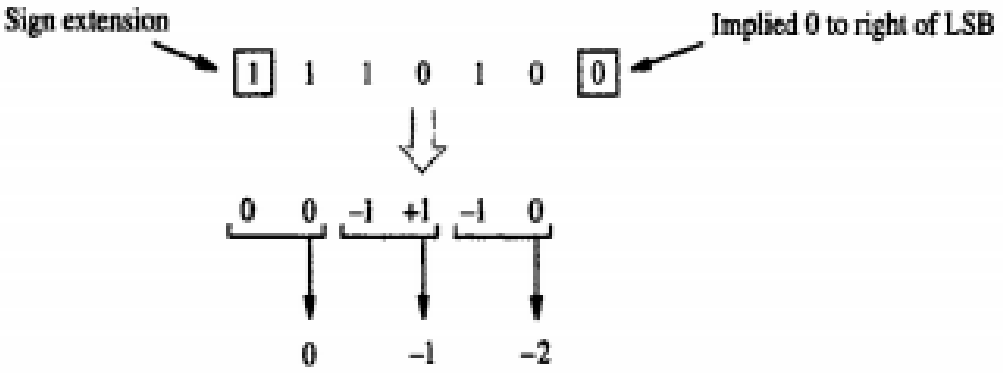
Fast Multiplication

1. Bit-Pair Recoding of Multipliers
2. Carry-Save Addition of Summands

Bit-Pair Recoding of Multipliers



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

Multiplier bit-pair		Multiplier bit on the right	Multiplicand selected at position i
$i+1$	i	$i-1$	
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

Figure 6.14 Multiplier bit-pair recoding.

```
      0  1  1  0  1   (+13)
    x 1  1  0  1  0   (-6)
  ---------------------
```

```
                  0  1  1  0  1
                  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
-------------------------------
1  1  1  0  1  1  0  0  1  0   (-78)
```

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

Figure 6.15 Multiplication requiring only $n/2$ summands.