CARRY LOOK AHEAD ADDER

It is a method for fast addition.

Ex:

```
  1 1 0 1
+ 1 1 0 0
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1 1 0 0 1
---------
```

Each full added have a propagation delay of 25ns.

∴ for 4 bit parallel adder the delay is 100 ns.

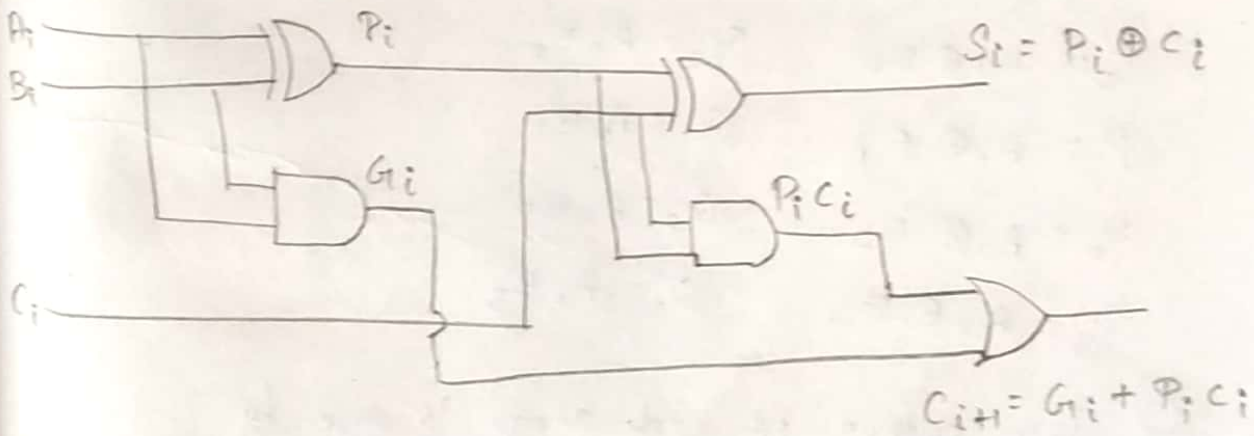
∴ The total time required to produce the output 11001 is 100ns.

The speed of addition process can be increased by using carry look ahead adder

We define 2 functions Carry generate G_i and Carry propagate P_i.

$$P_i = A_i \oplus B_i$$

$$G_i = A_i B_i$$



The output Sum and carry is given by

$$\text{Sum } S_i = P_i \oplus C_i$$

$$\text{Carry } C_{i+1} = G_i + P_i C_i$$

The Carry output of each stage can be written as

$C_1 = G_0 + P_0 C_0$ where C_0 is the input carry

$$C_2 = G_1 + P_1 C_1 = G_1 + P_1 (G_0 + P_0 C_0) = G_1 + P_1 G_0 + P_1 P_0 C_0$$

$$C_3 = G_2 + P_2 C_2 = G_2 + P_2 (G_1 + P_1 G_0 + P_1 P_0 C_0)$$

$$C_3 = G_2 + P_2 G_1 + P_2 P_1 G_0 + P_2 P_1 P_0 C_0$$

From the above expression of C_1, C_2, C_3 it can be seen that C_3 does not have to wait for C_2 and C_1 to propagate. C_3 is estimated at the same time as C_2 and C_1 are estimated.

The Carry propagate and carry generate functions are given by,

$P_0 = A_0 \oplus B_0$ $\quad G_0 = A_0 B_0$

$P_1 = A_1 \oplus B_1$ $\quad G_1 = A_1 B_1$

$P_2 = A_2 \oplus B_2$ $\quad G_2 = A_2 B_2$

$P_3 = A_3 \oplus B_3$ $\quad G_3 = A_3 B_3$

The Sum output of each stage is given by.

$S_0 = P_0 \oplus C_0$ $\quad S_1 = P_1 \oplus C_1$

$S_2 = P_2 \oplus C_2$ $\quad S_3 = P_3 \oplus C_3$