CSC 137 - HWK #1

Fernando Mendoza
137-Section 05

1.3 What is the FP number representation of -5.375 in hex w/ 1-bit sign, 4-bit biased exponent, 11-bit fraction, where bias = 7?

① sign = 1 = neg

② 5/2 = 2 r1 ↑
2/2 = 1 r0
1/2 = 0 r1

③ .375 × 2 = 0.75
.75 × 2 = 1.5
.5 × 2 = 1.0

101.011

→ **step 3**

101.011×2^0

step 4: scientific

1.01011×2^2

step 5: Exponent

exp = bias + bias_exp
= 7 + 2
= 9
= 1001

step 6: Combine

1 | 1001 | 01011000000
sign | exponent | fraction

step 7: Hex

0xCAC0

1.4 What is the real # equivalent to FP number 0x3400 w/ 1-bit sign, 4-bit biased exponent, 11-bit fraction & bias offset = 7?

step 1 Hex → FP

0x 3 4 0 0

0011 0100 0000 0000

=

0 0110 1000 0000 000

step 2: Bits

Sign Bit = 0
exp bit = 6 - 7 = -1
fraction = 1000 0000 000

step 3: Combine

= 1 + fraction × 2^{exp}
= 1.10000000000
= 1.1×2^{-1}
= $(0.11)_2$ = $2^{-1} + 2^{-2} = 0.5 + 0.25 = 0.75$ w/ sign bit = 0 → = **0.75** ←

1.5 What is the real # equivalent to FP # 0x3400 w/ 1-bit sign, 4-bit biased exponent, 11-bit fraction & bias offset = 8?

step 1: Hex -> Binary

0x3400 = 0011 0100 0000 0000 = 0 0110 10000000000

step 2:

sign = 0
exponent = biased_exp - bias = 6 - 8 = -2
fraction = 10000000000

step 3: Combine

= 1. fraction × 2^{exp}
= $1.10000000000 \times 2^{-2}$
= 1.1×2^{-2}
= $(0.011)_2$ = $2^{-2} + 2^{-3}$ = **0.375** ←

1.14 What is a Von Neumann architecture bottleneck?

- Where we are presented the issue of having a faster CPU vs a slower memory. Due to its speed, memory currently acts as a constraint on CPU's as they (memory) are slower in comparison to CPU speed. ←