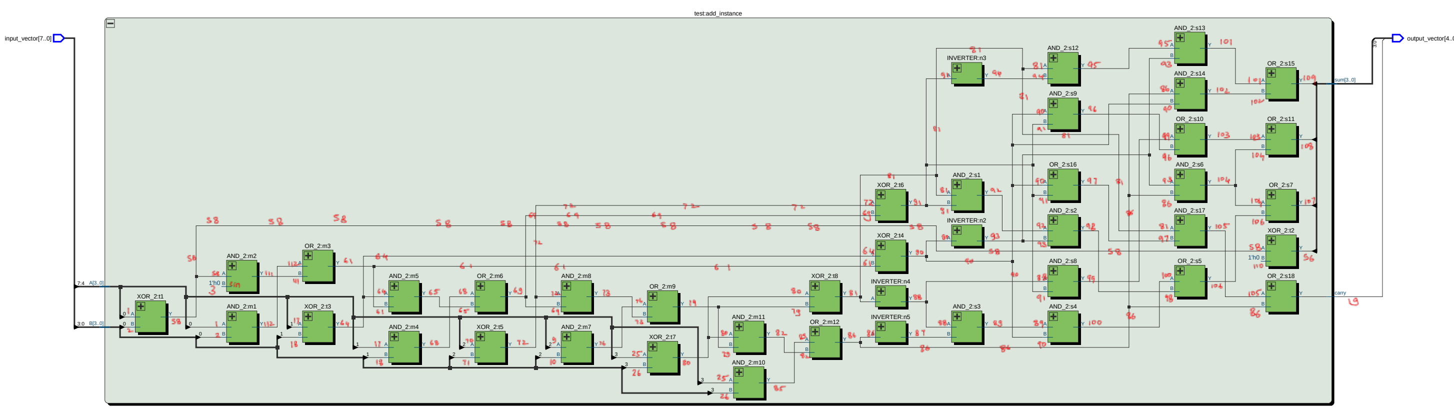
test:add_instance
input_vector[7..0]
output_vector[4..0]
XOR_2:t1
AND_2:m2
AND_2:m1
OR_2:m3
XOR_2:t3
AND_2:m5
AND_2:m4
OR_2:m6
XOR_2:t5
AND_2:m8
AND_2:m7
OR_2:m9
XOR_2:t7
AND_2:m11
AND_2:m10
XOR_2:t8
OR_2:m12
XOR_2:t6
XOR_2:t4
INVERTER:n4
INVERTER:n5
INVERTER:n3
INVERTER:n2
AND_2:s1
AND_2:s3
AND_2:s12
AND_2:s9
OR_2:s16
AND_2:s2
AND_2:s8
AND_2:s4
AND_2:s13
AND_2:s14
OR_2:s10
AND_2:s6
AND_2:s17
OR_2:s5
OR_2:s15
OR_2:s11
OR_2:s7
XOR_2:t2
OR_2:s18
sum[3..0]
carry

Specifications

- BCD Adder

inputs:

$A_3\ A_2\ A_1\ A_0 \qquad B_3\ B_2\ B_1\ B_0 \qquad C_{in}$

output: $C_o \quad S_3\ S_2\ S_1\ S_0$

Equations:

$$S_0' = A_0 \oplus B_0 \oplus C_{in}$$

$$S_1' = A_1 \oplus B_1 \oplus C_1$$

$$S_2' = A_2 \oplus B_2 \oplus C_2$$

$$S_3' = A_3 \oplus B_3 \oplus C_3$$

$$C_1 = A_0 \cdot B_0 + C_{in}(A_0 \oplus B_0)$$

$$C_2 = A_1 \cdot B_1 + C_1(A_1 \oplus B_1)$$

$$C_3 = A_2 \cdot B_2 + C_2(A_2 \oplus B_2)$$

$$C_{out} = A_3 \cdot B_3 + C_3(A_3 \oplus B_3)$$

$$S_0 = S_0'$$

$$S_1 = \overline{C_{out}}\,(S_3' S_2' \overline{S_1'} + \overline{S_3'} S_1') + C_{out}\,\overline{S_1'}$$

$$S_2 = \overline{S_3'}\,S_2' + S_2' S_1' + C_{out}\,\overline{S_1'}$$

$$S_3 = S_3' \overline{S_2'}\,\overline{S_1'} + C_{out}\,S_1'$$

$$C_o = C_{out} + S_3' S_2' + S_3' S_1'$$

don't care condition: $A_3 \cdot (A_2 + A_1) \cdot B_3 \cdot (B_2 + B_1)$