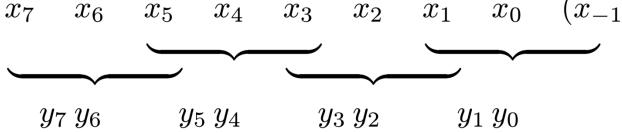
Modified Booth's Algorithm

- Guarantees that the maximum number of summands that must be added is n/2 for n-bit operands.
- Bit pair recoding technique
- Observe the following:
 - The pair (+1, -1) is equivalent to the pair (0, +1)
 - -(+1, 0) is equivalent to (0, +2)
 - x_1 x_4 x_3 x_2 x_5 x_6 -(-1,
- Exam



Modified Booth's Algorithm

101101	101101
<u>× -1 1</u>	× -1
1101101	010011
10010011	0010011

Modified Booth's Algorithm

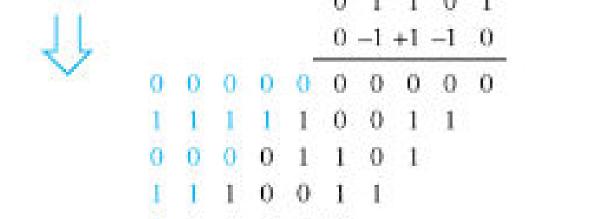
	1	0	1	1	0	1	
		,	×	1	•	0	_
0	0	0	0	0	0	0	-
1	0	1	1	0	1		
1	0	1	1	0	1	0	

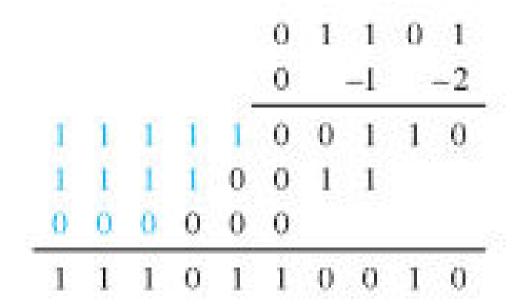
Table of Multiplicand and Selection decisions

Multip	olier Bit-Pair	Multiplier	Booths Represenation		Multiplicand selected at	
i + 1	İ	bit on the right i –			position i	
0	0	0	0	0	0 x M	
0	0	1	0	1	+ 1 x M	
0	1	0	1	-1	+1 x M	
0	1	1	1	0	+ 2 x M	
1	0	0	-1	0	- 2 x M	
1	0	1	-1	1	- 1 x M	
1	1	0	0	-1	-1 x M	
1	1	1	0	0	0 x M	

Select Line (encoding)	Partial Products (operation)			
000	add 0			
001	add multiplicand			
010	add mulitplicand			
011	add 2*multiplicand			
100	subtract 2*multiplicand			
101	subtract multiplicand			
110	subtract multiplicand			
111	subtract 0			

Multiplication requiring only n/2 summands







Modified Booth's Multiplication - Example

Example: $-9 \times -13 = 117$

 $M = 110111, \overline{M} + 1 = 001001$

Comment	Α	Q	Q ₋₁	SC
	000000	110011	0	3
Subtract M	001001			
	001001			
Ashr	000100	111001	1_	
Ashr	000010	011100	1	2
Add M	110111			
	111001			
Ashr	111100	101110	0	
Ashr	111110	010111	0	1
Subtract M	001001			
	000111			
Ashr	000011	101011	1	
Ashr	000001	110101	1	0

Modified Booth's Multiplication - Example

Example: 13x9 = 117

 $M = 001101, \overline{M} + 1 = 110011$

Α	Q	Q ₋₁	SC
000000	001001	0	3
001101			
001101			
000110	100100	1	
000011	01 0010	0	2
's100110			
101001			
110100	101001	0	
111010	010100	1	1
001101			
000111			
000011 000001	101010 110101	0 0	0
	000000 001101 001101 000110 000011 's100110 101001 110100 01101 000111 000011	000000 0010 <mark>01</mark> 001101 001101 000110 100100 000011 01 00 1 0 's100110 110100 101001 111010 0101 0 0 001101 000011 101010	000000 0010 <mark>01 0</mark> 001101 000110 100100 1 000011 01 0010 0 's100110 101001 110100 101001 0 111010 010100 1 000111 000011 101010 0