NCTU-EE IC LAB – Spring2021

Online Test-Appendix

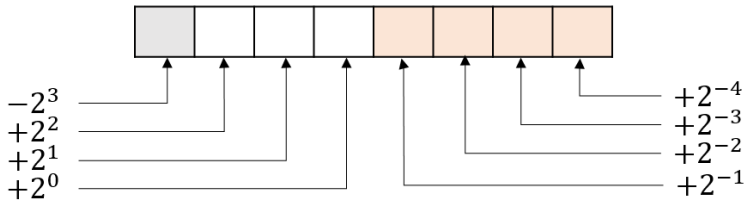
Fix point operation

◆ Description

In a regular binary integer, the bits represent powers of two. For example, decimal 13 is 1101 in binary. With decimal numbers, we use a decimal separator, a point or comma, to separate integer and fractional parts. 1001 is one thousand and one, whereas 10.01 is ten and one hundredth. We can do the same thing in binary and use the bits to represent any power of two we like. For example, we can think 4.75 as 4+1/2+1/4 or with a handy point to mark the fractional part, 100.11.

Here provide some examples for your references.

Both a and b are 1sign bit + 3 bits integer and 4 bits fractional number



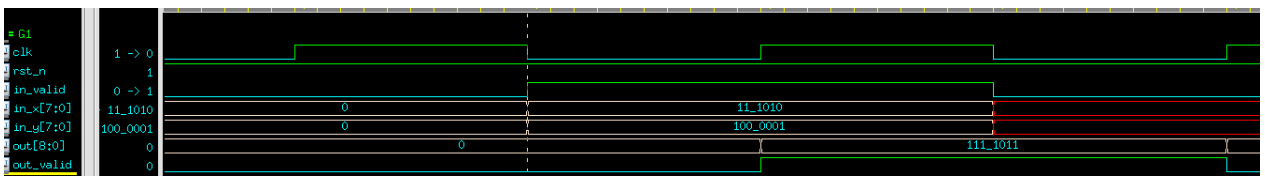
Example 1 :

a = $(0011.1010)_2$= $(3.6250)_{10}$

b = $(0100.0001)_2$= $(4.0625)_{10}$

	binary	decimal
	0011.1010	3.6250
+	0100.0001	4.0625
=	0111.1011	7.6875

Waveform :



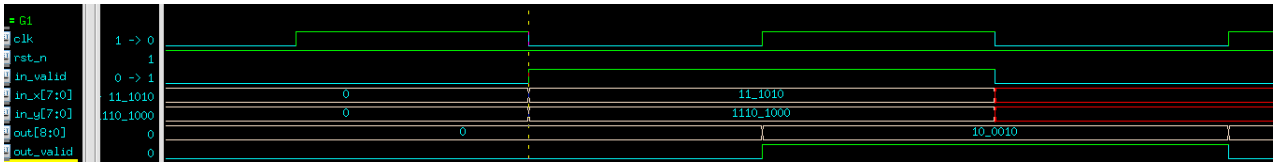
Example 2 :

a = $(0011.1010)_2$= $(3.6250)_{10}$

b = $(1110.1000)_2$= $(-1.5000)_{10}$

Waveform :

	binary	decimal
	0011.1010	3.6250
+	1110.1000	-1.5000
=	0010.0010	2.1250



Example 3 :

a = $(0011.0100)_2$= $(3.2500)_{10}$

b = $(0010.0001)_2$= $(2.0625)_{10}$

	binary	decimal
	0011.0100	3.2500
x	0010.0001	2.0625
=	00000110.10110100	6.703125

Waveform