

Modified Booth Algorithm

1. M = Multiplicand (n bits),
 $A = 0$, Q = Multiplier (n bits)
2. Count = $n/2$
3. While (Count $\neq 0$)
 - a. If $Q_1Q_0Q_{-1} = 001$
 - i. $A \leftarrow A + M$
 - b. Else if $Q_1Q_0Q_{-1} = 010$
 - i. $A \leftarrow A + M$
 - c. Else if $Q_1Q_0Q_{-1} = 011$
 - i. shift left M by 1 bit
 - ii. $A \leftarrow A + M$
 - d. Else if $Q_1Q_0Q_{-1} = 100$
 - i. shift left M by 1 bit
 - ii. $A \leftarrow A + \overline{M} + 1$
 - e. Else if $Q_1Q_0Q_{-1} = 101$
 - i. $A \leftarrow A + \overline{M} + 1$
 - f. Else if $Q_1Q_0Q_{-1} = 110$
 - i. $A \leftarrow A + \overline{M} + 1$
 - g. Arithmetic shift right A , Q , Q_{-1}
 - h. Arithmetic shift right A , Q , Q_{-1}
 - i. Count \leftarrow Count - 1

Recoding table

Y_{i+1}	Y_i	Y_{i-1}	Partial Products
0	0	0	0* <i>Multiplicand</i>
0	0	1	1* <i>Multiplicand</i>
0	1	0	1* <i>Multiplicand</i>
0	1	1	2* <i>Multiplicand</i>
1	0	0	-2* <i>Multiplicand</i>
1	0	1	-1* <i>Multiplicand</i>
1	1	0	-1* <i>Multiplicand</i>
1	1	1	-0* <i>Multiplicand</i>

Example

Perform modified Booth on the following numbers:

$-9 \times -13 = 117$

$M = -9 \Rightarrow 110111$ $9 \rightarrow 001001$
 $-9 \rightarrow 110111$

$Q = -13 \Rightarrow 110011$ $13 \rightarrow 001101$
 $-13 \rightarrow 110011$

Initial setting:

Accumulator Register A: 000000

Register Q (Multiplier) = 110011 $\rightarrow (-13)$

Register M (Multiplicand) = 110111 $\rightarrow (-9)$

	A	Q	Q_{-1}
I	000000	110011	0
A ← A - M	001001		
	001001	110011	0
ASR	000100	111001	1
ASR	000010	011100	1
II	110111		
A ← A + M	111001	011100	1
	111001	101110	0
ASR	111100	010111	0
ASR	111110		
III	001001		
A ← A - M	000111	010111	0
	000111	101011	1
ASR	000011	110101	1
ASR	000001		
Stop Q_{-1} (Previous LSE) Product = 000001 110101 = 117			

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