Interaction and Perception

Taxonomy of Infoviz Tasks

- Overview: See overall patterns, trends
- Zoom: See subset
- Filter: See subset based on attributes
- Details on demand: See more about specific object
- Relate: See relationships, compare values
- History: Keep track of actions and insights
- Extract: Mark and capture specific data

Visual Information Seeking Mantra

Overview first,
zoom and filter,
details on demand.

—Ben Shneiderman

Three Types of Feedback Loops

- Data selection and manipulation
  - Most important for interactive visualization
- Exploration and navigation
- Problem solving

Reaction times

Simple Reaction Times

Optimal (finger at the ready)

- ~130 ms (Kohlberg, 1971)

Infrequent (still at the ready)

- Up to 700 ms (Warrick et al., 1964)

Choice Reaction Times

Hick-Hyman law:

Reaction Time = $a + b\log_2(C)$

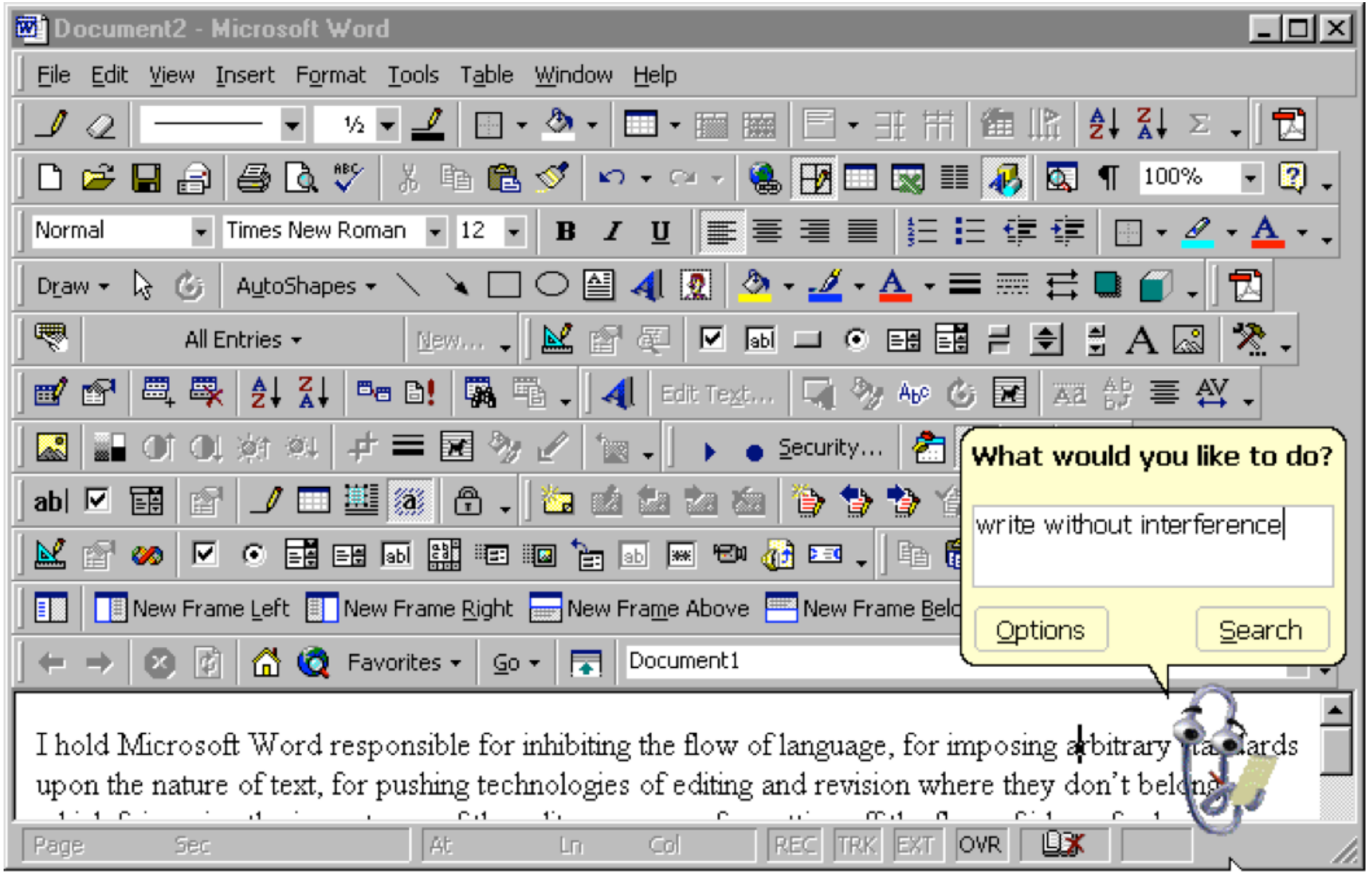
Where C = number of choices, and a and b are constants. $\log_2(C)$ is information processed by humans in bits.

Choice Reaction Times

Hick-Hyman law:

Dealing with choice is expensive

Minimize visual noise


Document2 - Microsoft Word
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I hold Microsoft Word responsible for inhibiting the flow of language, for imposing arbitrary standards upon the nature of text, for pushing technologies of editing and revision where they don't belong
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System Response Times

Three Thresholds

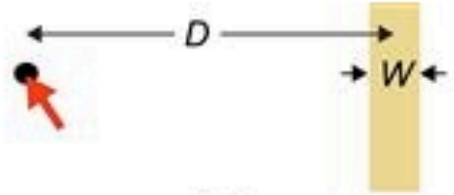
- 0.1 s for visual continuity, feels like real time:

  animations, sliders
- 1 s for reasonable system response:

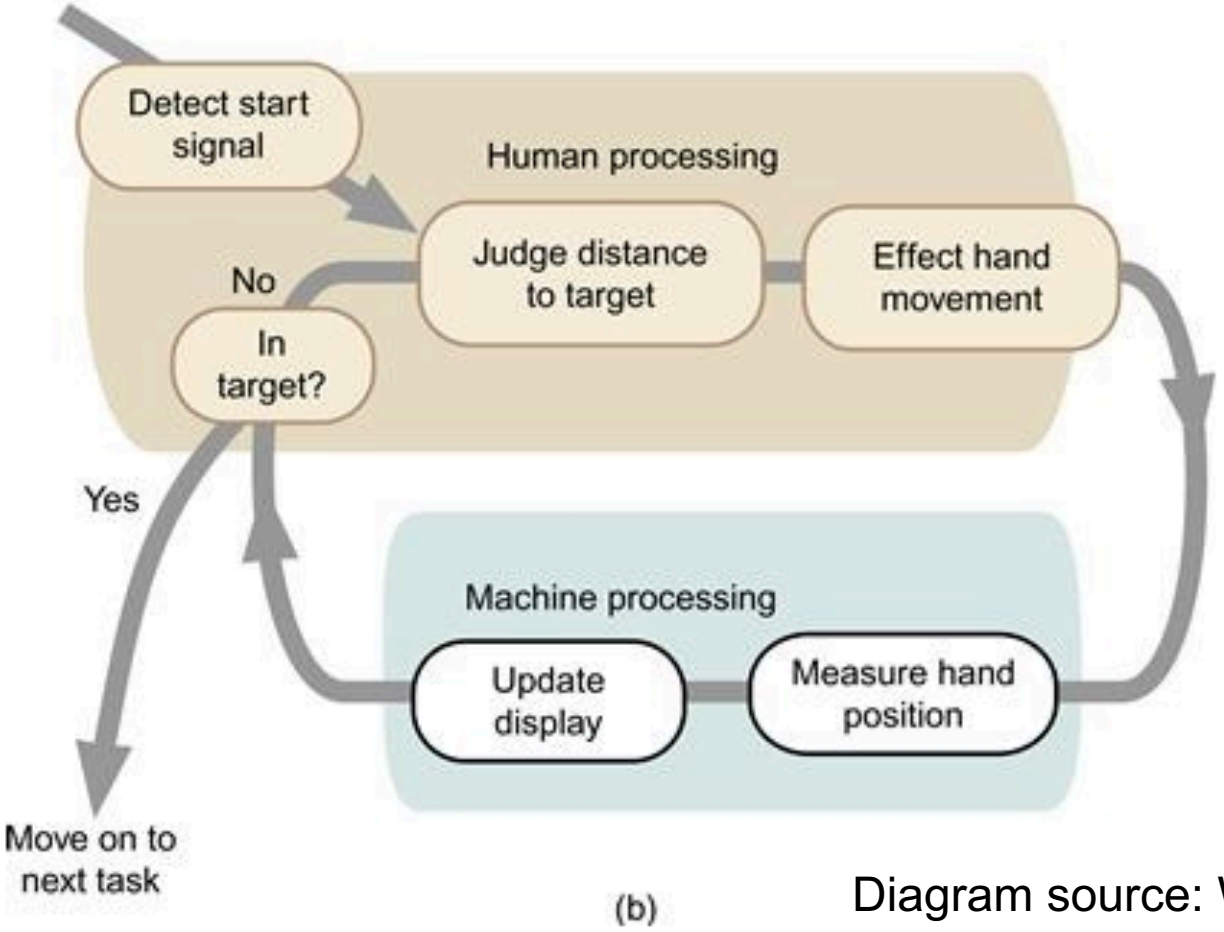
  pause in conversation
- 10 s for process expected to be slow:

  cognitive response

  threshold for suspecting system is broken



(a)



(b)

Diagram source: Ware, 2010

Fitts's Law

$$\text{Selection time} = a + b \log_2(D/W + 1)$$

- D = distance to target
- W = width of target
- $\log_2(D/W + 1)$ is index of difficulty (in bits)
- $1/b$ = index of performance (in bits/s), roughly constant, typically ~4

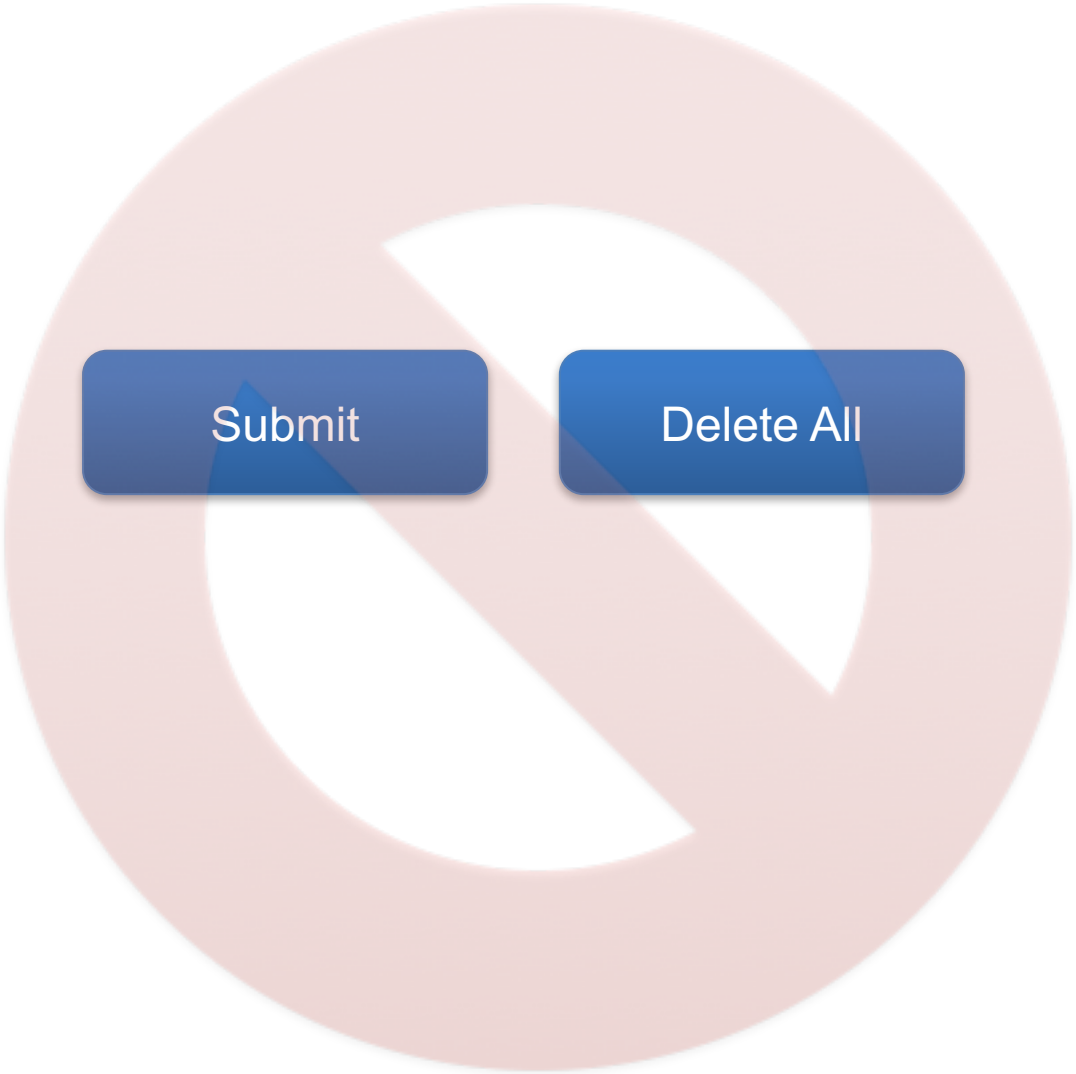
Fitts's Law

- Time increases as distance to target increases
- Time increases as width of target gets smaller

Fitts's Law

- Keep controls that you want users to easily move between near each other.
- Make click targets large.
- Keep controls that users should use rarely away from commonly used controls.

Fitts's Law



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