Human-Information Interaction

Scott Klemmer

TAs: Marcello Bastea-Forte, Joel Brandt, Neil Patel, Leslie Wu, Mike Cammarano

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Questions about the Project
Engelbart Video
Form Me to You
<table>
<thead>
<tr>
<th>Time Scale</th>
<th>Category</th>
<th>Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>$10^7$ (months)</td>
<td>SOCIAL</td>
<td>Social Behavior</td>
</tr>
<tr>
<td>$10^6$ (weeks)</td>
<td></td>
<td></td>
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<tr>
<td>$10^5$ (days)</td>
<td></td>
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<tr>
<td>$10^4$ (hours)</td>
<td>RATIONAL</td>
<td>Adaptive Behavior</td>
</tr>
<tr>
<td>$10^3$</td>
<td></td>
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<tr>
<td>$10^2$ (minutes)</td>
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<tr>
<td>$10^1$</td>
<td>COGNITIVE</td>
<td>Immediate Behavior</td>
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<tr>
<td>$10^0$ (seconds)</td>
<td></td>
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<tr>
<td>$10^{-1}$</td>
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<td></td>
</tr>
<tr>
<td>$10^{-2}$</td>
<td>BIOLOGICAL</td>
<td></td>
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<tr>
<td>$10^{-3}$ (msec)</td>
<td></td>
<td></td>
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<tr>
<td>$10^{-4}$</td>
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</tbody>
</table>
HUMAN INFORMATION INTERACTION
GOMS

- Routine cognitive skill
- Well-known path
Information Search

- Problem solving
- Heuristic search
- Exponential if don’t know what to do
Optimal Foraging Theory Information Foraging Theory

OPTIMALITY THEORY

Max $\left[ \frac{\text{Energy}}{\text{Time}} \right]$ Max $\left[ \frac{\text{Useful info}}{\text{Time}} \right]$
Information Foraging Theory:

Microeconomics of information access.

People are information rate maximizers of benefits/costs. Information has a cost structure.

\[
R = \frac{G}{T_B + T_W} = \frac{Gain}{T_{Between-patch} + T_{Within-patch}}
\]
INFORMATION PATCHES

e.g. desk piles, Alta vista search list

unlike animals foraging for food, humans can do patch construction
We’ll stay in a patch longer...

- When a patch is highly profitable
- As distance between patches increases
- When the environment as a whole is less profitable
WITHIN-PATCH ENRICHMENT: INFORMATION SCENT

perception of value and cost of a path to a source based on proximal cues
Relevance-Enhanced Thumbnails

- Within-patch enrichment
- Emphasize text that is relevant to query
- Text callouts
PHASE TRANSITION IN NAVIGATION COSTS AS FUNCTION OF INFORMATION SCENT

Notes: Average branching factor = 10
Depth = 10
Designing for the Scent of Information

Jarad Spool, UIE
MACHINE MODELING OF INFORMATION SCENT

Information Goal

- new
- medical
- treatments
- procedures
- cell
- patient
- dose
- beam

Link Text
PREDICTION OF LINK CHOICE

(a) ParcWeb

(b) Yahoo

Observed frequency

Predicted frequency

R² = 0.72

R² = 0.90
USER FLOW MODEL

User need (vector of goal concepts)

Determine relevance of documents

Calculate Pr(Link Choice) for each page

Start users at page

Flow users through the network

Examine user patterns
SENSE MAKING TASKS

- Characteristics
  - Massive amounts of data
  - Ill-structured task
  - Organization, interpretation, insight needed
  - Output, decision, solution required
- Examples
  - Understanding a health problem and making a medical decision
  - Buying a new laptop
  - Weather forecasting
  - Producing an intelligence report
Importance of Sensemaking

- 75% of “significant tasks” on the Web are more than simple “finding” of information (Morrison et al., 2001)
  - Understanding a topic (e.g., about health)
  - Comparing/choosing products

- Information retrieval does not support these tasks (Bhavnani et al., 2002)
  - E.g., Estimated that one must visit 25 Web pages in order to read about 12 basic concepts about skin cancer
Credits & Further Reading

- This lecture draws heavily on Stu Card’s slides on HII
- Peter Pirolli, Information Foraging