

Signed-Operand Multiplication

Booth Algorithm

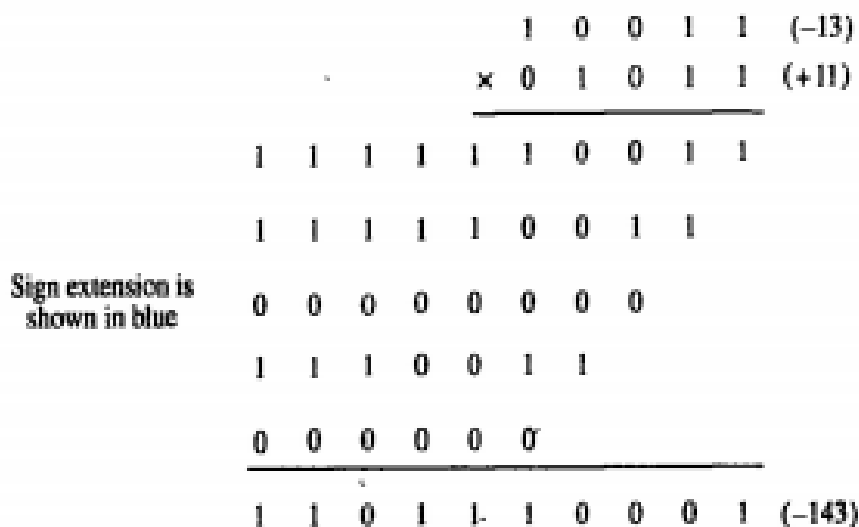


Figure 6.8 Sign extension of negative multiplicand.

45*30

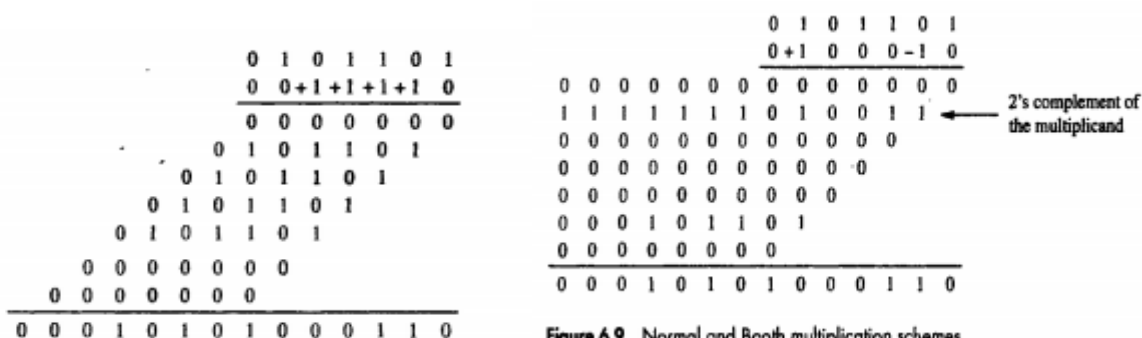


Figure 6.9 Normal and Booth multiplication schemes.

difference between two numbers:

$$\begin{array}{r}
 0100000 \text{ (32)} \\
 -000010 \text{ (2)} \\
 \hline
 0011110 \text{ (30)}
 \end{array}$$

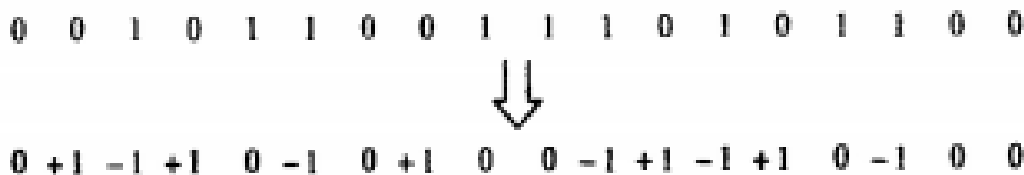


Figure 6.10 Booth recoding of a multiplier.

Multiplier		Version of multiplicand selected by bit i
Bit i	Bit $i - 1$	
0	0	$0 \times M$
0	1	$+1 \times M$
1	0	$-1 \times M$
1	1	$0 \times M$

Figure 6.12 Booth multiplier recoding table.

$$\begin{array}{r}
 01101 \quad (+13) \\
 \times 11010 \quad (-6) \\
 \hline
 \end{array}
 \Rightarrow
 \begin{array}{r}
 01101 \\
 \underline{0-1+1-10} \\
 0000000000 \\
 111110011 \\
 00001101 \\
 1110011 \\
 \underline{000000} \\
 1110110010 \quad (-78)
 \end{array}$$

Figure 6.11 Booth multiplication with a negative multiplier.

Worst-case multiplier	0101010101010101
	+1 -1 +1 -1 +1 -1 +1 -1 +1 -1 +1 -1 +1 -1
Ordinary multiplier	1100010110111100
	0 -1 0 0 +1 -1 +1 0 -1 +1 0 0 0 -1 0 0
Good multiplier	0000111110000111
	0 0 0 +1 0 0 0 0 -1 0 0 0 +1 0 0 -1

Figure 6.13 Booth recoded multipliers.