

# Redundant CORDIC Noll

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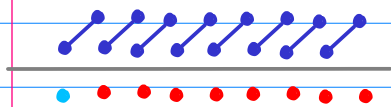
doubling of each element of the sequence  
is not necessary

( # of the inspected digits  
# of angle elements which have to be doubled

$p = 3$  or  $4$  MSD's

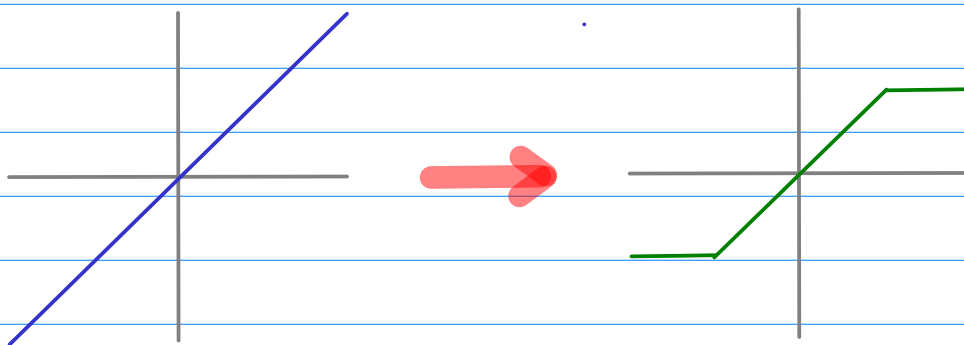
→ typically only each second sequence element  
has to be doubled

## VMA (Vector Merging Adder)



final stage adder  
CP (Carry Propagation) Address

## Level slicing problem



In the redundant number system

(a) exact comparison

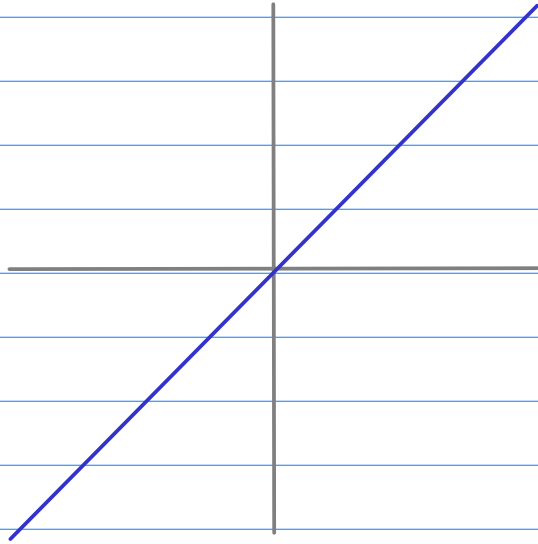
VMA may be used

(b) magnitude estimation

by inspecting only a few MSD

(Most Significant Digits)

Noll  
CSA



$2^0$	$2^1$	$2^2$
-------	-------	-------

$2^{-(m-1)}$
--------------

$c^0$	$c^1$	$c^2$
-------	-------	-------

$c^{-(m-1)}$
--------------

$s^0$	$s^1$	$s^2$
-------	-------	-------

$s^{-(m-1)}$
--------------

a positive saturation

$$C = 0.000 \dots 0$$

$$S = 0.011 \dots 1$$

a negative saturation

$$C = 0.000 \dots 0$$

$$S = 1.100 \dots 0$$

+0.5

0.100

1.011

1.100

-0.5

2's  
complements

0,0 11 ... 1

1,1 00 ... 0

positive saturation  
conditions

negative saturation  
conditions

C	0, 1	
S	0, 0	

C	1, 0	
S	1, 1	

c	0, 0	
S	0, 1	

c	1, 1	
S	1, 0	

c	0, 1	
S	0, 1	

c	1, 0	
S	1, 0	

positive saturation  
value

negative saturation  
value

0, 0	11 ... 1
------	----------

1, 1	00 ... 0
------	----------

0.5  $0.1$   $00 \dots 0$

$0.0$   $11 \dots 1$   $0.5 - 2^{-(m-1)}$

-0.5  $1.1$   $00 \dots 0$

$1.1$   $00 \dots 0$  -0.5

