

1. <http://www.cse.buffalo.edu/~bina/cse241/spring2017/index.html>
2. Enrollment \downarrow Piazza page
cse241
3. Please go to recitations
4. ulearn recorded sessions

George Boole 1815-1864

The Laws of Thought

AI

Intelligent Thought

Boolean Algebra

Binary logic True
X

False
NOT X

AND operator

OR operator

{0, 1} basic element

0 - false

1 - true

{ NOT, AND, OR } operators
axioms ; laws and theorems

Feb 6, 2017

Review "Binary Arithmetic" from last class.

+A -A A = 65

+B -B B = 75

slip 1:

$$\begin{array}{r} 2 \overline{) 65} \\ 2 \overline{) 32} \quad -1 \\ 2 \overline{) 16} \quad -0 \\ 2 \overline{) 8} \quad -0 \\ 2 \overline{) 4} \quad -0 \\ 2 \overline{) 2} \quad -0 \\ \underline{1} \quad -0 \end{array}$$

$$\begin{array}{r} 2 \overline{) 75} \\ 2 \overline{) 37} \quad -1 \\ 2 \overline{) 18} \quad -1 \\ 2 \overline{) 9} \quad -0 \\ 2 \overline{) 4} \quad -1 \\ 2 \overline{) 2} \quad -0 \\ \underline{1} \quad -0 \end{array}$$

MSB
Most Significant
bit:

left most bit:

A

0	1	0	0	0	0	0	1
---	---	---	---	---	---	---	---

B

0	1	1	0	0	1	0	1	1	1
---	---	---	---	---	---	---	---	---	---

-A
2's comp.

1	0	1	1	1	1	1	1	0
---	---	---	---	---	---	---	---	---

0 +
1 - 2's comp

1	0	1	1	0	1	0	0
---	---	---	---	---	---	---	---

1	1	0	1	1	1	1	1
---	---	---	---	---	---	---	---

1	0	1	1	0	1	0	1
---	---	---	---	---	---	---	---

A+B

0	1	0	0	0	0	0	1		
0	1	0	0	1	0	1	1		
1	0	0	0	1	1	0	0		

overflow: bit carried into MSB \neq bit carried out of MSB

A-B = A + (-B)

$$\begin{array}{r} 010000001 \\ + 10110101 \\ \hline 11110110 \end{array}$$

no overflow

Result is: negative

out of MSB

-A-B = (-A) + (-B)

1	0	1	1	1	1	1	1		
1	0	1	1	0	1	0	1		
0	1	1	0	1	0	0			

bit carried into MSB: 0
bit carried out of MSB: 1
Overflow

(-A)+B

1	0	1	1	1	1	1			
0	1	0	0	1	0	1	1		
1	1	0	0	0	1	0	1		

no overflow

Result is:
sign of result is: positive

2's comp: (2's comp(x)) = x