

Optimising the ACT-R paired associate model using HTCondor

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18th April 2016

INTRODUCTION

This repository contains four key files: *paired.lisp* which contains the ACT-R model code taken from Unit 4 of the ACT-R tutorials, *actr-s-64.exe* the standalone ACT-R executable MS Windows, *paired.job* which is the HTCondor submit description file, and *new-random-state.lisp* which creates a random module to address certain issues with random number generation (discussed further below).

A detailed description of the paired associate task and the ACT-R model can be found in the documents *unit4.pdf* and *unit4_exp.pdf* from the tutorial unit (available in the repository). The paired associate model is an ideal example to use because it is relatively simple but requires the four parameters shown in Table 1 to be estimated (although, as with most models, the base-level learning parameter remains unchanged from its recommended value of 0.5).

Table 1: Optimal parameter values for ACT-R paired associate model

| Parameter | Label | Value |
|--------------------------------|-------|-------|
| Retrieval threshold | :rt | -2 |
| Latency factor | :lf | 0.4 |
| Instantaneous activation noise | :ans | 0.5 |
| Base-level learning rate | :bll | 0.5 |

To incorporate the optimisation procedure, the original model code has been modified to include three variables that will hold the values of the other parameters

```
(defvar *rt* 1.0)    ;; retrieval threshold
(defvar *lf* 1.0)    ;; latency factor
(defvar *ans* 1.0)   ;; activation noise
```

In the *diff-evol.lisp* file a function is defined to assign these values their values from a parameter vector

```
(defun assign-model-parameters (vec)
  (setf *rt* (aref vec 0))
  (setf *lf* (aref vec 1))
  (setf *ans* (aref vec 2)))
```

and then these are used to set the parameters in the model definition using ACT-R's *sgp-fct* function

```
(sgp-fct (list
  :rt *rt*      ;; retrieval threshold
  :lf *lf*      ;; latency factor
  :ans *ans*))  ;; activation noise
```

CREATING A SUBMIT DESCRIPTION FILE

RANDOM NUMBER GENERATION