



CSARCH Lecture Series: Signed Integer Representation (1's complement)

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Overview

Reflect on the following question:

- Why is 1's complement representation not recommended for signed integer representation?

Overview

- This sub-module introduces the concept of representing signed integer using 1's complement representation
- The objective is as follows:
 - ✓ Describe the process of representing signed integer using 1's complement

Integer

- For an introduction of signed integer, please refer to the lecture series on Signed Integer Representation – 2's complement

1's complement

- In 1's complement, the most significant bit is used as sign bit to represent positive (0) or negative(1)
- For positive integer, the 1's complement is the same as unsigned integer (i.e., positional notation representation)
- For negative integer, perform 1's complement on the “positive” representation of the negative integer
 - 1's complement means flip or complement the bit

1's complement

- What is the 1's complement representation of +15?

positive representation 01111

Answer: 01111

- What is the 1's complement representation of -15?

positive representation 01111

1's complement 10000

Answer: 10000

1's complement

- 01011 is the 1's complement representation of which decimal number?

Since the sign bit is 0, it means positive. Use the positional notation to get the magnitude

Answer: 11

- 101010 is the 1's complement representation of which decimal number?

Since the sign bit is 1, it means negative. Get the 1's complement of the representation and use the positional notation to get the magnitude

1's complement 010101

Answer: -21

1's complement

- Given an n -bit binary, the range of the value that can be represented for signed integer is from $-(2^{n-1})-1$ to $+(2^{n-1})-1$
- Reflection: what is the 8-bit 1's complement representation of +0 and -0?

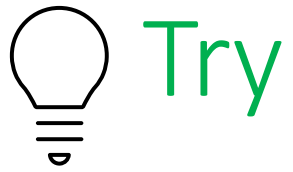
- What is the 1's complement representation of +0?

00000000

- What is the 1's complement representation of -0?

11111111

- 1's complement representation is NOT used as standard for signed integer. One reason is that it has 2 representations for decimal 0



Decimal	(8-bit) 1's complement representation
+100	
-100	

To recall ...

- What have we learned:
 - ✓ Describe the process of representing signed integer using 1's complement