



## using formalism in HCI

### from cognitive models to placemats

---

---

---

---

---

---

---

## what to model

- users
  - cognitive models
  - task models
- system
  - behaviour
  - architectural structure
- world
  - domain models



---

---

---

---

---

---

---

## notations

- graphical
  - digital watch STNs, Petri Nets, CTT, UML
- textual
  - production rules (used in UIMS and cog. models)
  - mathematical formulae, process algebras
- plain old sums
  - back of the envelope/placemat calculations

---

---

---

---

---

---

---

## placemat math - menu sizes

- on-screen menus
  - e.g. web site navigation
- how many items per screen?
- frequent misapplication of Miller 7±2
- but how many is right?

---

---

---

---

---

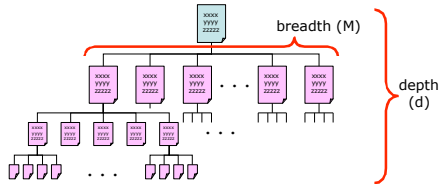
---

---

---

## placemat math (ii)

- menu tree has N items
- number of items per screen = M (breadth)
- depth (d) =  $\log_2(N) / \log_2(M)$




---

---

---

---

---

---

---

---

## placemat math (iii)

$T_{\text{total}}$  - time to find an item  
 $= (T_{\text{display}} + T_{\text{select}}) \times d$

$T_{\text{display}}$  - time to display screen (fixed)

$T_{\text{select}}$  - time to select menu item  
 $= A + B \log(M)$  (Fitts' Law)

$T_{\text{total}} = (T_{\text{display}} + A + B \log(M)) \times \log(N) / \log(M)$   
cancel

$= ( (T_{\text{display}} + A) \times \log(N) ) / \log(M) + B \log(N)$

---

---

---

---

---

---

---

---

## best menu size?

$$T_{\text{total}} = ( ( T_{\text{display}} + A ) \times \log(N) ) / \log(M) + B \log(N)$$

- larger M means shorter total time
- the bigger the better!

### N.B. other factors

- visual search (linear if not expert)
- error rates
- minimum selectable size
- effective organisation of menu items

---

---

---

---

---

---

---

---

## what to model

- users
  - cognitive models
  - task models



- system
  - behaviour
  - architectural structure



- world
  - domain models



---

---

---

---

---

---

---

---

## what to model

- users
  - cognitive models
  - task models

- system
  - behaviour
  - architectural structure



- world
  - domain models

---

---

---

---

---

---

---

---

## types of system model

---

- dialogue – main modes
  - full state definition
  - abstract interaction model
- } specific system
- generic issues

---

---

---

---

---

---

---