L&S160E Week 12 Notes

I. Logic:

a. Mechanical procedure for doing different computing: system

b. Organon, codify logical deduction with rules of inference (syllogisms)

c. Greek Logic (propositional logic)

i. Euclid (student of aristotle, looked at how to APPLY these systems, for mathematics → geometry

1. Not just abstract reasoning, but can be applied to problems.

ii. Always starts with two constants: true or false.

iii. Symbols: 0 (F) and 1 (T)

iv. Variables, lower case letters, p, q, r,

v. Punctuation, for forming a formula

1. ^, v,

2. Looking at the structure, the truth or false of formulas depend on the variables.

p	q	P^q
o	o	O
O	1	O
1	o	O
1	1	1

3. Patterns of formulas

4. Designed to provide a formalism for reasoning, a helpful tool

a. prevent logical conundrums

d. Algorithm (825 AD, about)

i. Mathematical or numerical 'recipe' for solving a class of problems

1. Algorithm for addition, pattern

a. Square roots, long divisions, prime numbers, for solving complex problems.

ii. Unambiguous what all the steps are, and can be automated

1. Can put it in a computer to execute each algorithm

e. Blaise Pascal

i. 1623- 1662: Gears, pulleys, systems, development of clocks

ii. His numerical wheel calculator

1. Similar to decimal system

2. Mechanical way to keep track of counting

f. Leibniz

i. Inventor of calculus (1646-1716)

ii. Computing machine

iii. binary numbers

g. BINARY NUMBERS

i. Computers use Binary numbers

ii. Characters are symbols,

1. Ie. Characters in the english alphabet

2. Ie. Characters in Decimal system

iii. In Binary Numbers, there is only two: 0,1

1. We add columns o 2, 4, 8, 16, 32, etc. as needed.

a. ColumnsL _ _ _ _ 16, 8, 4, 2, 1 (2^0)

b. First decimal numbers were written

h. Jacquard Loom (1801)

i. Mechanical Computer

1. First stored program-metal cards

2. Programmable metal cards, with holes in them, needles go through holes, yarn is weaved through

a. Allows to define patterns

b. First computer manufacturing!

c. Versions are still used today.

i. Charles Babbage

i. Difference engine 1822

1. First attempt to devise computing machine

2. Could analyze frequencies

ii. Analytical Engine 1833

1. Steam powered model,

2. could store numbers,

3. historians have recreated

iii. an example of

1. being programmed to do something else

j. Ada Byron

i. Countess of Lovelace,

ii. Analyze the analytical engine, wrote a text on how to define algorithm for that machine

1. The worlds first programmer

k. LOGIC

l. Mathematics and Mechanical Reasoning

i. Newton 1687: Philosophae Naturalis Principia Mathematica

ii. Late 1800s, codifying laws of reasoning

1. Boole,

iii. 1911: attempt to formulize all mathematical knowledge about numbers and sets

1. Could systematize all knowledge

2. Series of equations and formulas to prove everything that would be proved.

a. Characterize all statements about numbers, ie. There is an infinite amount of numbers,

3. Perfect Axiomatic system

a. "mechanical inference rules"

i. following the steps mechanically

b. criticisms:

i. incomplete

ii. it would include some false statements

4. is there a set of axioms

iv. Russell's Paradox

1. Set theory: 2 types of sets

a. Sets that are members of themselves: the set of even numbers, is not a member of itself.

b. The set of all things that are not even numbers, does include itself.

c. →"S"= the set of all sets that are members of themselves? …are those a member of itself?

d. If S is a member of itself, then it is a *contradiction*

v. Kurt Godel

1. 1931: publishes

a. Disrupts all of Russell's : never a set of axioms that is both complete and true

2. Godel's Solution

a. All consistent axiomatic formulations of number theory include undecideable propositions

i. There are statements that cannot be proven true or false.

ii. Expanded: any interesting rigid, systems this applies

b. Godel's statements, self-referential approach

i. It could not be both complete and true

ii. Completely changed the work and focus of mathematicians

c. Q: What was the impact on greater society? Was this seen through media?

i. …probably not headline news?

d. Q: did Russell ever respond to the theorem?

vi. **Alan Turing - (Britain 1912- 54)**

1. Idea of a class of numbers that could be computed

a. Recursive functions

2. Code breaking: enigma

3. 1936 Paper: Key idea was the abstract model of a machine,

a. Simple elements of machine

i. Precise vocabulary: 0,1

ii. Class of primitive operations, clerk looks at 0 or 1, and instructions shift right or shift left.

1. both the code and the date in zeros and ones

iii. You could compute: well formed sequences, correctness, completeness, equivalence, complexity

iv. http://aturingmachine.com/

vii. Hollerith

1. Punch card, inspired by the census

a. Saw an opportunity to devise paper cards to punch and get more precision, can be stored

b. Developed and used for census

2. CTR: Computing Tabulating Recording Company

3. IBM: 1924: International Business machines

a. Before computers, so complicated

viii. Vacuum Tubes, 41-56

1. Glass tubes with circuits inside, no air inside to protect circuitry.

a. Were able to do logical problems but more, like amplification as well

ix. Aiken (Britain 1900-73)

1. Could factory tube be paired up with mechanical/analytical engine

a. From this on, modern computers would forever be associated with digital processing

2. ENIAC: 1946

a. Rearranging cables to change programs

x. Stored program computing

1. Army extends ENIAC to construct research

a. The system is successful and mathematicians working with engineers to development larger machines.

xi. Grace Hopper

1. Pioneer of programming UNIVAC

2. First computer bug, a moth stuck in machine, "debugging"

II. Vannevar Bush: Article As We May Think

a. Written in at end of war 1945

b. He was a visionary with big ideas, lamenting all the destructive developments in war, ie. Atom bomb

i. What will the physicists do next? Hopefully scientific ressearch and intellectual energy will produce something good.

c. What lasting benefit has been science and research?

i. Machines increased our control over environment

1. Heidegger model of instrumentation

a. Babbage, calculating machine

b. More precise in machinery → more reliable and less expensive

2. Side story: camera, mirco-techology

ii. Encyclopedia Britannica can be reduced to matchbox.. . How?

1. Micro film: with photography we can make it smaller and more precise.

a. Dramatic statement for 1945.

2. This allows us to make encyclopedia/info more available

a. Already the production is greatly exceeding gap for consumption

i. Person who reads everything cannot be person to write anything…(?)

b. new way of relaying information,

3. Side discussion: Machine to talk to, speech to record information an generate more.

4. Electrical machines

a. There will never be a market for computers

b. Bush: there is no shortage of things we want to compute

i. There is a need, and he wants to find a way

5. Abacus, a form of logic

a. Equation solvers,

iii. Pg. 8

1. Selection, search, ability to find things

2. Class of digits

a. During this time, Dewey decimal system

3. We need new ways of index,

a. Human mind operates through associations, linkages that associate to one another, not indexing

b. Modeling human brain, cannot duplicate but can create something to mimic it.

i. Memex pg. 9-12

1. a drive in which an individual stores his knowledge that can be accessed with ease and flexibility

ii. Not only fast and efficient but also

4. Mirco-film: tap codes on a ke board

a. Associative indexing, a trail to connect items stored on micro-film.

i. Linking words, creating trails (storing not only data).

b. How does this work?

i. Trail through available material

ii. Trails: tagging today, clicking on links

c. Would be useful for many professions, more than business and storing for census.

5. Essential new things memex would brig us: flexibility

a. A machine that that can do and manage many things

i. To store,

ii. But to find things through the associative links.

6. A post modern vision!

a. It can do so many things, a reveal a while branch of knowledge, connections.

b. "Give man access and command of the inherited knowledge of the ages"

7. Timing:

a. Took 45 more years, for this system to be realized, but thoughts were all around.

b. Time for Heidegger's writings.

d. Transistor 1948

i. Bell telephone, silicone to silicone to

1. Three contacts, functioning a switch, gate.

2. Increased reliability

3. Extensive implications for modern computers

e. Turing Test 1950

i. Related to Bush, talking about complicated system

ii. Computing things of rational mathematical

iii. Could a computer think??

1. Teletype system, ask question at booth, is it the person or computer asking questions (after a certain time, if you can't tell it's a computer, it is intelligent)

a. Elegant test, both human and computer could fool you.

i. Like today, computer playing chess and other games.

iv. NOW: Artificial intelligence, complexities of AI and its intersects of the course. DREYFUS, as expert. Will be revisted in 2 weeks

f. Integrated circuit

i. The First micro-processor 1971

ii. Called a micro-ship

iii. Could allow patterns of circuits and metals

iv. Moore's Law

1. The speed of power of computing doubles 18 months.

2. Will grow exponentially

3. Although it was a remarkably hubristic statement, he proved to be right.

4. Power of processing and increased memory

g. Xerox Parc 1970

i. Open research facility to study what computers would do

1. Mouse was invented, screen interfaces, "a Mecca of inventions"

h. AL Tair: first personal computer 1975

i. With transistor and micro-processor, this was possible.

1. No keyboard

2. No video display

3. No storage device.

ii. Binary vocabulary, program was

i. APPLE 1976

i. The Steves could go further than blinking lights by adapting a screen

j. IBM

i. 1981- their own kits for personal computers, PC

ii. Provided hardware

k. Bill Gates

i. Software, borrowed operating system, and sold to IBM with share for him. (bill=$$$)

l. Macintosh

i. Debuts in 1894,

m. Question: On games, was it made through computers, or become an independent project?

i. Atari, played of of TV.

ii. Graphical computing for gaming and

III. Binary Numbers, Digitization

a. Magnified phonograph grooves

i. A to D converter

1. Analog: something moving

2. Digital: numbers

ii. Takes sound and converts to numbers 0s and 1s.

1. Analog to digital or digital to analog.

2. Analog:

3. Digital:

iii. Analog to digital overview:

iv. Sampling rates, how to sample a signal : rate, uses.

1. Ie. 44,000 times a second, 44.1 kHz, used for CD, DAT

v. Result a sequence of numbers, (sound into long list of 1s and 0s)

1. The Digital Audio Stream

2. Can take all sorts of sounds and convert to 0s and 1s, converted on microchips, then interprets by transistors

a. Extremely versatile and flexible , video, radio signals, forms of materials, etc.

3. Can take material and instantly make it **available** (availability the new issue).

b. Computer Generations

i. First generation 1945-56

ii. Second generation 56-63

1. New components of storage and operating systems, another step to flexibly and availability

c. Contemporary Issues/Computers

i. Internets and PCs

1. Rapidly expanding information, communication

ii. Will

iii. Goldberg: breakthrough in computer recognizing gestures,

1. Keyboards will be obsolete.

2. Free yourself from typing,

3. Computers learn you and reactions, act and organize accordingly

d. Artificial intelligence

i. Robotics and Automation

1. Bill gates:

2. Machine learning, robots learning from their experiences

a. Robots, towel folding.

i. How?
Find two points, uses the tables and folds.

ii. 50 towels

e. Lev Manovich on New Media

i. His principles of New Media

ii. Characterize old and new media

1. Modern (for Manovich and Arthur)= new

a. → post modern for us

iii. New, programmable and re-programmable.

iv. Logic of new media corresponds to production on demand, just in time delivery

1. Gold berg: The variability is the key thing, not necessarily digital

f. Goldberg's argument:

i. What is new media?

1. How to draw line between new and old?

ii. What is a medium?
Element that facilitates transformation from A to B.

1. Change in form

2. Agent for Transformation*

iii. Two classes of medium:

1. Singular: can be used once, thermoset polymers, once transformed that are stuck, set.

2. Reconfigurable: can be re-sued, ie. Radio, thermoplastic

iv. Reconfigurable media are essentially flexible, available for use (Bestand, Gestell)

a. Reconfigurable media are transformable agents for transformation

v. His proposal define new media as reconfigurable media

1. New media: transformable agents for transformation

a. Available, doubly transformative, post modern technology

b. Computers, nanotechnology, stem cells

vi. **New Media as "Means without Ends"

IV. Movie: The computer and the Mind of man

V. qMan as a tool maker

VI. than in 1900s, invention to expand the capabilities of man's mind

Clear, Basic Overview:

- First Computing Machine: Abacus
    - Simple computing of addition/subtraction
- Mechanical Reasoning: Logic
    - Not a machine per say, but more of a system

- Greek age
- First stage of applications

- Greek Logic (propositional logic)
  - Reasoning applied to important problems i.e. geometry
  - Binary logic: true or false
  - Procedure can be automated to combine with each other to make complicated formulas
    - Branch of mathematics/philosophy to provide a formalism to reasonining

- Algorithm
  - Formal specification and you can write down
  - Unambiguous as to what all the steps are
  - Can be automated in a logical system to follow all steps in order

- Blaise Pascal's (1623-1662) Adding Machine
  - In the epoch of subject/objects
  - Relevant

- Binary Number System

	16	8	4	2	0
0				0	0
1				0	1
2				1	0
3				1	1
4			1	0	0
5			1	0	1
6			1	1	0
7			1	1	1
8		1	0	0	0
9		1	0	0	1
10		1	0	1	0

- Rusell's Paradox
    - *S* = the set of all sets that are not members of themselves
    - Is *S* a member of itself? Yes.
- Turing Machines, 1936
    - Key finding: instructions and data were in the same format: 0, 1
    - Through this, Turing was =able to prove what's computable or not by such a system
- Howard Aiken (1900-1973)
    - Could the mechanical vacuum be translated into electronic computing?
- Vannevar Bush, As We May Think. Atlantic Monthly (1945) http://www.theatlantic.com/doc/194507/bush
    - What will they do next after the atom bomb? Hope for something good with all that intellectual energy?
    - Machines have increased our ability to control the environment (along with Heidegger's model of instrumentation)
    - We can become more and more precise in our machinery with increasing levels of precision
    - Encyclopedia Britannica can be reduced to the volume of a matchbox
        - Microfilms and photography
    - "There will always be plenty of things to compute"
    - Selection (or search)
        - Dewey decimal system as a primitive example of search
        - By *association* instead of indexing
    - Memex
        - Not just for doing one thing or class of things, but flexible to do many things
        - Store, index, find things

        - "New profession of trailblazers"

- Computer
    - Quintessentially post-modern
        - Set of mechanisms of automation
        - Flexible to change information and data
        - Programmable to do different tasks
    - Programmability is key – tell it to do anything
- Lev Manovich on New Media (pg 89 reader)
    - Characterizes old vs new media
    - Uses "modern" = new = "post-modern" to us
    - The fact that it's digital means that it's programmable and re-programmable
    - Page 94
        - Key characteristic of new media is variability
    - Manovich focuses on digital/computational sense as new media, but Goldberg disagrees – it's the variability