Just-in-Time Information

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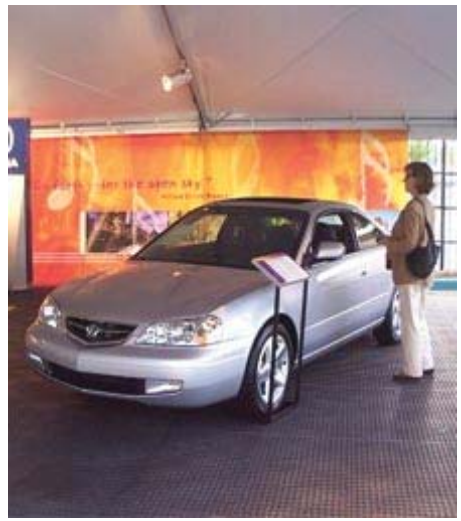
What is “Just-in-time Information”?

Proactively offering a user information that is highly relevant to what s/he is currently focused on



Why offer Just-in-time Information?

To promote:

- Insight
- Inspiration
- Interpersonal connections

...without interrupting the user's activities

How offer Just-in-time Information?

1. Model user interests/preferences
2. Sense current context of user
3. Compute information relevant to the context and user profile (recommendation algorithm)
4. Present information in subtle, non-intrusive way

Just-in-time Information for the Desktop User

Examples:

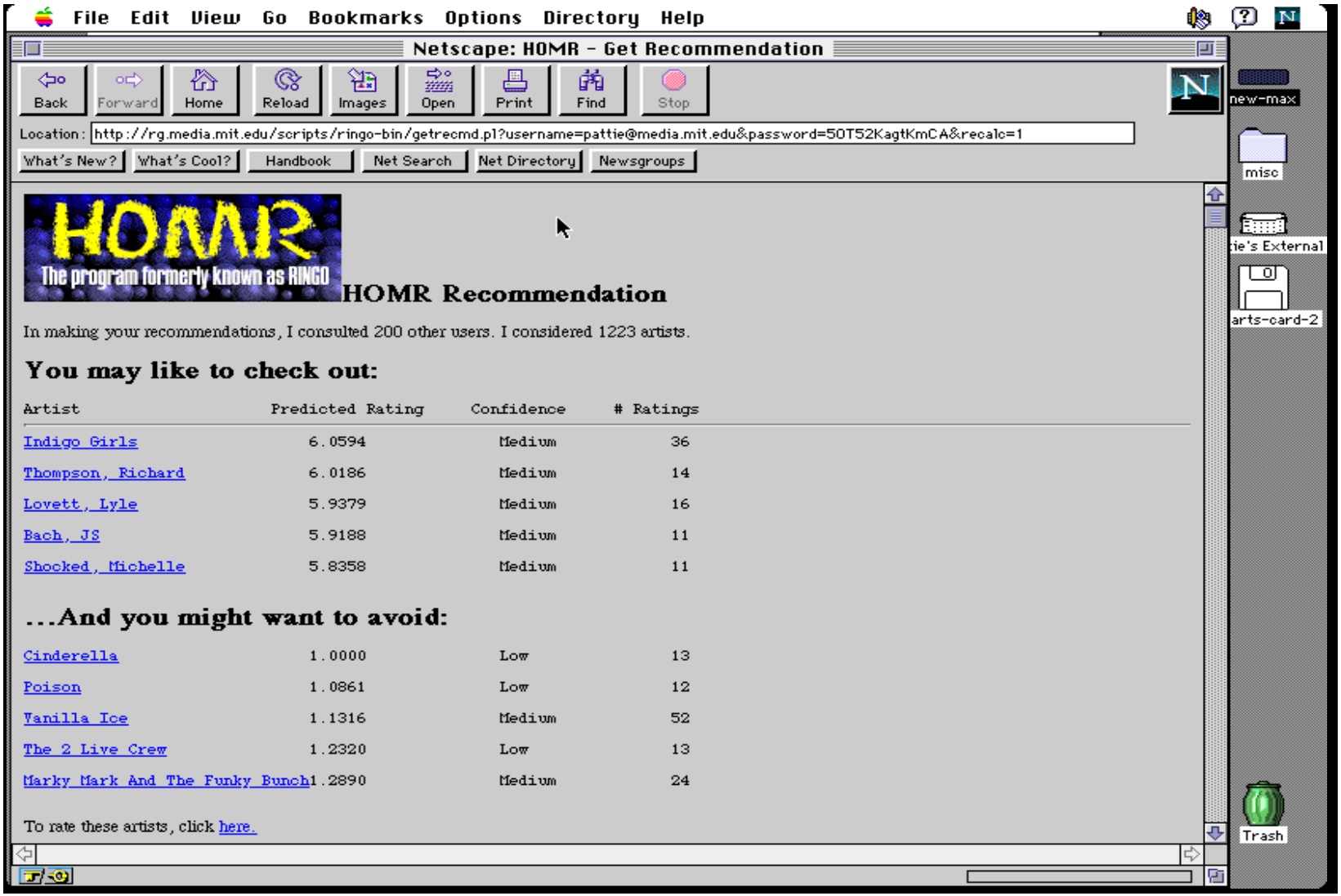
- Recommender systems
  - Based on patterns identified in user's behavior
  - Based on patterns identified among users
- Remembrance systems
- Mentoring systems
- Matchmaking systems
- ...

Letizia: A Recommender System for Webpages

- Henry Lieberman 1998

"Collaborative Filtering" recommenders

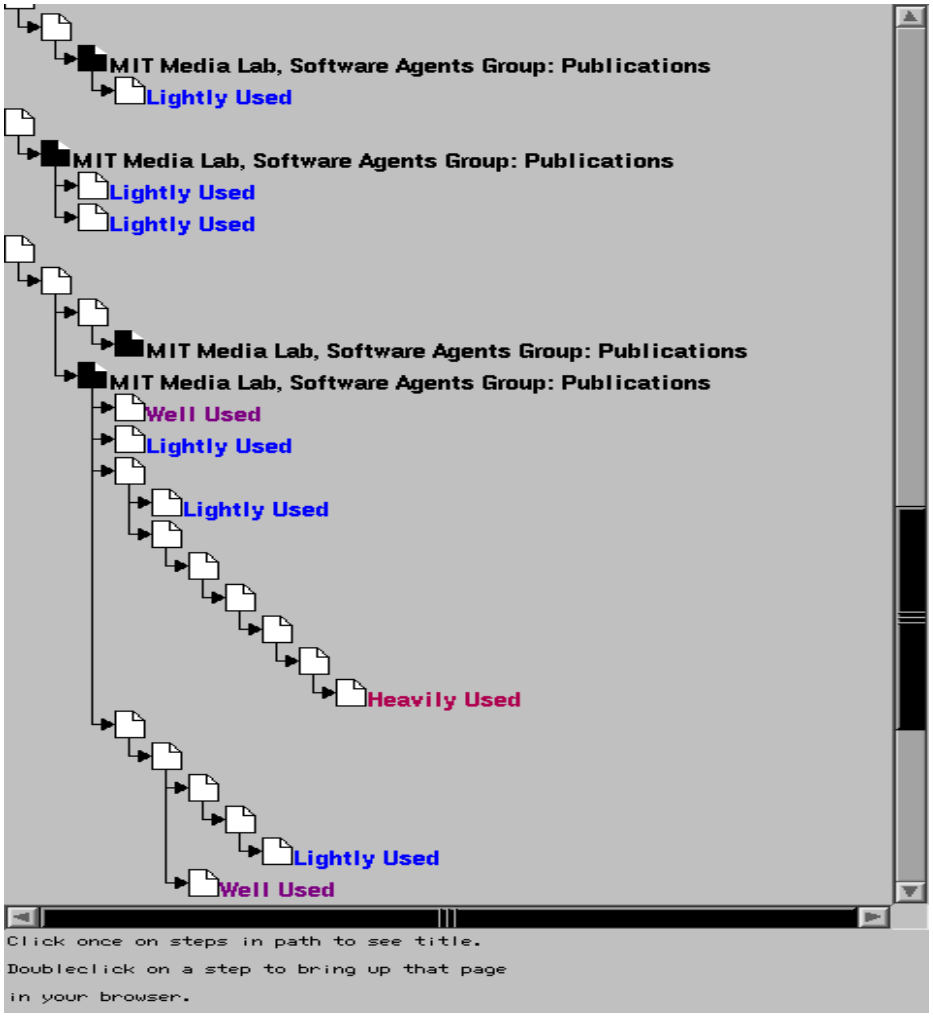
- Upendra Shardanand, Max Metral 2004



Firefly (Barnes&Noble, Launch, etc, 94)

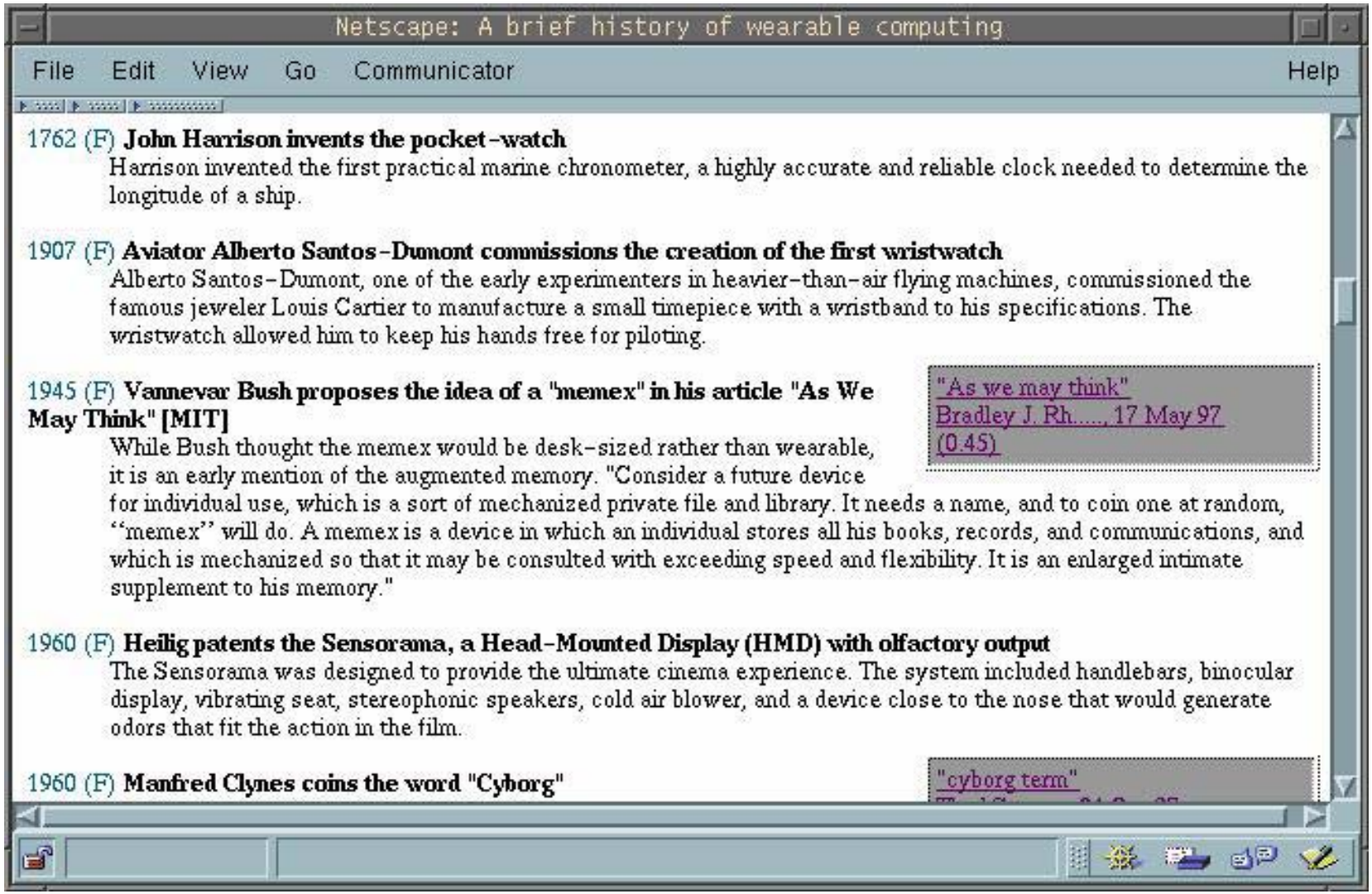
Footprints: Visualizing popular paths on a website

- Alan Wexelblat 1999



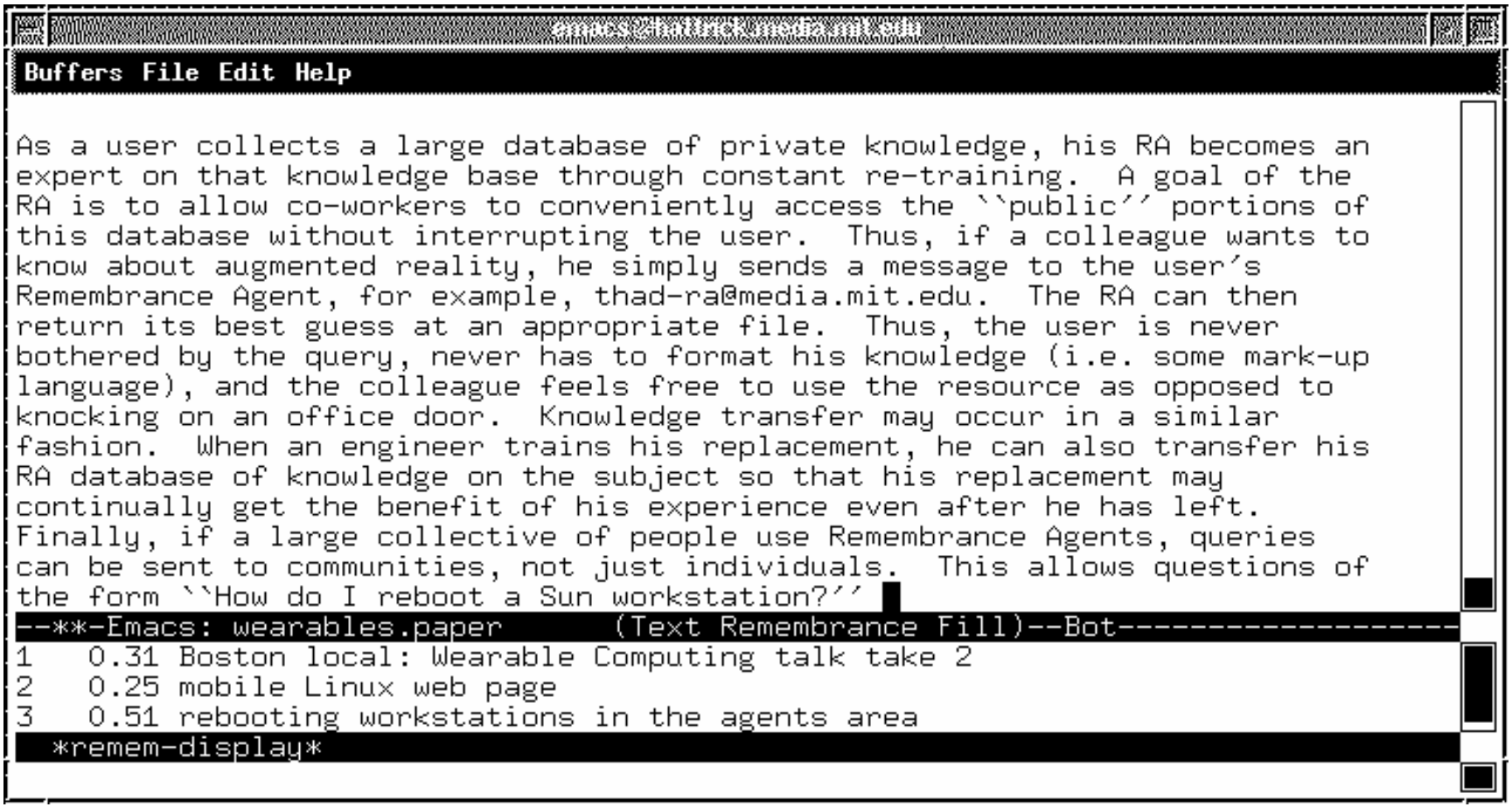
Remembrance Agent (Web version)

- Bradley Rhodes 1996



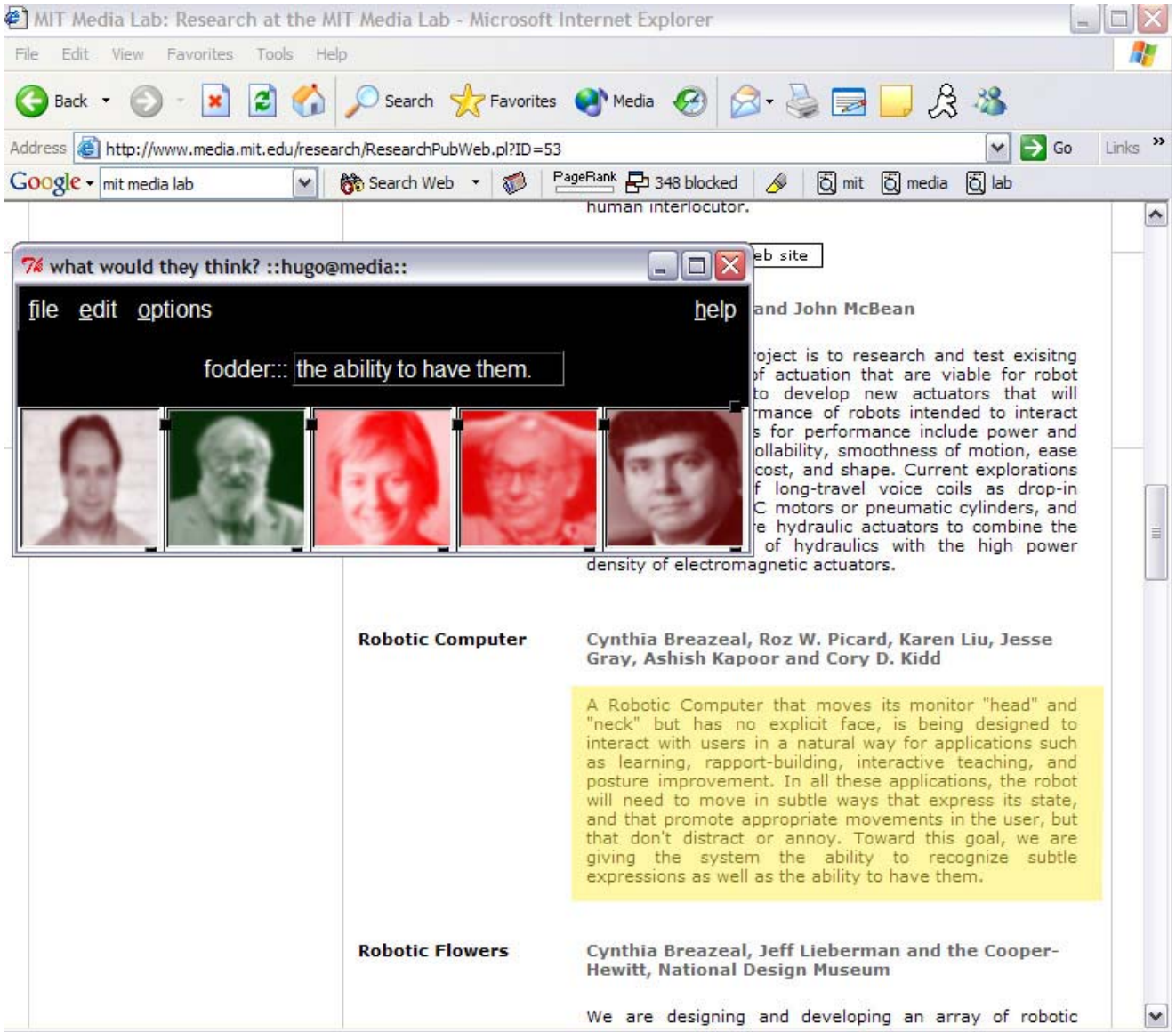
Remembrance Agent (Emacs version)

– Bradley Rhodes 1996



"What would they think?" Virtual Mentors

- Hugo Liu 2004



Uses NLP and "attitude processing" to show what some mentors have to say about the topic the user is focused on

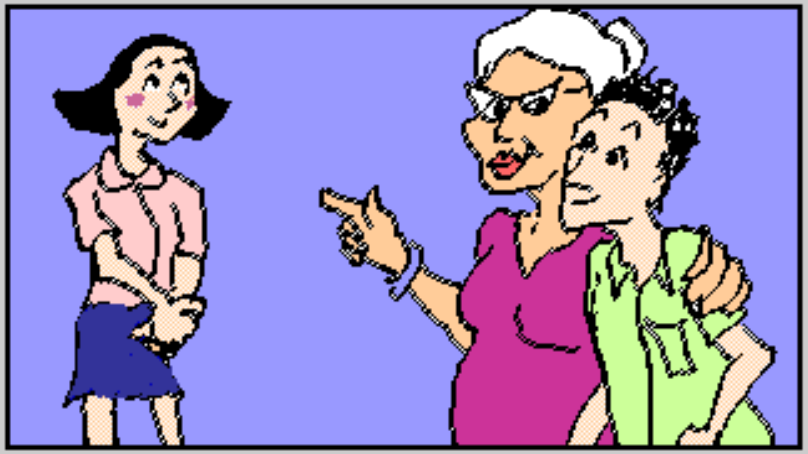
Yenta Matchmaking System

- Leonard Foner 1999

Current cluster memberships

Cluster number	Top words	Number of documents	Visibility			Status
			ignore	careful	carefree	
2	agent, paper, conference, author	11	○	○	◉	Searching (tried for 4 hours)
3	one-time-pad, shipping, contract	24	○	○	◉	Found and joined: (37 known, ~400 estimated members)

Submit Preferences



I've got someone you might want to meet!

Introduce me | Open a commlink

ID	7A 34 56 D1 8C 91 EA 0A 30 DC D3 2A 52 E8 09 FA
Handle	Blueshell
Known age	At least 2 years 3 months 1 week
Attestations	I am a SkrodeRider. *(3 signatories)* My Skrode is of the traditional design. ***(no signatories!)***
Who initiated	We did

Cluster contents

Cluster number	Top words	Number of documents	Visibility		
			ignore	careful	carefree
3	one-time-pad, shipping, contract	24	○	○	◉

Submit Preferences

Just-in-time Information While on the Go

State of the art in mobile computing:

- Too many clicks
- Not enough screen space

Wearable *Remembrance Agent*

– Bradley Rhodes 1998

User receives
context-specific reminders
of relevant information
(based on location,
day of week, time of day,
other people present,
conversation topics)

Impulse: Automated Information Exchange with Entities in the Physical Vicinity

- Joan Morris & Jim Youll 2000

The Coop Bookstore
out of stock

Harvard Univ. Bookstore
lowest price $55

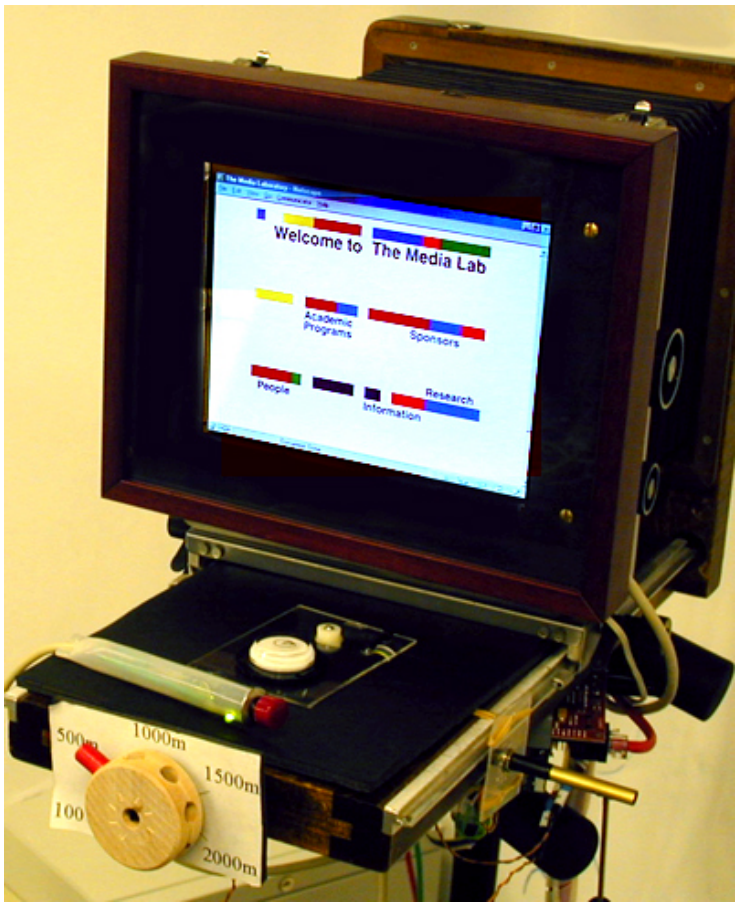
Brad's PDA

Wordsworth Bookstore
lowest price $45

beep!

Periscope: A Browser for the Real World

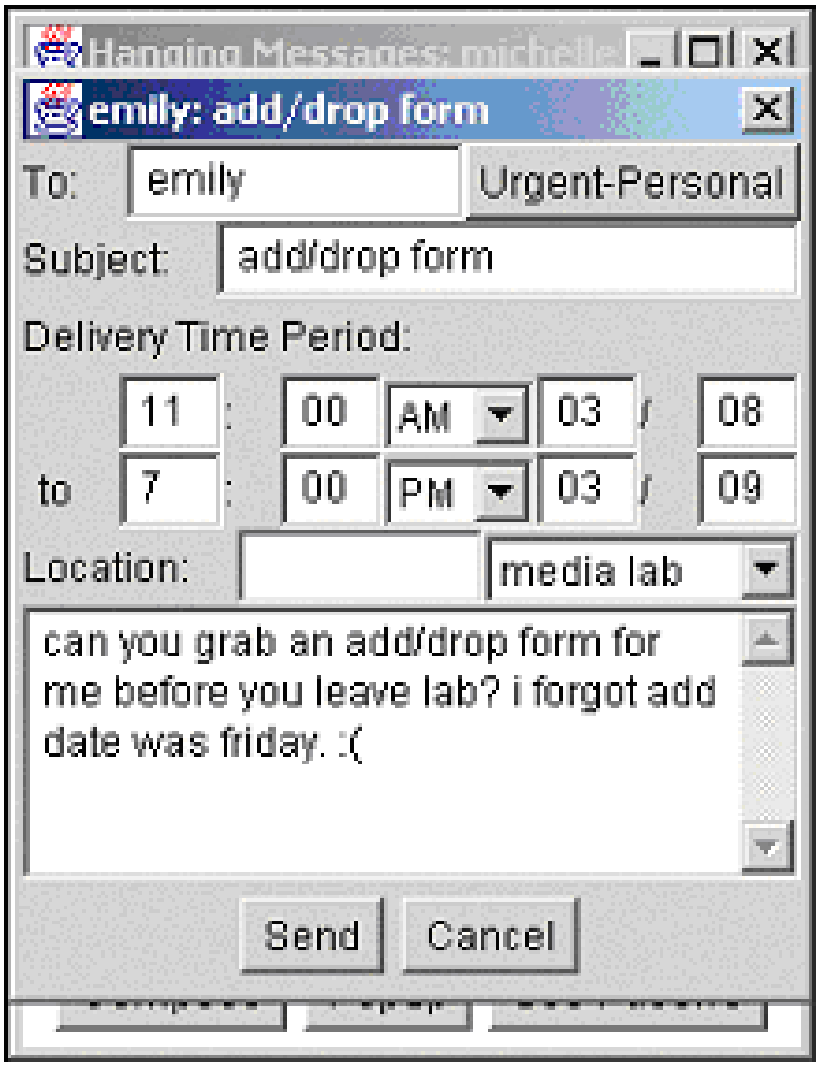
– Jim Youll 2001



Camera with compass
and range finder shows
Web pages about the location the user/camera is currently focused on

Hanging Messages:
A platform for Annotating the physical world

- Emily Chang 2000



A PDA device with GPS allows users to leave & receive location-based and thread-based messages from others

Ether Threads: location-based messaging using a cell phone

- Bradford Lassey 2004

Blue-tooth and GPS data trigger location-based messages relevant to the user and the threads s/he is interested in

Photowhere:
Automated annotation of photographs

- Dan Relihan & Bradford Lassey 2004

- Cell phone communicates with GPS device via bluetooth to record location of picture taken
- Phone interfaces to metacarta.com server to find URLs about that location
- Extracts and offers keywords for the picture taken

ReachMedia: On-the-move Interaction with Augmented Objects

– Assaf Feldman, Sajid Sadi 2005

- Wireless RFID reader wristband reads tags in objects held by user
- Touching an object results in a menu of services and information:
  - Order a copy
  - Read reviews
  - Leave a message
  - Retrieve messages
  - Do a keyword search
  - ...

ReachMedia: On-the-move interaction with Augmented Objects

– Assaf Feldman, Sajid Sadi 2005

- Wireless and mobile
- Natural and seamless, hands-free and eyes-free interaction option:
  - Gesture input (accelerometers on wristband)
  - Audio output
- Keypad & screen-based interaction option

ReachMedia: Video

Peripheral visual interface for ReachMedia Platform

- Enrico Costanza 2005

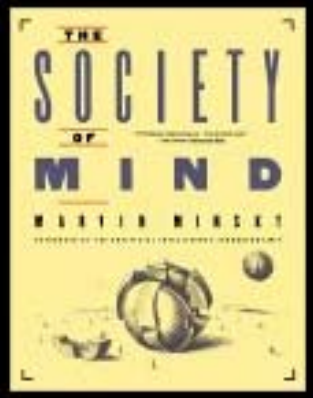
Wearable peripheral display
(using tiny LEDs)
embedded in a pair of eyeglasses
delivers notification cues
in a private, subtle and
non-obtrusive way

Ambient Semantics: Personalizing information presented on the ReachMedia Platform

- Hugo Liu 2004

E.g. When user picks up a book with ReachMedia wristband, user's cell pone conveys:

- A prediction of how much user will like the book
- Which passages are relevant to user's interests
- How it relates to other books recently read
- Reviews by respected friends/editors
- Which friends loved/hated it
- …



I see that you are looking at
SOCIETY OF MIND.

Your friends are crazy about this book!
Barbara Barry and Henry Lieberman say it's
one of their favorites!

People on the web who have read
SOCIETY OF MIND have said some things
about it:

"In this book Minsky tries, as have
many scientists before him, to explain what
seems unexplainable. Even though in present day,
many people believe in science over magic,

Hugo, please meet Dave Merrill!

Dave and you both love some of
the same sports, such as snowboarding.

Both of you know Nathan Eagle, Elisabeth
Sylvan, Cory Kidd, Cameron Marlow, Joanie Morris
DiMicco!

Hugo, you might also be interested that
Dave Merrill likes neal stephenson, student, lifelong
learners, lifelong learners, outdoor enthusiasts, domestic
gods
& goddesses, surfing, polo, water polo, cake,
eagles, thai, mexican, musicians, san francisco lovers,
europhiles, linguists, futurama, the simpsons, run lola

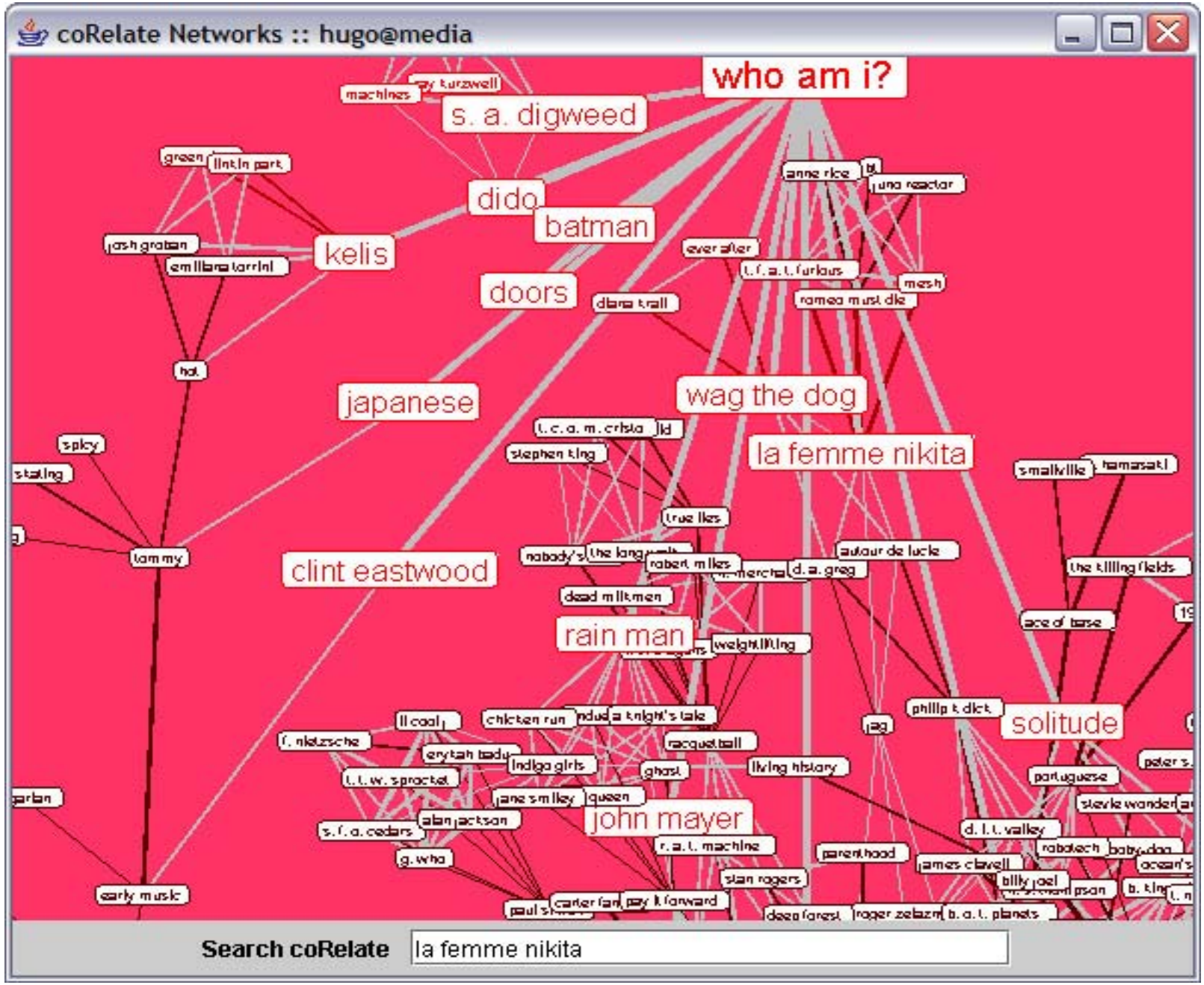
Logged in as Hugo Liu. Fri May 13 06:12:11 2005

Ambient Semantics: Personalizing Just-in-time Information

- Hugo Liu 2004

- Uses webmining to build:
  - User profiles (orkut, friendster, linked-in, homepages)
  - Object profiles (amazon, google)
- Uses webmining to build *InterestMap*
  - Map of correlations between interests as mined from tens of thousands of homepages
  - Is used to compute distance/relevance
- Presents information about object/person that ranks high in relevance

InterestMap – Hugo Liu 2004



Invisible Media: Sensing & responding to visual focus of attention

- David Merrill 2005

-User wears earbud with IR emitter/receiver

- Augmented objects sense the user's focus of attention

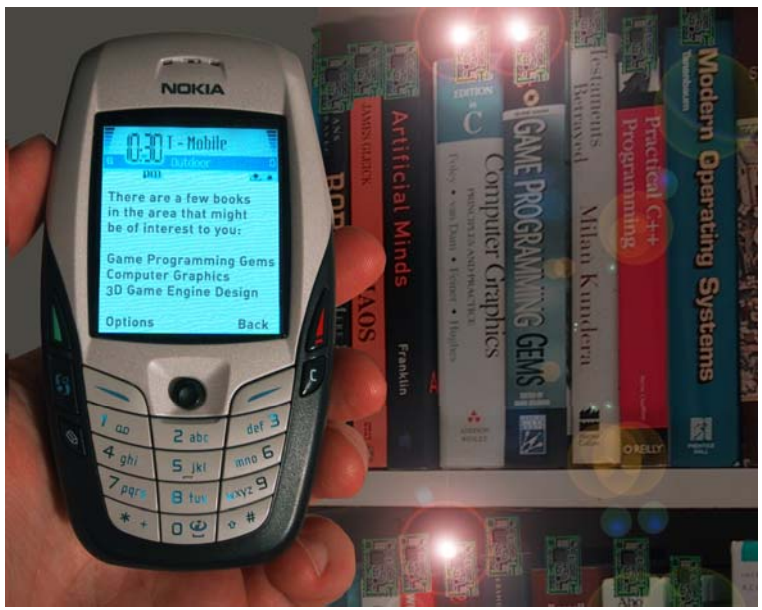
- Relevant information is presented in audio format

- Speech input

Object Awareness: Drawing the person's attention to objects of interest in the immediate environment

- David Gatenby 2005

- Bluetooth-enabled cell phone communicates user's interests to augmented objects in user's vicinity
- Relevant objects can draw the user's attention by blinking their LED's



Functions:
-Finding an object
-Keyword search
-Recommendations
-Similarities
-…

Other Projects: Augmenting Everyday Objects with Specific Functionalities

- Responsive portraits
- Responsive mirrors
- Augmented pillows
- Augmented doors, windows, walls, clocks, ...

CASY: Responsive Portraits Support Staying in Touch

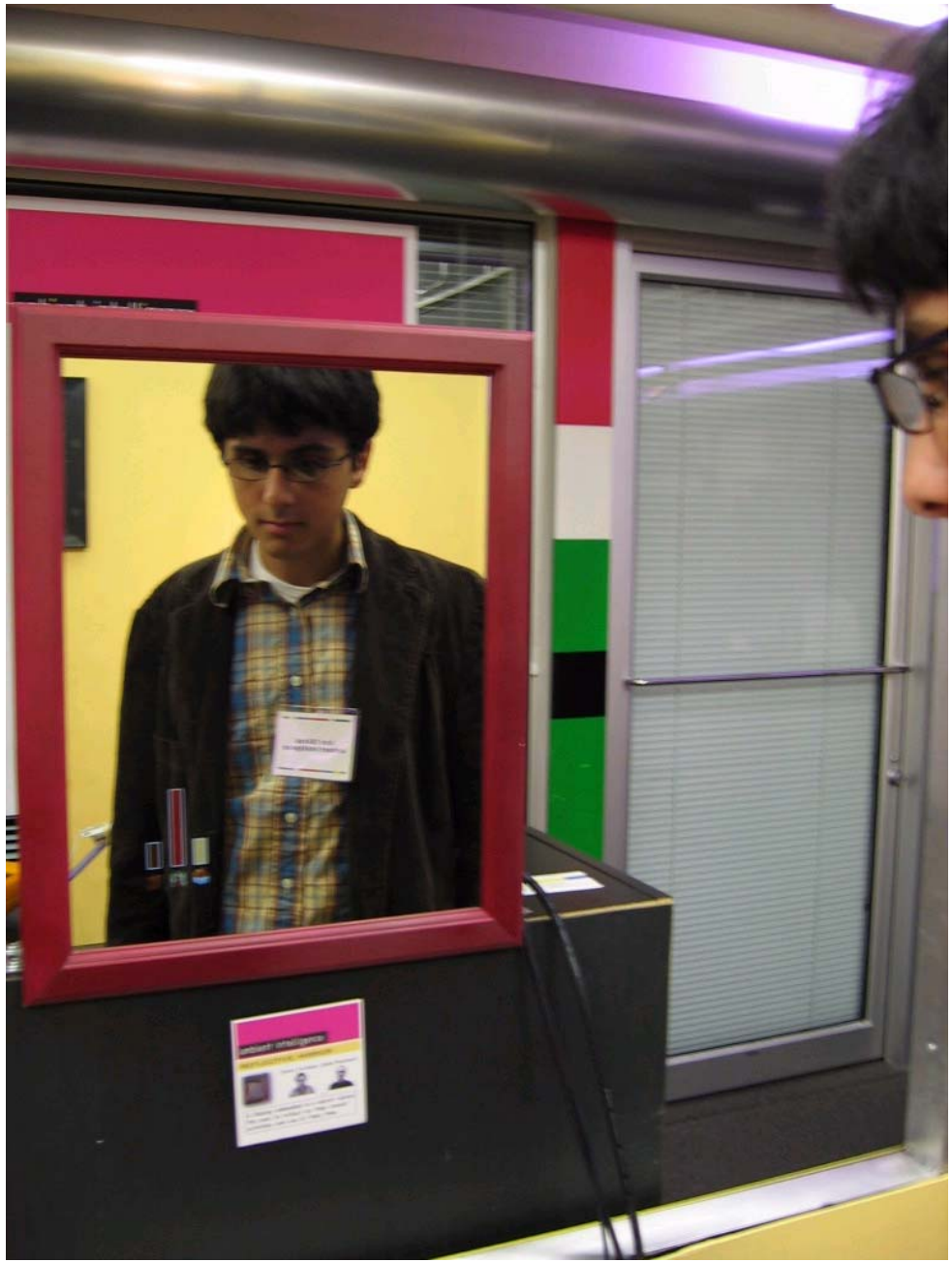
- Orit Zuckerman 2005

- Context-based delivery of audio/video messages on PDA
- Ex:
  - Grandparent records ‘good morning’ and ‘good night’ video snippets
  - Grandchild is shown the snippet in-context of going to sleep or waking up

Reflective Mirror

- David Bouchard,
  Enrico Costanza 2005

Bathroom mirror allows person to reflect on their recent behavior.
Uses half-way mirror & hidden LCD screen and camera.

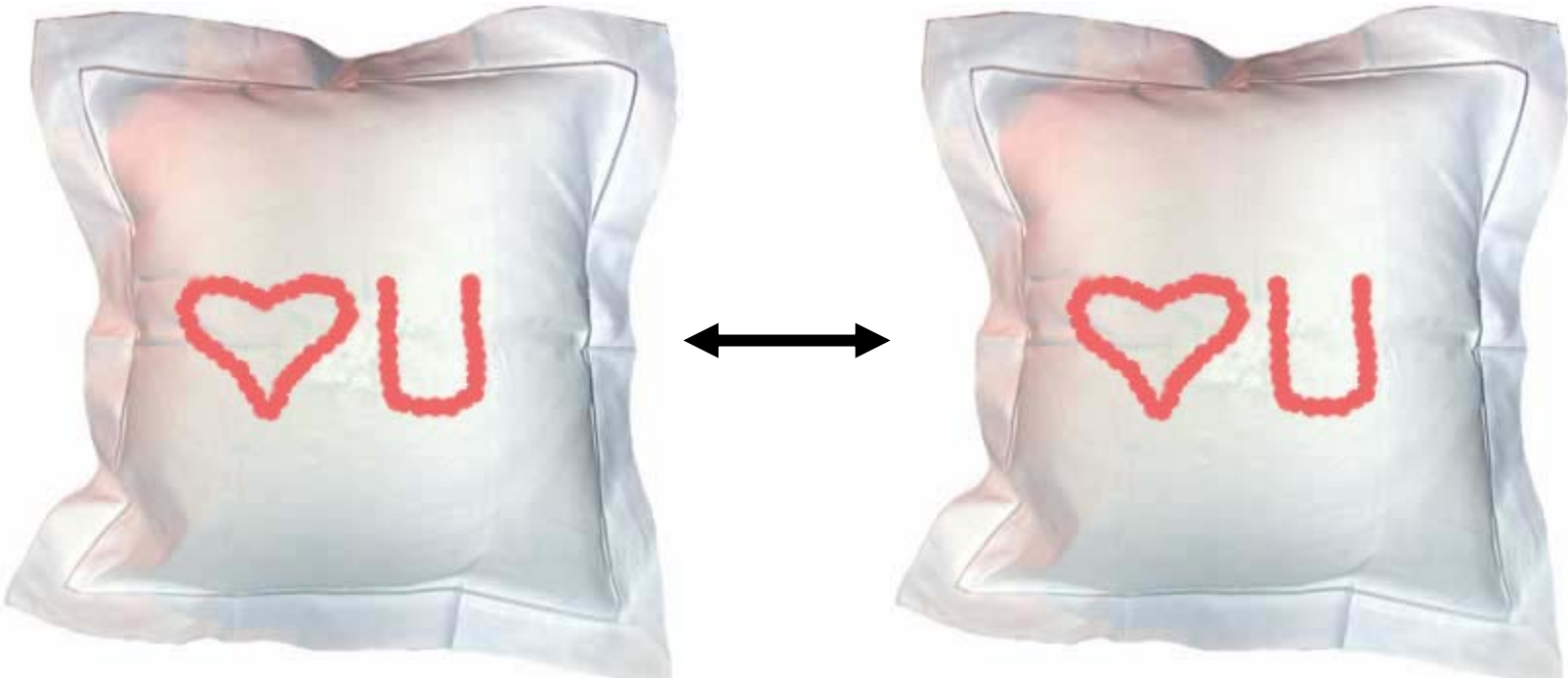


Identity Mirror – Hugo Liu 2005

Abstracted “mirror” reflects person’s “identity neighborhood” as gleaned from user’s homepage and public profiles pages

Pillow Talk

- Amir Bakhtiar, Sajid Sadi & David Merrill 2005



A pair of networked touch-sensitive pillows with crude LED displays support synchronous, low-tech messaging

Just-in-time Information: Technical Challenges

Just-in-time information "works" if it is:

- likely to be relevant to the user
  - Challenges in:
    - » *user profiling*
    - » *detecting context of user*
    - » *recommendation algorithms (personalization, contextualization)*
- offered unobtrusively
  - Challenges in:
    - » *Subtle interfaces*
- requires minimal user effort to access
  - Challenges in:
    - » *Natural, "on-the-move" interfaces*

Challenge: User Modeling/Profiling

Approaches:

- Entered explicitly by user
  - *Form filling, choosing options in menu*
- Gathered implicitly by system
  - *Data mining of observed user behavior*
  - *Data mining of personal texts*
    - *Eg homepages, profiles on social networking sites, files*
- Combination of approaches

Challenge: Detecting User Context

- Detect who, what, where, when
  - Offer info relevant to current focus of user
- Approaches:
  - On desktop:
    - *Sense user's actions in different applications*
  - Offline:
    - *Sensors in the environment & on user*
- May involve use of background knowledge & inferencing
  - E.g. shaking someone's hand first time
    - *Background info, creating connections, breaking the ice*
  - versus shaking someone's hand nth time
    - *Reminders of previous conversations online/offline*

Challenge: Recommender Systems

Range of approaches based on:

- Cases/prototypes
- Features of the content (patterns in content)
- Collaborative Filtering (patterns among users)
- Other approaches

Challenge: Subtle, Natural Interfaces

- Goals:
  - Avoid change of focus/interruption
  - Recommendations are proactive but easily ignorable
  - Avoid additional gear/devices/windows
  - Support “on-the-move” access to details
- Approaches:
  1. Either offer suggestions using secondary I/O modalities of user
     Eg peripheral vision, audio, gestures, etc
  2. Or provide seamless integration of recommendations in existing interface in minimal way
- Offer “ramping” interface
  - Present minimal “hints”
  - User controls access to more information/detail

Other User Interface Lessons Learned

- Transparency is key
  => trust
- Avoid dependence/“tunnel vision” problem
- Protect user’s privacy

Summary

Radically rethink user-information interaction by:

- Proactively offering “just-in-time” information
- Highly relevant to a unique user and their current focus of attention
- In non-disruptive, easily accessible way

For More Information

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