who want to generate some hypothesis based on simulation results.
  - People who want to explore buffer computational properties.
  - People who want to use simulated users for usability testing.
  - People on the rush, they just want to get going.

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An example: Simulation of adaptive menus

- Motivation for the simulation
  - Are adaptive user interfaces usable?
  - Adaptive menus must be better.
- Adaptive menu options
  - Random: it says it all, never the same
  - Fixed: : it says it all, always the same
  - Stacked: last chosen goes on top, pushing down the rest
  - Frequency: Sorted based on frequency access
  - Activation: Sorted based on activation (frequency and time)

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Distribution of menu items

- A simulated subject sees 10 successive sets of 30 targets in the four adaptive menu conditions.
  - Random targets 1-30: ("t08" "t08" "t08" "t08" "t11" "t11" "t11" "t02" "t02" "t05")
  - Early targets 1-15: ("t07" "t07" "t07" "t07" "t10" "t10" "t10" "t01" "t01" "t04")
  - Late targets 16-30: ("t09" "t09" "t09" "t09" "t12" "t12" "t12" "t03" "t03" "t06")
- The model is reset for each menu condition.
- Parameters
  - Subsymbolic Computations, Randomness, Base level learning 0.5
- Productions.
  - get-new-target, retrieve-target-position (with success or failure), scan-menu-for-target (upward or downward), test-target-success, add-target-to-menu.

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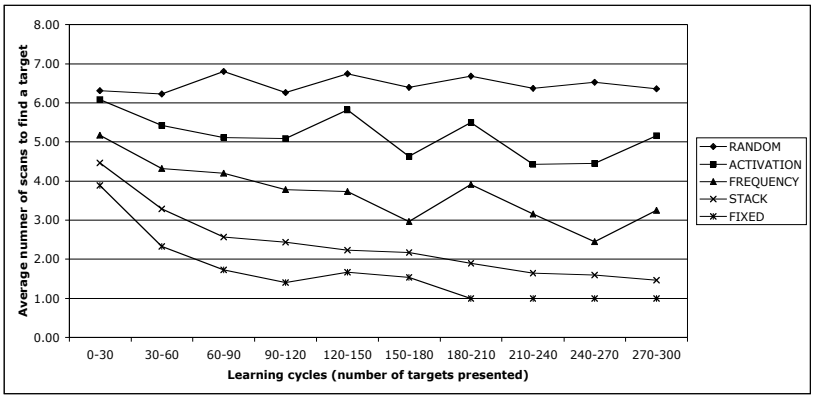
Simulation results



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Current research

- Usability testing with simulated users.
  - Robert West and COGNOS.
- Modelling media player usage while viewing video content related to self-performance of ensemble music playing.
  - MusicGrid: NAC, CRC, School boards, NRC Canada.
- Modelling quality of experience judgments and person-person interaction.
  - Advanced collaborative environments: NRC, CRC, NewMic.

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Thank you :)

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