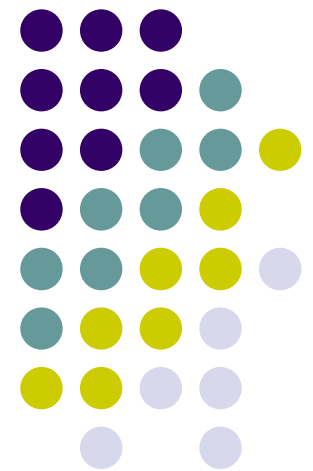


Fast Multiplication

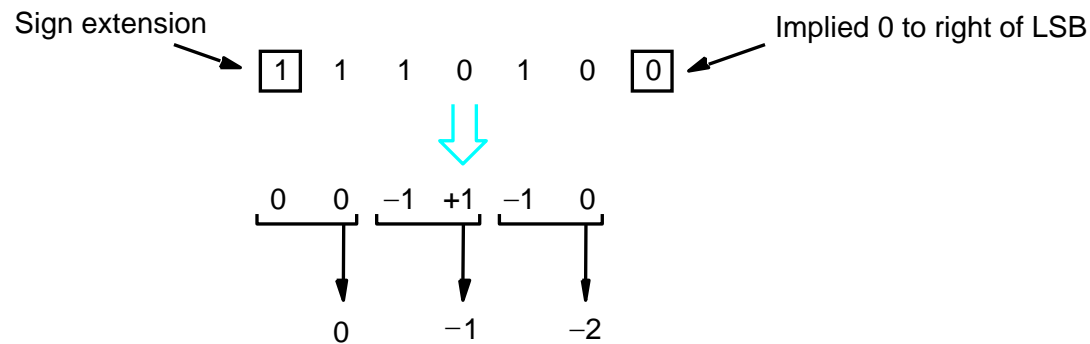
Bit-Pair Recoding of Multipliers



Bit-Pair Recoding of Multipliers



- Bit-pair recoding halves the maximum number of summands (versions of the multiplicand).



(a) Example of bit-pair recoding derived from Booth recoding

Bit-Pair Recoding of Multipliers



Multiplier bit-pair		Multiplier bit on the right $i-1$	Multiplicand selected at position i
$i+1$	i		
0	0	0	0 $\times M$
0	0	1	+ 1 $\times M$
0	1	0	+ 1 $\times M$
0	1	1	+ 2 $\times M$
1	0	0	- 2 $\times M$
1	0	1	- 1 $\times M$
1	1	0	- 1 $\times M$
1	1	1	0 $\times M$

(b) Table of multiplicand selection decisions

Bit-Pair Recoding of Multipliers



$$\begin{array}{r} 0\ 1\ 1\ 0\ 1\ (+13) \\ \underline{1\ 1\ 0\ 1\ 0\ (-6)} \end{array}$$



$$\begin{array}{r} 0\ 1\ 1\ 0\ 1 \\ \underline{0\ -1\ +1\ -1\ 0} \\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0 \\ 1\ 1\ 1\ 1\ 1\ 0\ 0\ 1\ 1 \\ 0\ 0\ 0\ 0\ 1\ 1\ 0\ 1 \\ 1\ 1\ 1\ 0\ 0\ 1\ 1 \\ 0\ 0\ 0\ 0\ 0\ 0 \\ \hline 1\ 1\ 1\ 0\ 1\ 1\ 0\ 0\ 1\ 0\ (-78) \end{array}$$



$$\begin{array}{r} 0\ 1\ 1\ 0\ 1 \\ \underline{0\ -1\ -2} \\ 1\ 1\ 1\ 1\ 1\ 0\ 0\ 1\ 1\ 0 \\ 1\ 1\ 1\ 1\ 0\ 0\ 1\ 1 \\ 0\ 0\ 0\ 0\ 0\ 0 \\ \hline 1\ 1\ 1\ 0\ 1\ 1\ 0\ 0\ 1\ 0 \end{array}$$

Multiplication requiring only $n/2$ summands.