ULTRABLOGGING
Light of Day
or
Fantasy/Voyeurism/Big Brother

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What Seems Inevitable

- Personal/Public Information Upload
  - Text
  - Photo
  - Voice/Video
- GPS (location-aware services)
- Sharing & Tagging (news atoms)
- Cited Commentary (news molecules)
- Lurching toward real time
VISION & QUESTIONS

Liberty, Justice & E Pluribus Unum?

OR

Technological Fantasy?
Voyeurism?
Big Brother?
Can It Be Done?

- Memory Capacity
  - Requirements?
  - Possible?

- Communications Capacity
  - Requirements?
  - Possible?
How Much Information?

Cell Phone Call: 10 kbps

MPEG Music: 5MB = 5 minutes → 133 Kbps

DVD Video: 5GB = 2 hours → 5.55 Mbps
Personal Memory

Cell Phones: 10 Kbps × 1 day → ≈ 900 Mb

MPEG Music: 1.33 Kbps × 1 day → ≈ 10 Gb

DVD Video: 5.55 Mbps × 1 day → ≈ 500 Gb
NY Metro Zeitgeist

(10 million folks)

Cell Phones: 100 Gbps $\times$ 1 day $\rightarrow \approx$ 9 Pb (petabit)

MPEG Music: 1.33 Tbps $\times$ 1 day $\rightarrow \approx$ 100 Pb

DVD Video: 55.5 Tbps $\times$ 1 day $\rightarrow \approx$ 5 Eb (exabit)
Theoretically Maximum Data Rates

**SHANNON**

\[ C = W \log_2 \left( \frac{P_r}{N_0 W} + 1 \right) \]

- \( P_r = P A_r / R^\alpha \) (propagation constant \( \alpha \))
- \( N_0 = kT = 1.38 \times 10^{-23} \times 300 = 4.14 \times 10^{-21} \text{Watts/Hz} \)
- Moderate handheld radiated power: \( P = 1W \).
- Typical Range (cellular): \( 100m \)
- Typical aperture (uplink): \( 1m^2 \).
- Maximum data rate with \( W = 100\text{MHz} \) (one of the U-NII bands):
  - \( \approx 1.9 \text{ Gbps} \) (\( \alpha = 2 \))
  - \( \approx 1 \text{ Gbps} \) (\( \alpha = 4 \))
Wireless Serpents

- **Mutual interference:**
  - Spatial reuse: factor of $\approx 10$ penalty
  - Buying more spectrum is *expensive*

- **Fading** can attenuate signals by many factors of 10
  - Non-line-of-sight can increase propagation loss by lots
  - Destructive interference can create *nulls*
  - It all varies *randomly*
Technological Bows of Burning Gold

- **MIMO:**
  - exploits fading environment (effectively “increases” W)

- **Transceiver Cooperation:**
  - mitigates mutual interference
  - increases reliability
  - *Network Information Theory* still a gray area

**CAVEATS:** lots of them, but ...
PUNCHLINE: Theory Says

Many hundreds of simultaneous 5 Mbps streams within few-hundred-$m^2$ “cells” of a wireless network not unthinkable.

BUT who’s gonna build the necessary (expensive) infrastructure?
On the Cheap: 802.11 meshes

- Grids of disparately owned 802.11 base stations
- Periodic fixed network access points

- Lots of fun research questions
- Divide rates by 10 (interference/reuse)
- Not for high bandwidth apps
Common Exotica: inscribed matter channels

- Practical real time “backhaul”: doable but tough

- Tolerate delay?
  - Can you even index large streams for search in real time?
  - How many users need true real time?

- Try a FedEx (or Netflix) approach
  - Store information on memory chits
  - Drop off (or toss) periodically at local repositories for upload

- **SURPRISE:** Can be incredibly more energy-efficient than radio!
IN FACT: ET Might Write, Not Radiate

But that’s a story for another day...
Technology Push vs. Application Pull

- Internet was a (publicly subsidized) beast of *accretion*
- Yahoo, Google, etc. came LATER
- How might an ultrablogging society *evolve*?
  - What are the “killer apps”?
  - Where does it all start?
START WAVING HANDS VIGOROUSLY
iPod Revolution

- 60GB iPod
  - 12 2-hour DVDs
  - 12000 5-minute songs
  - 5000 days cell-quality voice
- 14 million sold Q4 2005
- 43 million projected for 2006
- Add mic, camera, GPS, wireless link & keyboard?
iPod Convergence

- Text-messaging
- IM
- Cell phone
- Stored/streamed media consumption
- Event tagging & upload
- Micro-news/social Pod-casting
• Memex
• Domestic Discord Damper
• Little need for verifiability
• Useful Tags:
  – Date/Time, Place, Actors, Transcript (A & V)
• Key Issues:
  – Big Brother *in utero*, Voyeurism seem manageable
• Selected sharing of personal info

• What IS Truth?
  – Objective Correlates
  – What the majority agrees is truth?
  – Truth “certificates”

• Voyeurism, Cyberstalkers, Nascent Big Brother

• Key Issues:
  – Indexing, verifiability, security, info provenance-tracking
• Global A/V-information economy
  – Tier 0: Primary sources
  – Tier 1: Aggregators
  – Tier $N$: News Services, Public Safety, Government

• Directed requests for (real time?) A/V news
  – Find and direct amenable Tier 0 sources to “the action”

• Key Issues:
  – Indexing writ large, verifiability, security, info provenance-tracking, reputation & trust (Netflix Prize!)
  – Big Brother has potentially arrived
Should It Be Done?

- Interpersonal Dealings
- Social Intercourse
- What’s Public? What’s Private?
- Legal Structures
- Civil Rights
- Truth in Government
ULTRABLOGGING SUMMARY

• Realtime Wireless: doable with effort/capital
  – But unclear WHO would do ...
  – Meshes probably won’t cut it

• More Interesting (my areas of ignorance):
  – Can there be secrecy?
  – Can information usage be tracked?
  – Truth vs. Fiction: can we reliably tell the difference?
  – Interpersonal Relations
  – What’s Public/Private?

• Social/Society Issues:
  – Seem manageable if writ small
  – Unclear writ large
REGARDLESS

Communications Theory Touches It All
(great sabbatical topic)