

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 electrondes, 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 convrter
 - 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; sstem measures current voltage to figure out where pressure is
 - b. Operatng system turns on pixel below stylus ("showing ink")
 - c. Syste, 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 searately, 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)