Lecture 02

1. Discussion of Vannevar Bush article (1945)
   a. Photography – walnut on your forehead; cord down your sleeve; would be good to get instant results
   b. Compression – Encyclopedia Britannica can be reduced to the size of a matchbox
      i. Don’t only need to compress; also need to be able to find things
   c. Speech – Voder@ NY Worlds Fair turns keys into speech; Vocoder @ Bell Labs turns speech into keys
   d. Search – photocells and microfilm will survey items 1000/second; print out duplicates
   e. Memex – Mechanized private file and library; stores all books, records, communications; can be consulted with exceeding speed and flexibility; supplement to human memory

2. First assignment and first lab
   a. Assignment – some exploration of your habits; some estimation; available on website
   b. Lab – introduction to various things you’ll need in the course
      i. Things to know (smart quotes, Duo authentication, … )
      ii. Waiting for OIT to establish Unix accounts
   c. Collaboration – do, but don’t

3. Hardware
   a. PC vs. Mac vs. otherwise
      i. What’s the difference? (OS, hardware)
      ii. World – 90% PC; PU – students 75% Mac; administration – 60% PC
   b. Phones
      i. What’s the difference (OS, hardware, also cellular)
      ii. World – 70% Android; 30% iOS; wasn’t always this way
   c. Why does PC/Android dominate the market?
   d. Difference between hardware and software?
   e. Hardware details
      i. Boxes for CPU, I/O (mouse, keyboard, display), Memory (RAM, Disk, DVD?), networking, etc. connected by Bus

![Diagram of computer hardware components](image)
ii. Parts –
   1. PC 2007 -- Note bus connections
   2. CPU (small but with a lot of pins) 1999
      a. Fan 2009
   3. RAM (2008 small 256MB, 144 pins; large 128 MB; 2004)
      a. $45 then, $4 now
   4. Disk (IBM 40GB 2001 $25 on Ebay now) (OCZ Vector (solid state 120GB 2010, can still buy on Amazon for $80)
   5. Motherboard 1998; note how many connections

4. Communication
   a. Wires carry signals (electrons flowing or not flowing)
      i. Signals are either 0 or 1
         1. A single signal is called a bit
         2. Bit can be either 0 or 1; can represent 2 values
         3. To represent more values, use more bits
      ii. Signals are grouped as 8’s
         1. 8 bits make a byte; byte can represent up to 256 values
      iii. What flows through the wires are individuals bits, grouped in bytes to represent whatever

5. Revisit parts and talk about their capacities and speeds
   a. Measurements
      i. Powers of 10
      ii. Kilo – 1000, mega – 1 million, giga – 1 billion, tera – 1 trillion
      iii. Peta – 1 quadrillion, exa – a quintillion, zetta – 1 sextillion
      iv. $10^3$, $10^6$, $10^9$, $10^{12}$, $10^{15}$, $10^{18}$
   b. How things are rated
      i. CPU – MHZ, GHz, clock speed
      ii. RAM – MB, GB, capacity
      iii. Disk – GB, TB capacity
   c. Parts –
      i. PC 2007
      ii. CPU clock speed ~ 2 Ghz
      iii. RAM (2008 small 256MB, 144 pins; large 128 MB; 2004)
         1. $45$ then, $4$ now
      iv. Disk (IBM 40GB 2001 $25 on Ebay now) (OCZ Vector (solid state 120GB 2010, can still buy on Amazon for $80)
6. Fitting it together
   a. Less visible ratings
      i. Transistor count
         1. Doubles every 18-24 months
      ii. Line thickness
         1. Keeps shrinking
         2. Halves every 3-4 years, but quadratic
         3. Current thickness = 1/1000 of a human hair
   b. What’s changing
      i. Fewer parts (more going on where you can’t see)
      ii. More connections to outside (finer wires, buses getting wider)
      iii. CPU chips – more pins, bigger heat sinks, same size
      iv. Assembly more automated

7. Break for quantitative problem
   a. How many apples are eating in residential colleges each week?

8. Creepy or not creepy – house on Yelp + gift certificates?

9. Leaving the analog world, entering the digital world
   a. How do we transform things?
      i. Sound
      ii. Images
      iii. Motion
      iv. Text
         1. ASCII code represents characters (letters and numbers, etc.) as bytes
         2. Unicode expands the range here
   b. How does this disrupt the world?
      i. Vinyl → cassette → CD → iTunes
      ii. Borders → Amazon → Kindle
      iii. Film → Memory card
      iv. Movie → Netflix
      v. Things in filing cabinets → digital archives