Outline for April 20, 2007

Question: How trustworthy is digital evidence (such as digital photographs or printouts of emails)?

1. Greetings and felicitations!
2. Data going into the PC (continued)
   a. Mice: figures out how far you moved either by a rotating trackball spinning encoders (mechanical mouse) or by observing changes in surface over which you move it (optical); also signals for buttons
   b. Touchpads: two sets of electrodes, one going horizontally, the other vertically; do not touch, creating an electromagnetic field between them; field sampled. It is affected by touch, so you can get position.
   c. Speech recognition: enroll to build database of phoneme sounds for user; then, on dictation, analog-to-digital converter changes sounds to bits, speech engine adjusts to take background noise, etc. into account, acoustic recognizer matches sounds to phonemes, and speech engine maps these into words; may guess wrong
3. Scanners
   a. 3 layers: n-layer (n-type silicon), depletion area, p-layer (p-type silicon); photons hits, causing electron to travel between layers; depletion area charged proportional to number of photons, creating signal sent to analog-digital converter
   b. Flatbed scanner: shines light on paper, scan head captures this as it reflects off page, and analog-to-digital converter translates it to pixel representing light intensity at 300 or more pixels per inch
   c. Optical character recognition: create bitmap, fuzzy because pixels larger than details of text (can’t capture curves exactly); software breaks this into characters, words, lines, paragraphs; characters matched to font models; what is unrecognized compared to models of characters by looking for features
4. Portable computers
   a. Size limited by human eyes and fingers
   b. Same components as a big computer, but smaller and packed more tightly together; lots on motherboard
   c. PC card plugs into laptop, acts as main memory with its own unique range of addresses
5. Palm PCs and table PCs
   a. Touch top layer of screen; pressure brings it in contact with lower screen, causing current; system measures current voltage to figure out where pressure is
   b. Operating system turns on pixel below stylus (“showing ink”)
   c. System, distinguishes between pixels turned on by stylus and pixels already on
   d. Character recognition based on start and direction of stroke as well as general shape
6. Digital cameras
   a. Capture light by having photodiodes build up charge when lens shutter is snapped
      i. CCD: read each photodiode separately, and amplify it
      ii. CMOS: transistor associates with each photodiode and address and read lines to each, just like RAM
   b. Autofocus done by diverting (part of) image from lens to strip of 100–200 photocells; lenses moved until adjacent photocells have different values (good contrast)
   c. Auto exposure works in three ways
      i. Point-and-shoot (POS) uses photo diodes on outside of camera to determine lighting of full frame; aims for 18% gray
      ii. Center-weighted uses central 10% of image for this analysis
      iii. Spot metering uses even less (small circle in center)