Introduction to Informatics
Lecture 4: Information and Technology
Readings until now

- Lecture notes
  - Posted online @ http://informatics.indiana.edu/rocha/i101
    - The Nature of Information
    - Technology
  - @ infoport and web
    - What are blogs?
    - The Library of Babel by Jorge Luis Borges

- From course package
    - Chapters 1, 4 (pages 1-12)
  - From Andy Clark’s book "Natural-Born Cyborgs"
    - Chapter 2: "Technologies to Bond With" (pages 19 - 44)
Assignment Situation

- Labs
  - Past
    - Lab 1: Blogs
      - Closed (Friday, January 19)
    - Lab 2: Basic HTML
      - Due this Friday, January 26
  - Next
    - Advanced HTML: Cascading Style Sheets
      - Due Friday, February 2

- Assignments
  - Individual
    - First installment
      - Lecture 7: Thursday, February 1
Digital versus Analog

- **Digital** is used to convey the notion of discrete objects/values
  - Things we can count
  - The word digit comes from the Latin word for finger (*digitus*)
  - Digital information is equivalent to symbolic information
    - Any symbol system requires a set of discrete symbols for setting up an arbitrary semantic relation

- **Analog (or Analogue)**
  - Information transmission via electrical, mechanical, hydraulic, and sound signals
    - Continuously varying signals which are not countable
    - What was used up until Shannon
  - Instead of messages being arbitrarily encoded, analog signals rely on some physical property of the medium
  - It implies an analogy between cause and effect, input and output
    - Voltage as an “analogy” to sound in analog synthesizer
    - But it cannot encode any sound whatsoever!
    - Sounds depend on the physical properties of electricity, the transducer and equipment used
Analog Synthesizers

- Are not “universal” sound devices
  - Like sample synths and digital sound cards
  - Their sound depends very much on the analogs employed
- Famous synths
  - Minimoog
    - [http://www.synthmuseum.com/moog/moomini01.html](http://www.synthmuseum.com/moog/moomini01.html)
  - Roland TB-303
Playing with digital perceptions

- Buddha Machine
- FM3
Tools and Animals

- Many Animals use tools to solve problems in their environment
  - Even transmitting knowledge of using tools
  - A **tool** is anything not part of the body, which is used to accomplish a given task.

- Egyptian Vultures
- Woodpecker Finches
- Hooded Monkeys made “spoons” to reach yogurt from narrow plastic tubes from available pieces of wood
- Crow makes wire hook
- Use improved
- Fish With Bait

Owls use dung to catch beetles
Humans and Tools

- Humans use tools to transform their environments
  - We incorporate tools into every aspect of life
  - A **tool** is a “thing (concrete or abstract) with which some operation is performed; a means of effecting something; an instrument” (Oxford English Dictionary).
  - **Technology** is the collection of tools plus the knowledge of how to develop and apply them in our environment.
A story of technology

- Systematic discovery
  - With maps and technology
- Intelligence gathering
- Business Opportunity!!
A story of technology
History of Humanity

- Is the history of tool-making
  - The invention of new tools often brings about fundamental transformations in society and even in the way we think.

- Planetary Example
  - Language (first spoken then written) changed the way humans think and are able to solve problems

- Specific Example
  - The introduction of the firearm (*arquebus*) to Japan by the Portuguese in the 16th century largely resulted in the end of a 250-year civil war leading to the unification of Japan.

- Sumerian 3200 BC
- Egyptian 3400 BC (king Scorpion Tomb)
- Indus Valley 3500 BC
Transformative Tools

- Human-Machine “Symbiosis”
- stone tools (pre-homo sapiens), paints, boats, pulleys, screws, fabrics, metal, writing system, the wheel, levers, coinage, astrolabe, telescope, printing press, steam engine, adding and computing machines, airplanes, telephone, typewriter, antibiotics, digital computers, internet, etc.
Technology and Humanity

- Technology is the means whereby humanity separates itself from nature.
- It is the mechanism used to adapt the natural environment to the individual.
  - "a man without technology is not man" (Ortega y Gasset)
  - Humanity creates a "supernature" separate and dominant over "real nature"
- Humans use technology in two ways:
  - For survival
  - Result of will and desire
- But technology also changes the way humans live, think, multiply, and die.
  - Symbiosis: one creates the other
Technology and Problem Solving

- Solving problems is not the whole story
  - The introduction of the tool often precedes the problem to be solved!
    - Did the introduction of the firearm “solve” the civil war problem in Japan?
    - The invention of the telephone also did not solve a particular problem, as humans were communicating in other ways before its invention.
      - But it did enable faster communication
  - As the environment changes with our tools so do our needs and ourselves
    - Use of the same and new tools in unforeseen, creative ways (Heidegger)
    - Loop of social-technological interaction.
      - Every new tool changes the “problem space”.
Transparent Technology

- So well fitted to, and integrated with, our own lives, biological capacities, and projects as to become almost invisible in use (Andy Clark)
  - Glasses, wrist-watches, driving cars, mobile phones, pens, sports and musical equipment: human-centered
    - Not the same as easy to understand

Opaque Technology

- Highly visible in use: technology-centered
  - Computers, industrial machines
- Opaque technology can become transparent with practice
  - But it works better when biologically suited
    - Natural fit, ergonomics

http://www.baddesigns.com/examples.html
http://www.jnd.org/
(Donald Norman)
The Black Hole

Opaque technology heaven!

- Ed Grothus
  - Omega Church of Peace
  - A Critical Mass is said every Sunday with a Bomb Unworship Service. We change wine into water

First Church of High Technology
Black Hole Synod
Human Technology Symbiosis: Time

- Human beings first used natural cycles to prompt daily activities
  - the call of the night watch, heavy, fixed, unreliable sundials and water clocks,
Human Technology Symbiosis:

**Time**

- From time-obedience to time-discipline
  - Personal accurate timekeeping, wristwatches
    - enabled us to factor time constantly and accurately
  - Technology changing our own nature
    - Created new ways of thought, and cultural practices and institutions, which were otherwise precluded by our basic biological nature

- Humans incorporate technology
  - Navigation, printing press, telephone, television, Web
Natural-born Cyborgs?
Humans more than using, incorporate technology

- We know we “know” the time, simply because we are equipped with a watch
- As more portable computing devices become available, will we incorporate easily accessible collective knowledge as our own?

- Transparent *knowledge* technology
  - Example: Google SMS
  - Adaptive Knowledge Technology (Clark, Chapter 6)

http://www.google.com/sms/howtouse.html#top
Information appliances

Geared to support a specific activity
- Via storage, reception, processing, and transmission of information
- Form an intercommunicating web
- Talk to each other
- Are transparent tools
- Easy to use and fade into background: poised to be taken for granted
Next Class!

- **Topics**
  - What is Technology?
    - What is Information Technology?
    - Examples of important IT
  - History of Information Technology
    - From Silicon Chips to PCs
    - The History of the Internet

- **Readings for Next week**
  - Lecture notes Posted online @ http://informatics.indiana.edu/rocha/i101
  - Technology
  - @ infoport
  - From course package
    - From Andy Clark’s book "Natural-Born Cyborgs"
      - Chapter 6: Global Swarming (pp. 45-67)

- **Lab 3**
  - Advanced HTML (Cascading Style Sheets)