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)

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

$$T_{display} = \text{time to display screen (fixed)}$$
$$T_{select} = \text{time to select menu item}$$
$$= A + B \log(M) \quad \text{(Fitts’ Law)}$$

$$T_{total} = (T_{display} + A + B \log(M)) \times \frac{\log(N)}{\log(M)} \times \frac{\log(N)}{\log(M)}$$
$$= \left( (T_{display} + A) \times \log(N) \right) / \log(M) + B \log(N)$$
best menu size?

\[ T_{total} = \left( \frac{T_{display} + A \times \log(N)}{\log(M)} + B \log(N) \right) \]

- 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

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types of system model

- dialogue – main modes
- full state definition
- abstract interaction model

specific system

generic issues