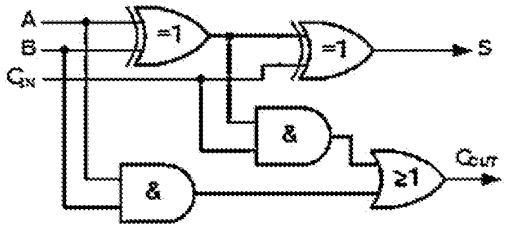


Truth Table			
B	A	SUM	CARRY
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

(PRIOR ART)

Figure 1



Truth Table				
C-in	B	A	Sum	C-out
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

(PRIOR ART)

Figure 2

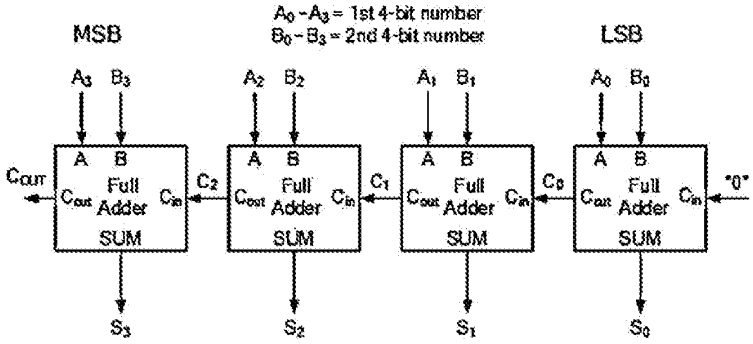


Figure 3 (PRIOR ART)

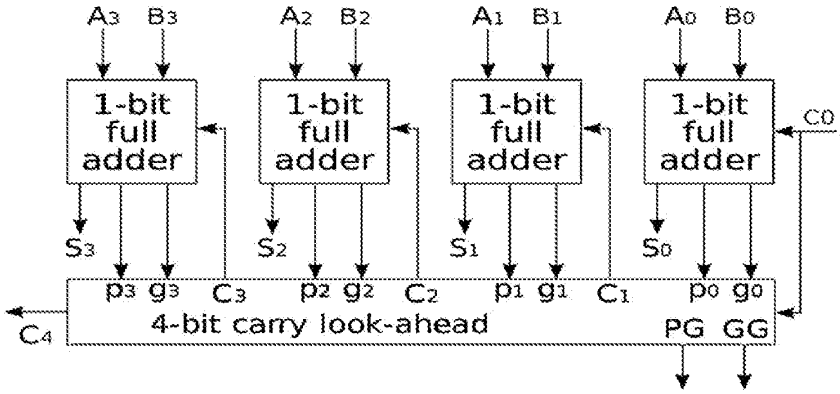


Figure 4 (PRIOR ART)

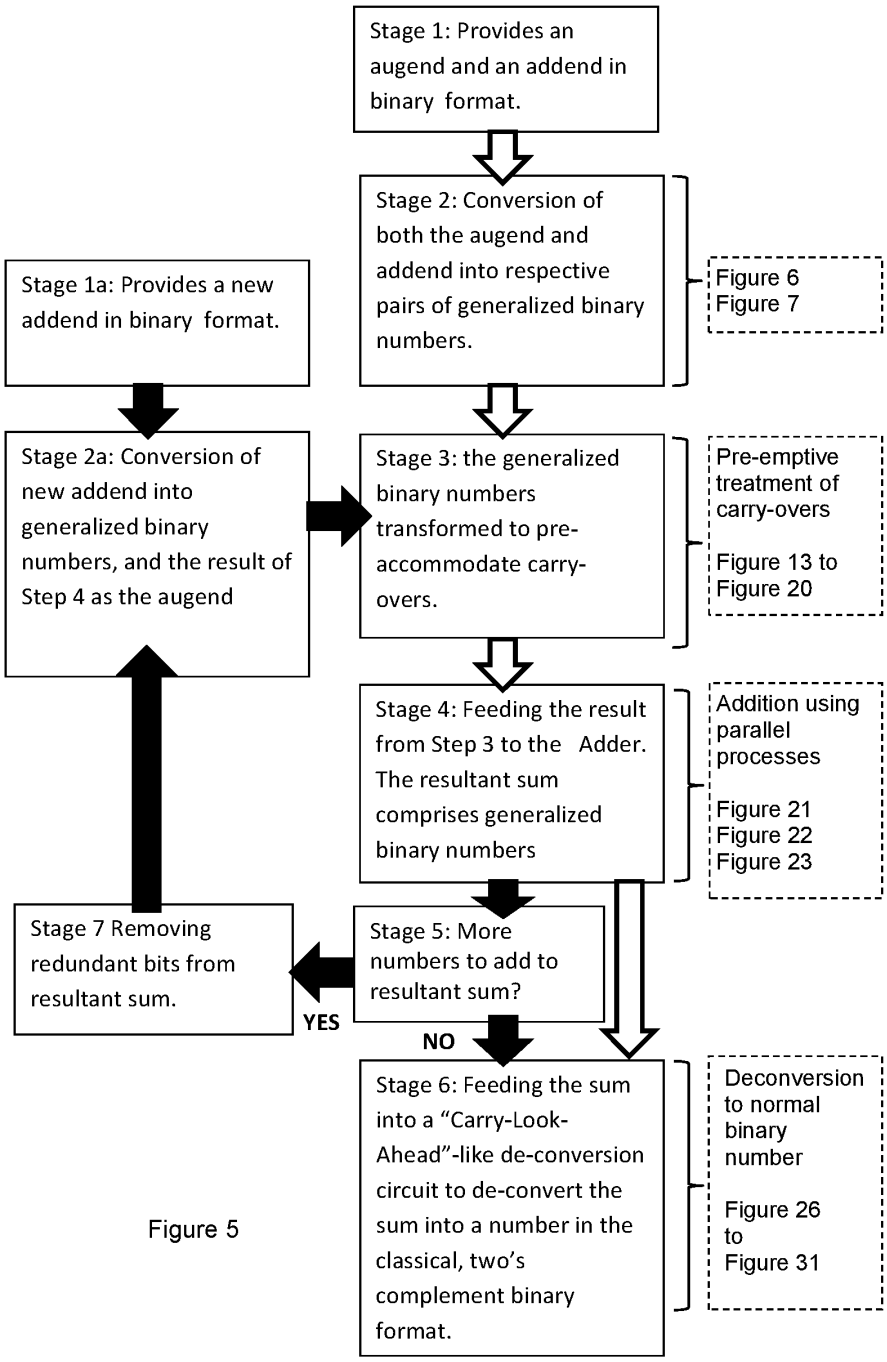

Stage 1: Provides an augend and an addend in binary format.
Stage 2: Conversion of both the augend and addend into respective pairs of generalized binary numbers.
Figure 6
Figure 7
Stage 1a: Provides a new addend in binary format.
Stage 2a: Conversion of new addend into generalized binary numbers, and the result of Step 4 as the augend
Stage 3: the generalized binary numbers transformed to pre-accommodate carry-overs.
Pre-emptive treatment of carry-overs
Figure 13 to Figure 20
Stage 4: Feeding the result from Step 3 to the Adder. The resultant sum comprises generalized binary numbers
Addition using parallel processes
Figure 21
Figure 22
Figure 23
Stage 7 Removing redundant bits from resultant sum.
Stage 5: More numbers to add to resultant sum?
YES
NO
Stage 6: Feeding the sum into a "Carry-Look-Ahead"-like de-conversion circuit to de-convert the sum into a number in the classical, two's complement binary format.
Deconversion to normal binary number
Figure 26 to Figure 31

Figure 5

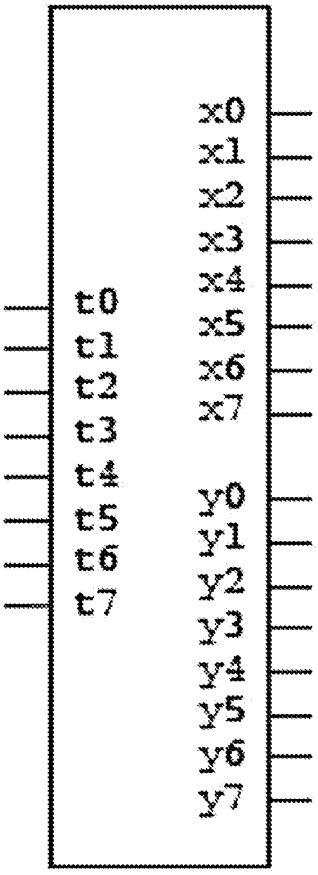


Figure 6

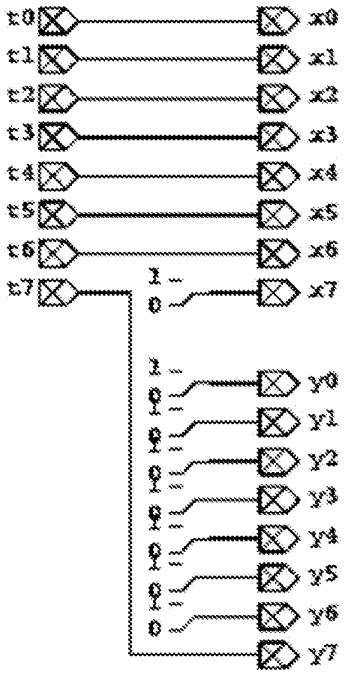


Figure 7

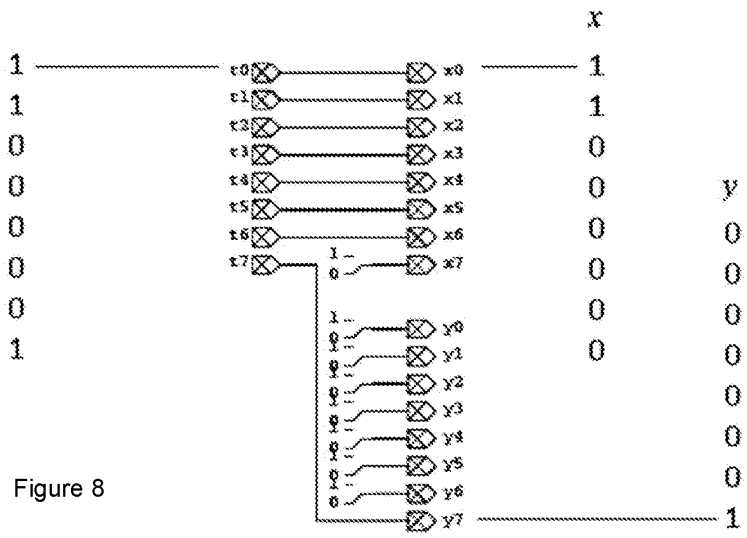


Figure 8

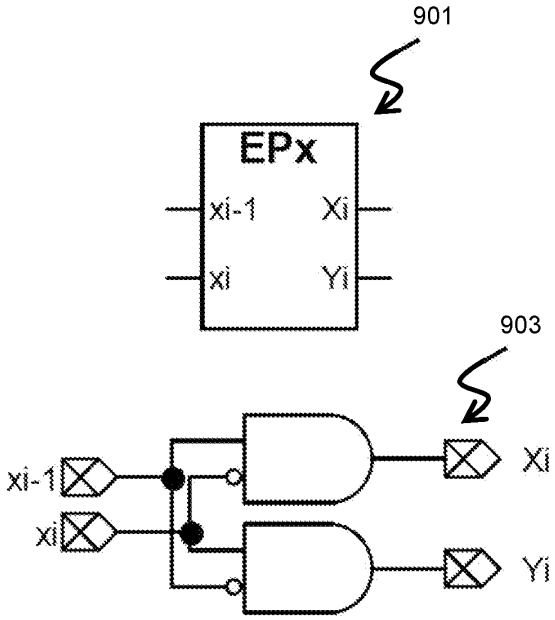


Figure 9

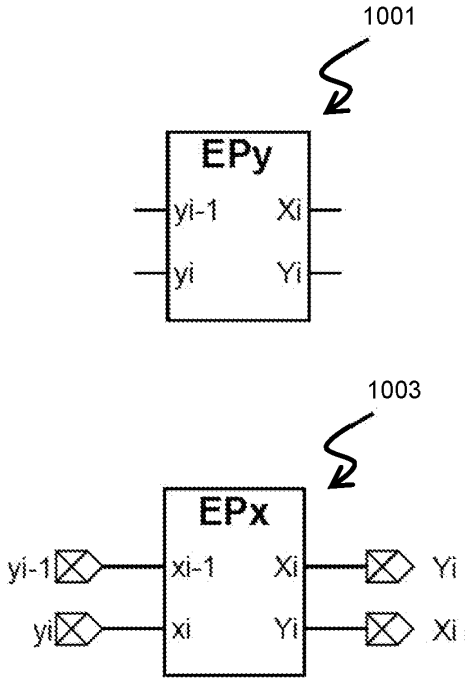


Figure 10

Substring of m (≥ 1) 1's				Substring of m (≥ 1) $\overline{1}$'s			
x_i	x_{i-1}	X_i	Y_i	y_i	y_{i-1}	X_i	Y_i
0	0	0	0	0	0	0	0
0	1	1	0	0	$\overline{1}$	0	$\overline{1}$
1	0	0	$\overline{1}$	$\overline{1}$	0	1	0
1	1	0	0	$\overline{1}$	$\overline{1}$	0	0

Figure 11

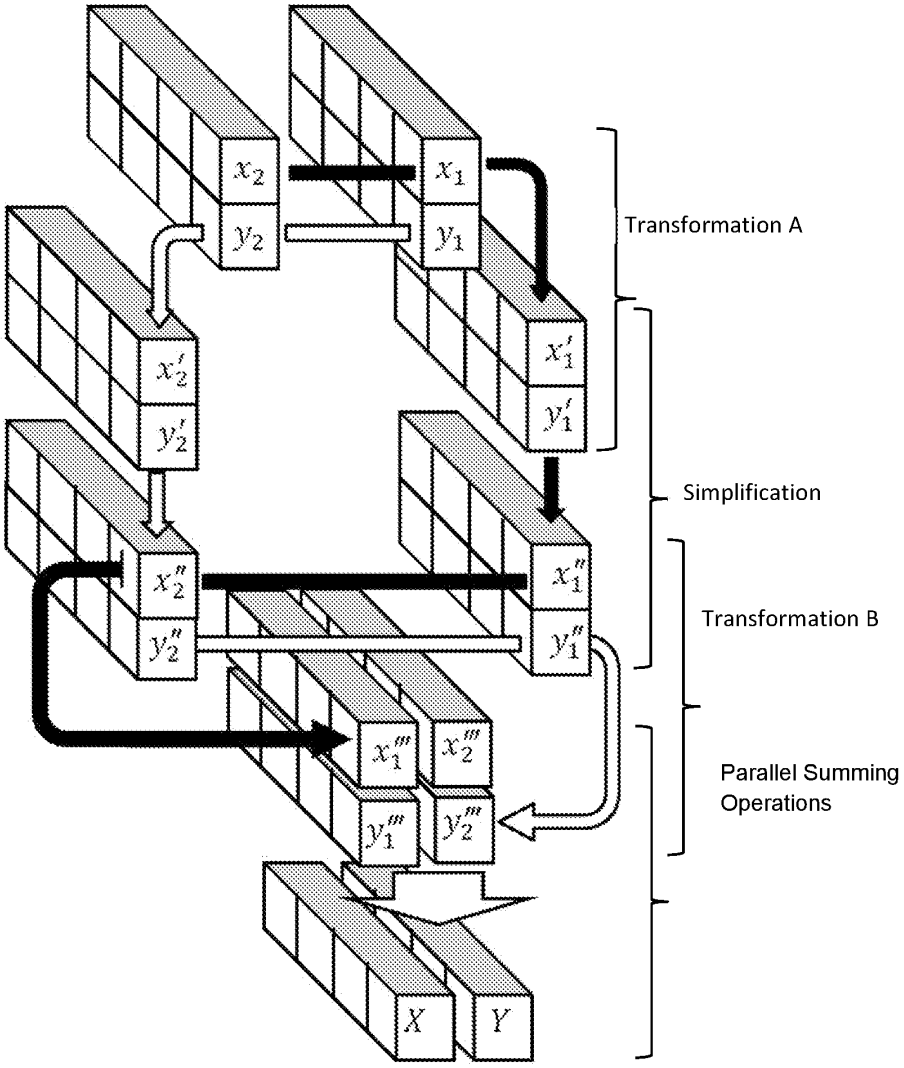

x_2
x_1
y_2
y_1
Transformation A
x_2'
x_1'
y_2'
y_1'
Simplification
x_2''
x_1''
y_2''
y_1''
Transformation B
x_1'''
x_2'''
y_1'''
y_2'''
Parallel Summing Operations
X
Y

Figure 12

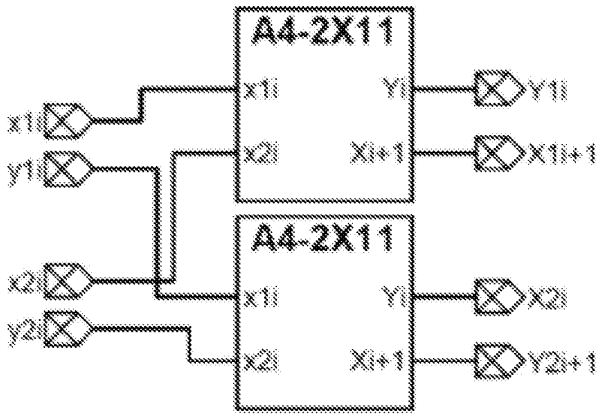


Figure 13

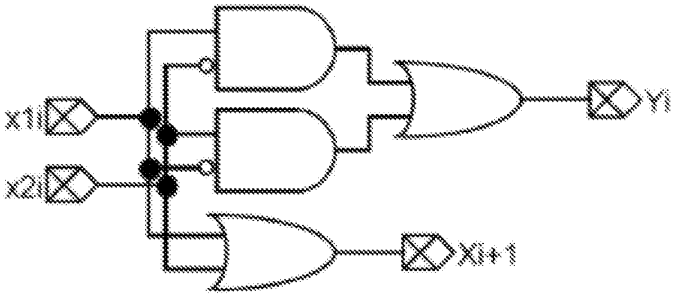


Figure 14

Positive input components				Negative input components			
Input n_w^+		Output $(n'_w)_1$		Input n_w^-		Output $(n'_w)_2$	
$(x_i)_1$	$(x_i)_2$	$(x'_{i+1})_1$ ‡	$(y'_i)_1$ §	$(y_i)_1$	$(y_i)_2$	$(y'_{i+1})_2$	$(x'_i)_2$
0	0	0	0	0	0	0	0
0	1	1	$\overline{1}$	0	$\overline{1}$	$\overline{1}$	1
1	0	1	$\overline{1}$	$\overline{1}$	0	$\overline{1}$	1
1	1	1	0	$\overline{1}$	$\overline{1}$	$\overline{1}$	0

Figure 15

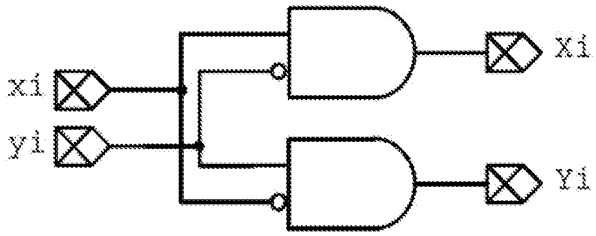


Figure 16

Input $\hat{z}_j$	Output z'_j
0^*	0
1	1
$\overline{1}$	$\overline{1}$

0^* implies $\hat{x}_j = \hat{y}_j = 0$ or $\hat{x}_j = \hat{y}_j = 1$

Figure 17

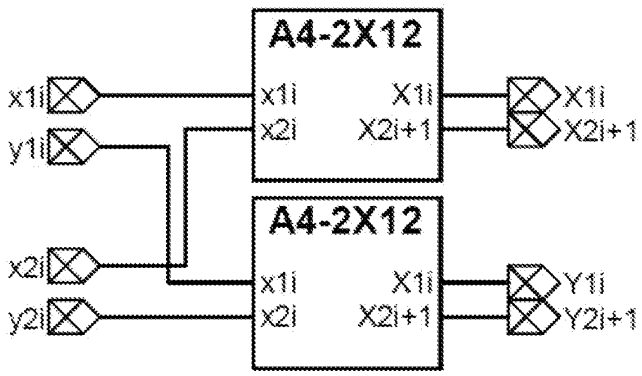


Figure 18

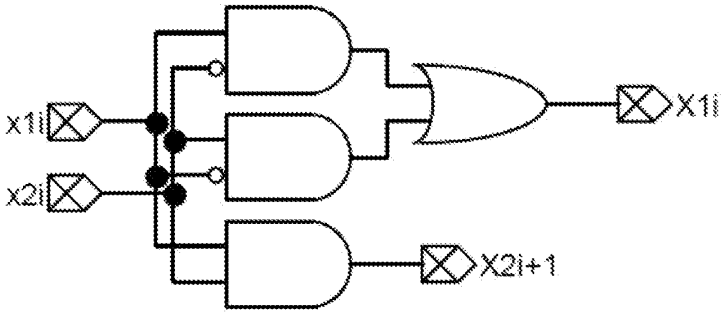


Figure 19

Positive input		Output		Negative input		Output	
$(x_i^n)_1$	$(x_i^n)_2$	$(x_{n+1}^m)_2$	$(x_i^m)_1$	$(y_i^n)_1$	$(y_i^n)_2$	$(y_{i+1}^m)_2$	$(y_i^m)_1$
0	0	0	0	0	0	0	0
0	1	0	1	0	$\overline{1}$	0	$\overline{1}$
1	0	0	1	$\overline{1}$	0	0	$\overline{1}$
1	1	1	0	$\overline{1}$	$\overline{1}$	$\overline{1}$	0

Figure 20

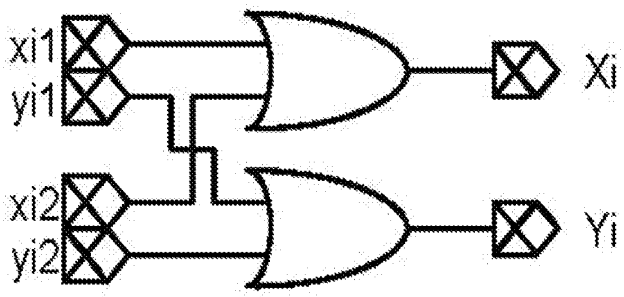


Figure 21

Input n_w^m		Output N_w
$(z_i^m)_1$	$(z_i^m)_2$	Z_i
0^*	0	0
0^*	1	1
0^*	$\overline{1}$	$\overline{1}$
1	0	1
1	1	*
1	$\overline{1}$	0
$\overline{1}$	0	$\overline{1}$
$\overline{1}$	1	0
$\overline{1}$	$\overline{1}$	*

*: $(z_i^m)_1 = 0$ implies $(x_i^m)_1 = (y_i^m)_1 = 0$ or $(x_i^m)_1 = (y_i^m)_1 = 1$

*: impossible inputs

Figure 22

Inputs				Outputs		Simplified Outputs	
x_1'''	y_1'''	x_2'''	y_2'''	X'	Y'	X	Y
0	0	0	0	0	0	0	0
0	0	1	0	1	0	1	0
0	0	0	$\overline{1}$	0	$\overline{1}$	0	$\overline{1}$
1	0	0	0	1	0	1	0
1	0	1	0	Prevented			
1	0	0	$\overline{1}$	1	$\overline{1}$	0	0
0	$\overline{1}$	0	0	0	$\overline{1}$	0	$\overline{1}$
0	$\overline{1}$	1	0	1	$\overline{1}$	0	0
0	$\overline{1}$	0	$\overline{1}$	Prevented			

Figure 23

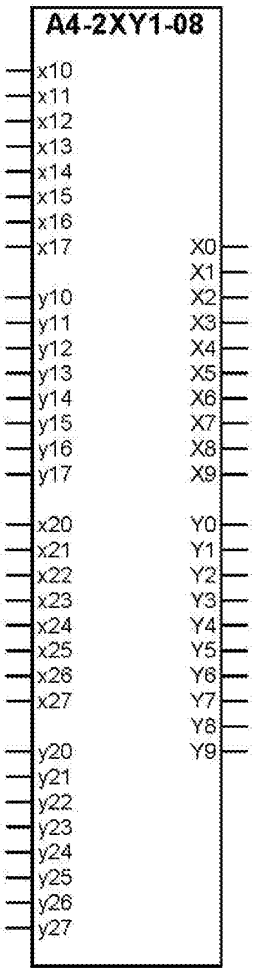

A4-2XY1-08
x10
x11
x12
x13
x14
x15
x16
x17
y10
y11
y12
y13
y14
y15
y16
y17
x20
x21
x22
x23
x24
x25
x26
x27
y20
y21
y22
y23
y24
y25
y26
y27
X0
X1
X2
X3
X4
X5
X6
X7
X8
X9
Y0
Y1
Y2
Y3
Y4
Y5
Y6
Y7
Y8
Y9

Figure 24

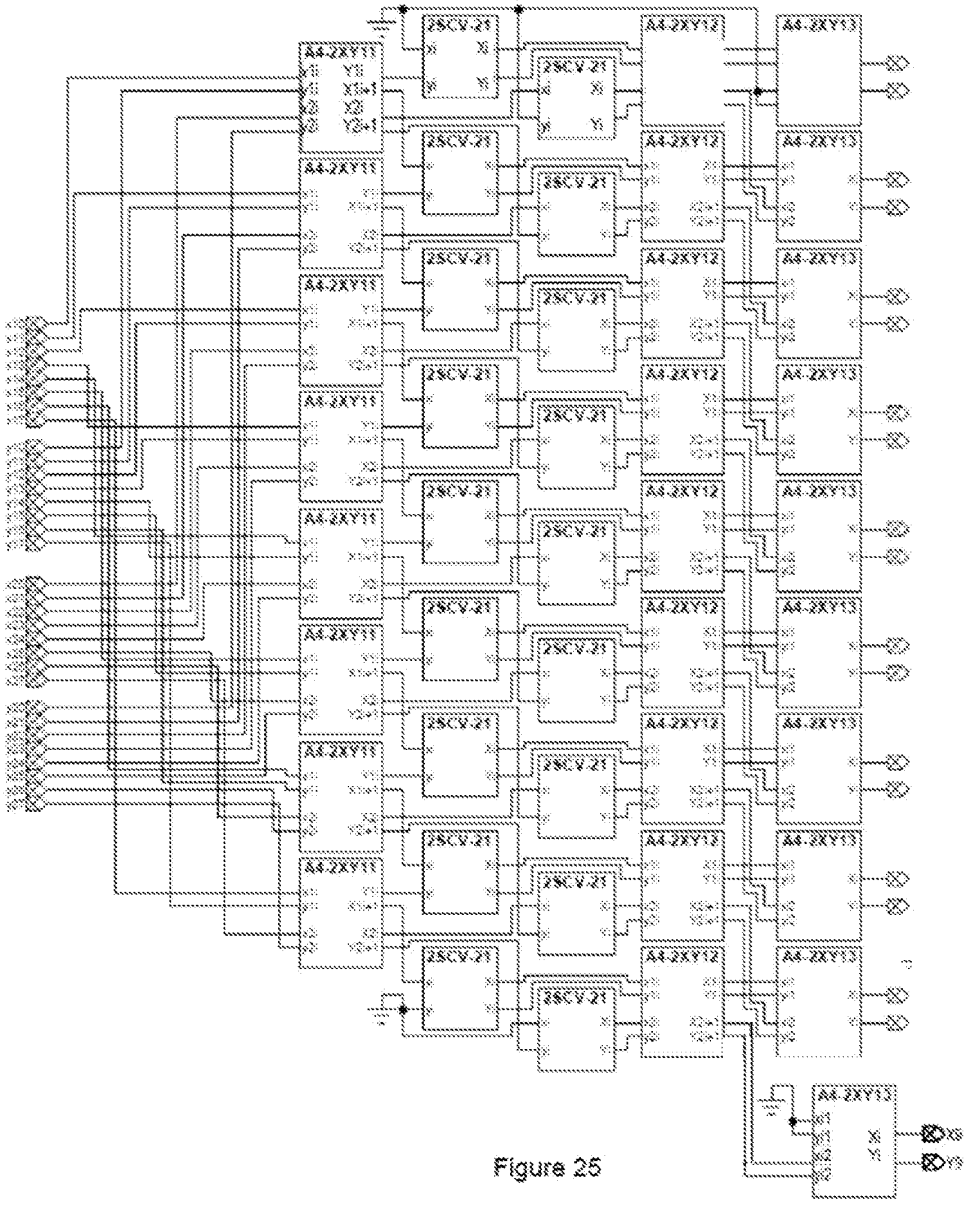


Figure 25

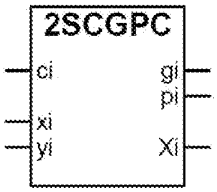


Figure 26

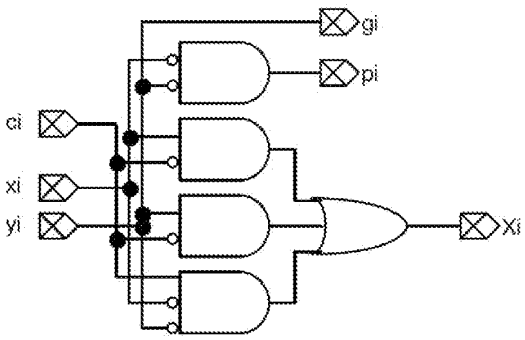


Figure 27

Input z_i	Generate g_i	Propagate p_i
0 ($x_i = y_i = 0$ only)	0	1
1	0	0
$\overline{1}$	1	0

Figure 28

"carry" c_i	General binary number z_i	2's complement number X_i
0	0	0
0	1	1
0	$\overline{1}$	1
1	0	1
1	1	0
1	$\overline{1}$	0

where $i = 0, 1, 2, \cdots, (n-1)$.

Figure 29

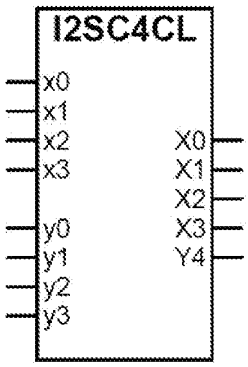


Figure 30

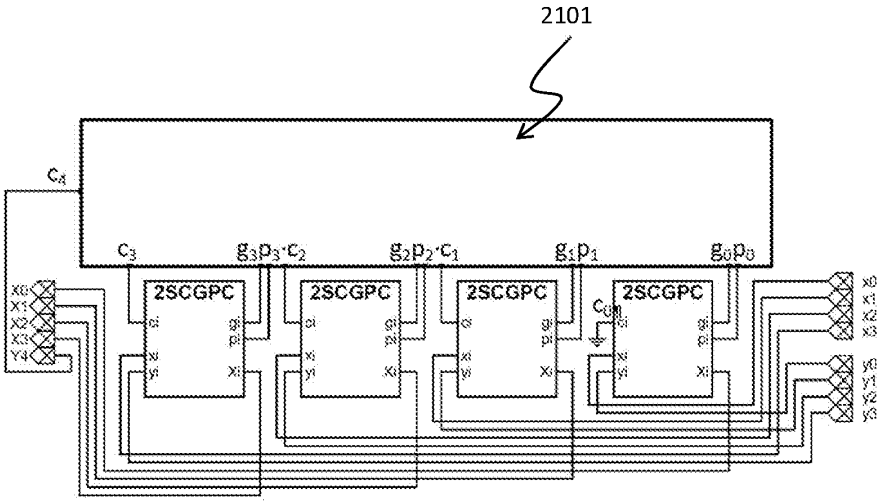


Figure 31

Input		Output		Input		Output	
$(x_i)_1$	$(x_i)_2$	$(x_i')_1$	$(x_i')_2$	$(y_i)_1$	$(y_i)_2$	$(y_i')_1$	$(y_i')_2$
0	0	0	0	0	0	0	0
0	1	1	0	0	$\overline{1}$	$\overline{1}$	0
1	0	1	0	$\overline{1}$	0	$\overline{1}$	0
1	1	1	1	$\overline{1}$	$\overline{1}$	$\overline{1}$	$\overline{1}$

Figure 32

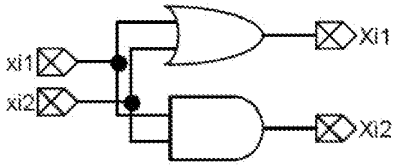


Figure 33

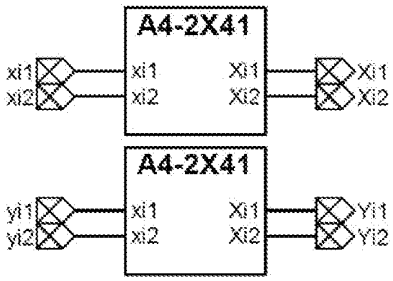


Figure 34

Input			Output			Input			Output		
$(x_i')_1$	$(x_i')_2$	$(x_{i-1}')_1$	$(x_i'')_1$	$(x_i'')_2$	$(y_i'')_3$	$(y_i')_1$	$(y_i')_2$	$(y_{i-1}')_1$	$(y_i'')_1$	$(y_i'')_2$	$(x_i'')_3$
0	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	1	0	0	0	$\overline{1}$	0	$\overline{1}$	0
0	1	0	*	*	*	0	$\overline{1}$	0	*	*	*
0	1	1	*	*	*	0	$\overline{1}$	$\overline{1}$	*	*	*
1	0	0	0	0	$\overline{1}$	$\overline{1}$	0	0	0	0	1
1	0	1	0	0	0	$\overline{1}$	0	$\overline{1}$	0	0	0
1	1	0	0	0	0	$\overline{1}$	$\overline{1}$	0	0	0	0
1	1	1	1	0	0	$\overline{1}$	$\overline{1}$	$\overline{1}$	$\overline{1}$	0	0

Figure 35

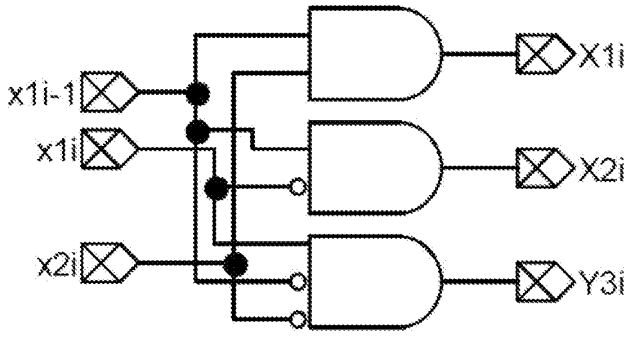


Figure 36

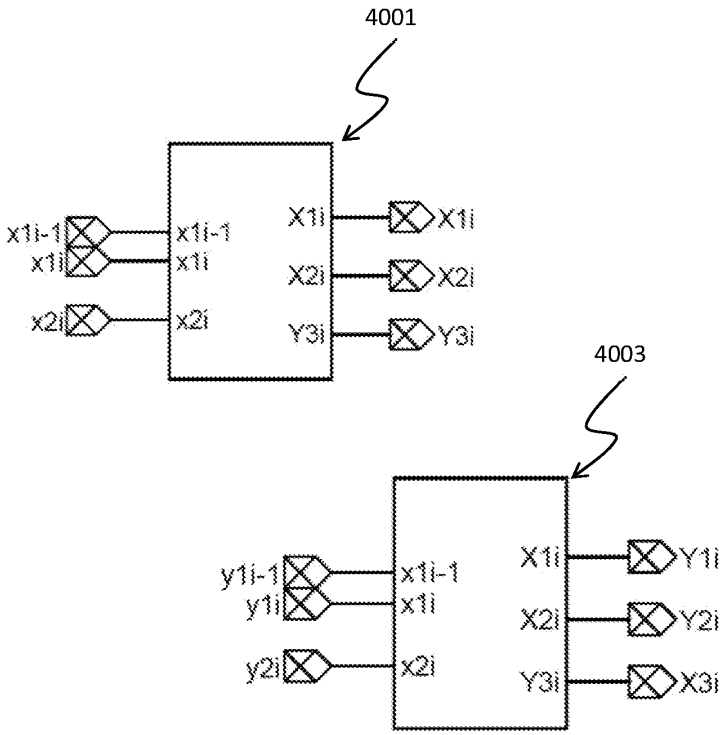

4001
x1i-1
x1i
x2i
x1i-1
x1i
x2i
X1i
X2i
Y3i
X1i
X2i
Y3i
4003
y1i-1
y1i
y2i
x1i-1
x1i
x2i
X1i
X2i
Y3i
Y1i
Y2i
X3i

Figure 37

Input*					Output
$(x_i'')_1$	$(x_i'')_2$	$(x_i'')_3$	$(x_{i-1}'')_2$	$(x_{i-1}'')_3$	x_i'''
0	0	0	0	0	0
0	0	0	0	1	0
0	0	0	1	0	0
0	0	0	1	1	1
0	0	1	0	0	1
0	0	1	1	0	1
0	1	0	0	0	1
0	1	0	0	1	1
0	1	1	0	0	0
1	0	0	0	0	1
1	0	0	0	1	1
Input					Output
$(y_i'')_1$	$(y_i'')_2$	$(y_i'')_3$	$(y_{i-1}'')_2$	$(y_{i-1}'')_3$	y_i'''
0	0	0	0	0	0
0	0	0	0	$\overline{1}$	0
0	0	0	$\overline{1}$	0	0
0	0	0	$\overline{1}$	$\overline{1}$	$\overline{1}$
0	0	$\overline{1}$	0	0	$\overline{1}$
0	0	$\overline{1}$	$\overline{1}$	0	$\overline{1}$
0	$\overline{1}$	0	0	0	$\overline{1}$
0	$\overline{1}$	0	0	$\overline{1}$	$\overline{1}$
0	$\overline{1}$	$\overline{1}$	0	0	0
$\overline{1}$	0	0	0	0	$\overline{1}$
$\overline{1}$	0	0	0	$\overline{1}$	$\overline{1}$

Figure 38

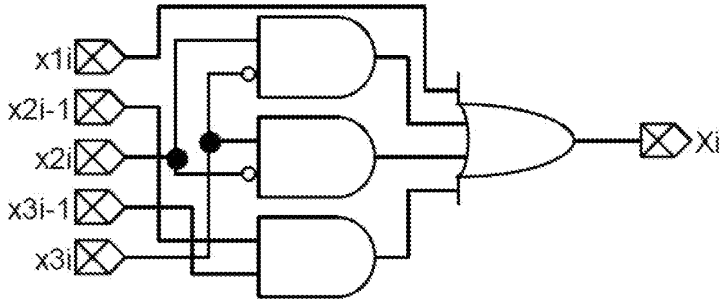


Figure 39

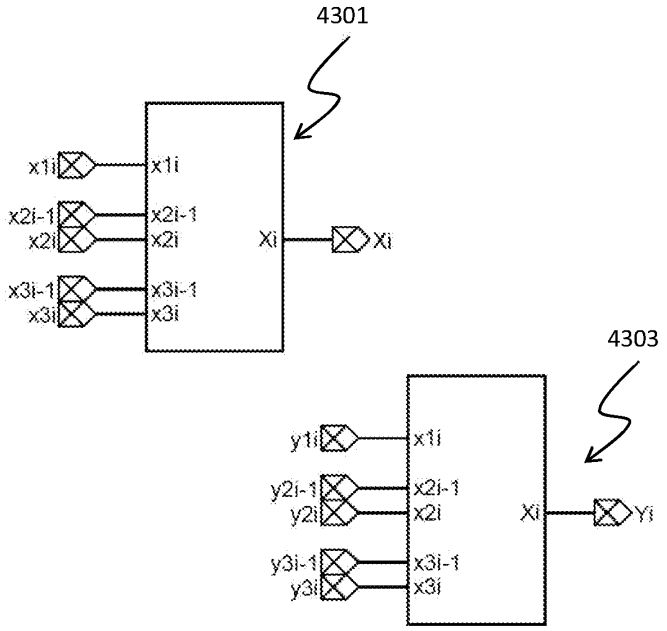


Figure 40

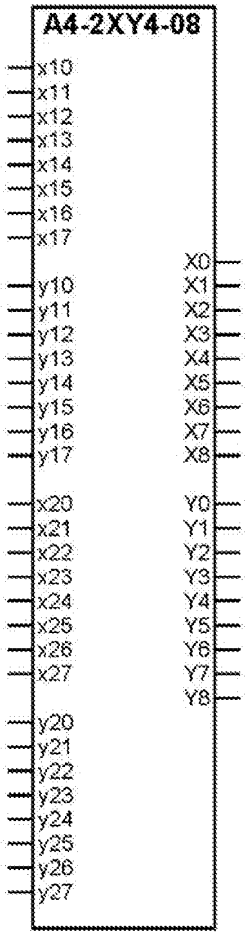

A4-2XY4-08
x10
x11
x12
x13
x14
x15
x16
x17
y10
y11
y12
y13
y14
y15
y16
y17
x20
x21
x22
x23
x24
x25
x26
x27
y20
y21
y22
y23
y24
y25
y26
y27
X0
X1
X2
X3
X4
X5
X6
X7
X8
Y0
Y1
Y2
Y3
Y4
Y5
Y6
Y7
Y8

Figure 41

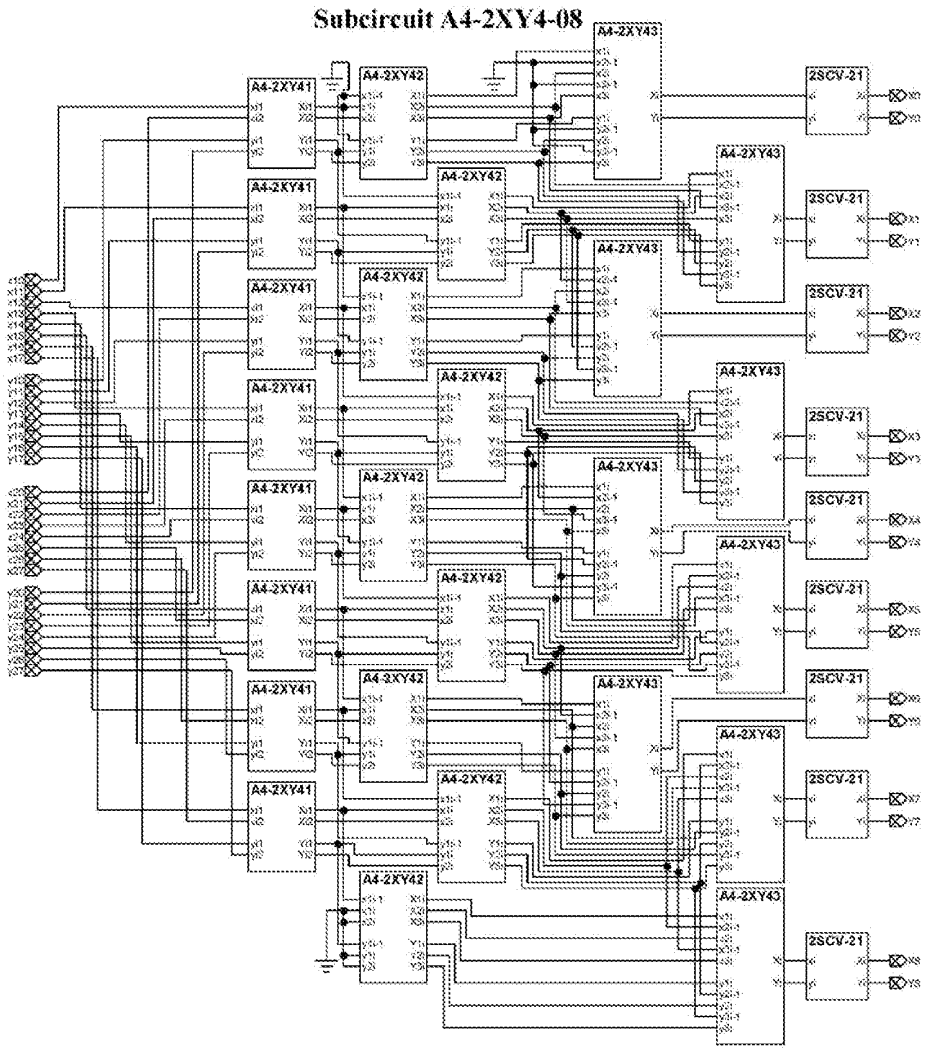


Figure 42

Input				Output	Input				Output
$(x_i'')_1$	$(x_{i-1}'')_1$	$(x_i'')_2$	$(x_{i-1}'')_2$	x_i'''	$(y_i'')_1$	$(y_{i-1}'')_1$	$(y_i'')_2$	$(y_{i-1}'')_2$	y_i'''
0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0	$\overline{1}$	0
0	0	1	0	1	0	0	$\overline{1}$	0	$\overline{1}$
0	0	1	1	*	0	0	$\overline{1}$	$\overline{1}$	$\overline{1}$
0	1	0	0	0	0	$\overline{1}$	0	0	0
0	1	0	1	1	0	$\overline{1}$	0	$\overline{1}$	$\overline{1}$
0	1	1	0	1	0	$\overline{1}$	$\overline{1}$	0	$\overline{1}$
0	1	1	1	*	0	$\overline{1}$	$\overline{1}$	$\overline{1}$	*
1	0	0	0	1	$\overline{1}$	0	0	0	$\overline{1}$
1	0	0	1	1	$\overline{1}$	0	0	$\overline{1}$	$\overline{1}$
1	0	1	0	0	$\overline{1}$	0	$\overline{1}$	0	0
1	0	1	1	*	$\overline{1}$	0	$\overline{1}$	$\overline{1}$	0
1	1	0	0	1	$\overline{1}$	$\overline{1}$	0	0	*
1	1	0	1	*	$\overline{1}$	$\overline{1}$	0	$\overline{1}$	*
1	1	1	0	0	$\overline{1}$	$\overline{1}$	$\overline{1}$	0	*
1	1	1	1	*	$\overline{1}$	$\overline{1}$	$\overline{1}$	$\overline{1}$	*

*Impossible inputs

Figure 43

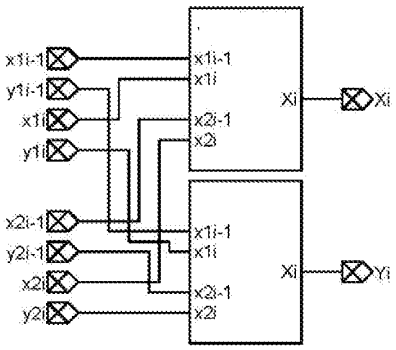


Figure 44

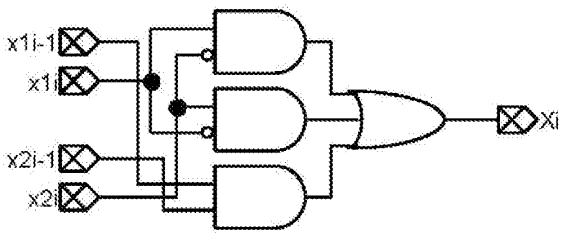


Figure 45

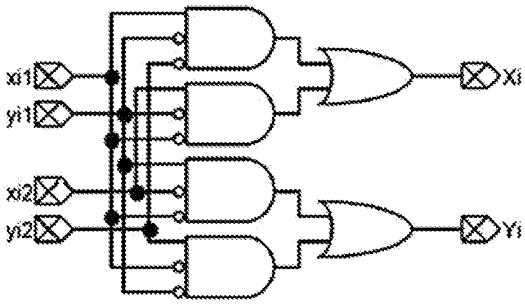


Figure 46