

Recitation 5



What's coming up

- HW2 is due **Mar 4th @ 8:00 pm**
- Exam 1 is on Tuesday Feb 24.

Exam

- Closed book
- No notes/cheat sheets
- No calculator
- No phone/electronics
 - Please silence phones before exam
- Bring your ID

Negative Binary Values

- For all negative numbers in 1's and 2's complement,
- Do these have a leading 1?
- Yes
- 0b010 Is this negative?
- 0b101 Is this negative?

Number Bases

- For all number systems:
- Magnitude of a value is based on position of that value
 - From right to left
- E.g., Decimal 2135 is:
 - $2 * 10^3 + 1 * 10^2 + 3 * 10^1 + 5 * 10^0$
- E.g., Hexadecimal 0xF5A
 - $F * 16^2 + 5 * 16^1 + A * 16^0$
- E.g., Binary 0b101
 - $1 * 2^2 + 0 * 2^1 + 1 * 2^0$

Number Bases

- Can any base^0 (1's) position be divided by that base evenly?
 - I.e., no remainder?
 - I.e., base^0 is the smallest digit position.
- Only 0, otherwise the value at base^0 is always a fraction

Time

- What does a clock do?
- Sets the discrete cycle for operations in CPU.
- How long is a clock?
- As long as the slowest CPU operation.

Number Conversion Practice

- Decimal to binary
- Binary to decimal
- Decimal to Hex
- Hex to decimal
- Binary to Hex
- Hex to Binary

Complement Practice

- What is 1's complement of -12 ?
 - How do we start?
- 0b01100
 - What next?
- Flip bits..
- 0b10011

Addresses and Number Ranges

- How many addresses do we have in a 32-bit addressable system?
- 2^{32}
- How many numbers can be represented in a 10 bit binary value?
- 1024
- What is the range of positive integers this represents?
- $[0, 1023]$
- What is the range if this were negative in 2's complement?
- $[-512, 511]$

Boolean Logic

- What is 1 And 0?
- What is 1 And 1?
- What is 0 Or 0?
- What is 0 Or 1?
- What is 1 Xor 1?
- What is 1 Xor 0?
- What does De Morgan's Law allow?
- Change Ands to Ors -> heed the negations!
- What are the 3 main operators for all Boolean Logic?
 - Can we replace this with one operation?

Disjunctive Normal Form (DNF)

- Take a table of values where the result is 1
- Turn this into a statement of Ands and Nots
 - No other operators
 - One variable per statement
- All of these “conjunctive” statements get surrounded in parenthesis and OR-ed together
- Gives Boolean statement for entire table

Memory

- Correlation due to cost(s)
 - SRAM vs DRAM
- Faster memory is smaller, Larger memory is slower
- Caches are then 2nd fastest (in sequential number order; i.e., 1 is faster than 3)
- What memory can you increase?
- Is tape real?