Announcements

• Project Turn-In Process
  ∗ Put name, lab, UW NetID, student ID, and URL for project on a Word doc
  ∗ Upload to Catalyst Collect It
• Project 1A:
  ∗ Turn in before 10pm tomorrow
• Project 1B
  ∗ Turn in before 10pm a week from tomorrow

Announcements

• Labs the next two weeks
  ∗ Monday and Tuesday labs:
    • Work on projects
• Reflections
  ∗ We will begin adding comments and grading your reflections (10 points)
• Quiz
  ∗ Wednesday or Thursday lab this week
  ∗ Chapters 3–7 of Fluency (8 next week)

Quiz Review

Chapter 3
• Types of networks
  • The Internet, Wide Area Network (WAN), Local Area Network (LAN)
• Protocols
• How to Read a Domain Name!
  • Network addresses, IP addresses, domain names, Domain Name Service (DNS)

Quiz Review

Chapter 3
• Deconstruct URLs
  • http://www.cs.washington.edu/education/courses/100/07au/index.html
  • Identify TLD, domain, server, folder structure, file

Quiz Review

Chapter 4
• The language in which web pages are written
• The filename extension is generally .html or .htm
• Plain text with a special structure defined by a set of tags
• Tags are used to encode structure and formatting

Quiz Review

“root” of a filesystem is specified with a single “/” slash (C:/)
• Absolute pathnames start from the root
• Relative pathnames start from the current directory
• Separating directories and filenames
  • UNIX: “/” (slash)
  • Windows: “\” (backslash)
• Parent directory: “..”
• Current directory “.”
Quiz Review

• HTML Page Structure
  ```html
  <!DOCTYPE definition... >
  <html>
  <head>
    <title>Title text</title>
  </head>
  <body>
    Body text goes here...
  </body>
  </html>
  ```

Quiz Review

• Anatomy of an HTML tag
  * `<ELEMENT attribute="value"></ELEMENT>`
  * `<img src="mypic.jpg" alt="my pic"/>

• Types of tags
  * Normally has an open AND a close element
  * Open and close at the same time
  * Some tags do not close at all (ex. Comment tag)

• Attributes
  * Name-value pairs, values in quotes
  * Some are required, some optional

Quiz Review

• Styles Tags
  * `<b>` bold, `<i>` italic, `<big>` big, `<small>` small

• Spacing Tags
  * `<p>` paragraph, `<br/>` line break, `<hr/>` horizontal rule

• Heading tags
  * `<h1>`, `<h2>`, `<h3>`, `<h8>` header format

• Table tags
  * `<table>`, `<th>` table header, `<tr>` table row, `<td>` table data

• References
  * `<a href="http://www.cnn.com">` anchor reference
  * `<img src="..." alt="...">` image reference

Quiz Review

• Search Engines like Google & Yahoo provide large piles of (unorganized) information
  * Index is generated by crawling the web and following all the links and indexing words
  * Not every page can be indexed!
    * If there are no links to it from other pages
    * It’s dynamically created from a database

• As specific as you can when searching the web!
  * Eliminate common words (a, the, but)
  * Use rare words
  * Try using longer queries
  * Don’t forget about advanced search

• Employ Boolean operators
  * AND = both words must be included (any order)
  * OR = one or the other word (but not both)
  * NOT = do not include this word
  * "quotes" to guarantee word order

Quiz Review

• Public domain
  * Expired copyright
  * Governmental works
  * Copyleft vs. copyright
  * Copyright rules
  * Primary vs. secondary sources
Quiz Review

Chapter 7

- Verify that its reproducible!!!
- Determine exactly what the problem is
- Eliminate obvious causes by double-checking
- Divide the process into smaller working parts
- Use tools to help you program (like colored text editor)
- Use techniques to help you program (like indenting, adding comments, etc...)

Computer Basics

How exactly does a computer work?

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Integrated Circuits

Integrated circuits (ICs) are the power source of the information revolution

- When computers were made of discrete parts, wires of every transistor (3), capacitor (2), resistor (2), etc., had to be hand-connected
- Labor intensive, expensive, error prone, unreliable, cumbersome, ... even with robots!
- Integrated circuits solved that by 2 ideas
  - Integration -- circuits built as a unit from like parts
  - Photolithography -- printing process to make chips

Intel Pentium Processor

Photolithography

Consider process for depositing wires

Remove Resist

The cost of the circuit is not related to complexity
Semiconductors

Silicon, a semiconductor -- sometimes it conducts and sometimes it doesn’t
• It’s possible to control when semiconductors do and don’t conduct

Compute by controlling conducting

Ex.: Use control to test Mars AND rover
Make semiconductor conduct
if “Mars” is found
Make semiconductor conduct
if “rover” is found

Send “yes” signal on wire
Detect presence/absence of “yes”

Field Effect

Charged objects are familiar -- use a nylon comb on a dry day
• A charged field can control whether a semiconductor conducts or not

A transistor has 3 wires
The charge of the control wire (gate) is key
• Neutral gate, channel doesn’t conduct
• Charged gate, channel conducts

MOS Transistors

The field effect idea is implemented in metal-oxide-semiconductor transistors

MIPS R10000 Processor

Notice that wires cross over other wires...

Operation

The two cases: the gate is neutral or the gate is charged

Charged gate attracts electrons to channel

Notice key points of integrated circuits:
Constructed as a unit of compatible parts
Fabricated in layers by photolithography
Computers...

Deterministically execute instructions to process information

"Deterministically" means that when a computer chooses the next instruction to perform it is required by its construction to execute a specific instruction based only on the program and input it is given.

Fetch/Execute Cycle

Computer = instruction execution engine

- The fetch/execute cycle is the process that executes instructions
  - Instruction Fetch (IF)
  - Instruction Decode (ID)
  - Data Fetch (DF)
  - Instruction Execution (EX)
  - Result Return (RR)

Anatomy of a Computer

Memory...

Programs and their data must be in the memory while they are running

Memory locations

The Hard Disk is the α-device

Memory addresses

byte=8 bits

Groups of four bytes are a word

Control

The Fetch/Execute cycle is hardwired into the computer’s control, i.e., it is the actual “engine”

The instructions executed have the form

ADD 10, 16, 20

Put in memory location 20 the contents of memory location 10 + contents of memory location 16

Indirect Data Reference

Instructions tell where the data is, not what the data is... contents change

One instruction has many effects

ADD 10, 16, 20

The Arithmetic/Logic Unit does the actual computation

Each type of data has its own separate instructions:
- ADDB: add bytes
- ADDBU: add bytes unsigned
- ADDH: add half words
- ADDHU: add halves unsigned
- ADDS: add short decimal numbers
- ADDD: add long decimal numbers

Most computers have only about 100-150 hard-wired instructions.

Input/Output

Input units bring data to memory from outside world; output units send data to outside world from memory.

- Most peripheral devices are "dumb" meaning that the processor assists in their operation.
- Disks are memory devices because they can output information and input it back again.

The PC's PC

The program counter (PC) tells where the next instruction comes from:
- Instructions are a word long
  - Recall that 4 bytes is a word
- Add 4 to the PC to find the next instruction

Program Counter: 112

Clocks Run The Engine

The rate a computer "spins around" the Fetch/Execute cycle is controlled by its clock:
- Current clocks run 2-3 GHz
- In principle, the computer should do one instruction per cycle, but often it fails to
- Modern processors try to do more than one instruction per cycle, and often succeed

Clock rate is not a good indicator of speed.

Summary

Semiconductors made Info Revolution
- Semiconductor properties...
  - Fields control when semiconductor conducts
  - On/off of conductors allows us to compute

Fetch/execute cycle runs instructions:
- 5 steps to interpret machine instructions
- Programs must be in the memory
- Data is moved in and out of memory

Instructions, data are represented in binary.