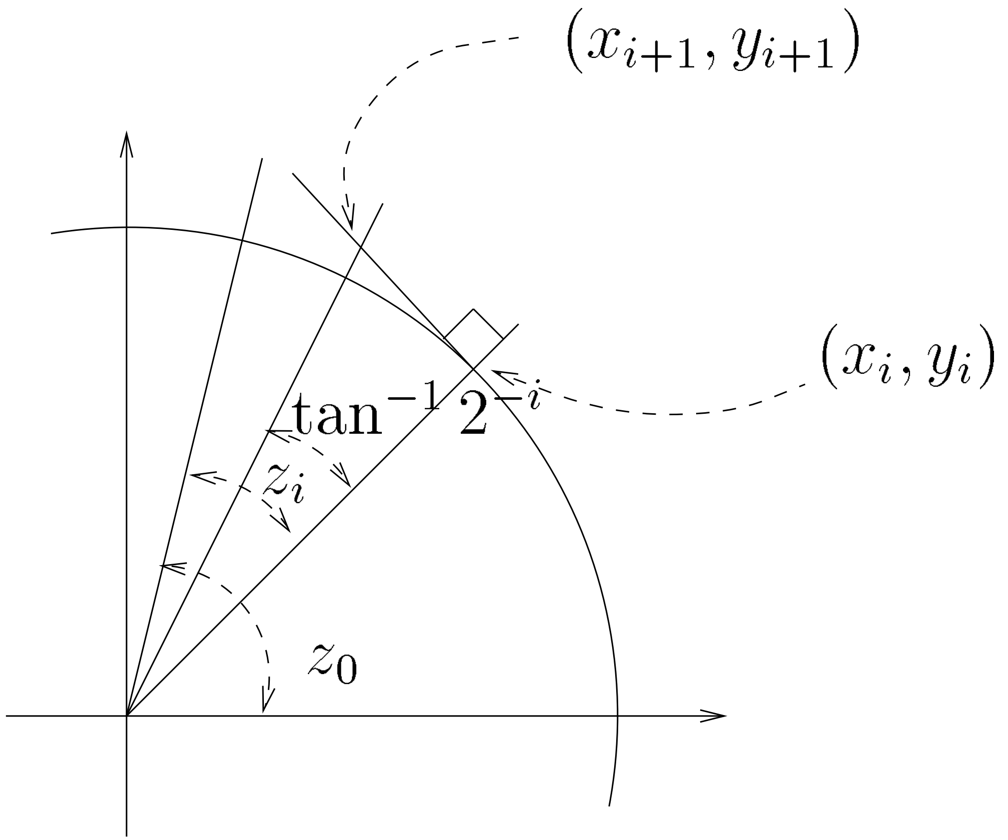

FIG. 1 - One iteration of the CORDIC algorithm.

Generalized CORDIC iteration

$$\left\{\begin{array}{lcl} x_{n+1} & = & x_n - m d_n y_n 2^{-\sigma(n)} \\ y_{n+1} & = & y_n + d_n x_n 2^{-\sigma(n)} \\ z_{n+1} & = & z_n - d_n w_{\sigma(n)}, \end{array}\right. \tag{1}$$

m	w_k	$d_n = \mathrm{sign}\, z_n$ (Rotation Mode)	$d_n = -\mathrm{sign}\, y_n$ (Vectoring Mode)
1	$\arctan 2^{-k}$	$x_n \rightarrow K\,(x_0 \cos z_0 - y_0 \sin z_0)$ $y_n \rightarrow K\,(y_0 \cos z_0 + x_0 \sin z_0)$ $z_n \rightarrow 0$	$K\sqrt{x_0^2 + y_0^2}$ 0 $z_0 - \arctan \frac{y_0}{x_0}$
0	2^{-k}	$x_n \rightarrow x_0$ $y_n \rightarrow y_0 + x_0 z_0$ $z_n \rightarrow 0$	x_0 0 $z_0 - \frac{y_0}{x_0}$
-1	$\tanh^{-1} 2^{-k}$	$x_n \rightarrow K'\,(x_1 \cosh z_1 + y_1 \sinh z_1)$ $y_n \rightarrow K'\,(y_1 \cosh z_1 + x_1 \sinh z_1)$ $z_n \rightarrow 0$	$K'\sqrt{x_1^2 - y_1^2}$ 0 $z_1 - \tanh^{-1} \frac{y_1}{x_1}$

TAB. 1 - Computability of different functions using CORDIC.

Circular ($m = 1$)	$\sigma(n) = n$
Linear ($m = 0$)	$\sigma(n) = n$
Hyperbolic ($m = -1$)	$\sigma(n) = n - k$ where k is the largest integer such that $3^{k+1} + 2k - 1 \leq 2n$

TAB. 2 - Values of $\sigma(n)$.

Computation of logarithms and square roots

$$\exp(x) = \cosh x + \sinh x$$

$$\ln(x) = 2\tanh^{-1}\left(\frac{x-1}{x+1}\right)$$

$$\sqrt{x} = K'\sqrt{\left(x+\frac{1}{4K'^2}\right)^2 - \left(x-\frac{1}{4K'^2}\right)^2}.$$

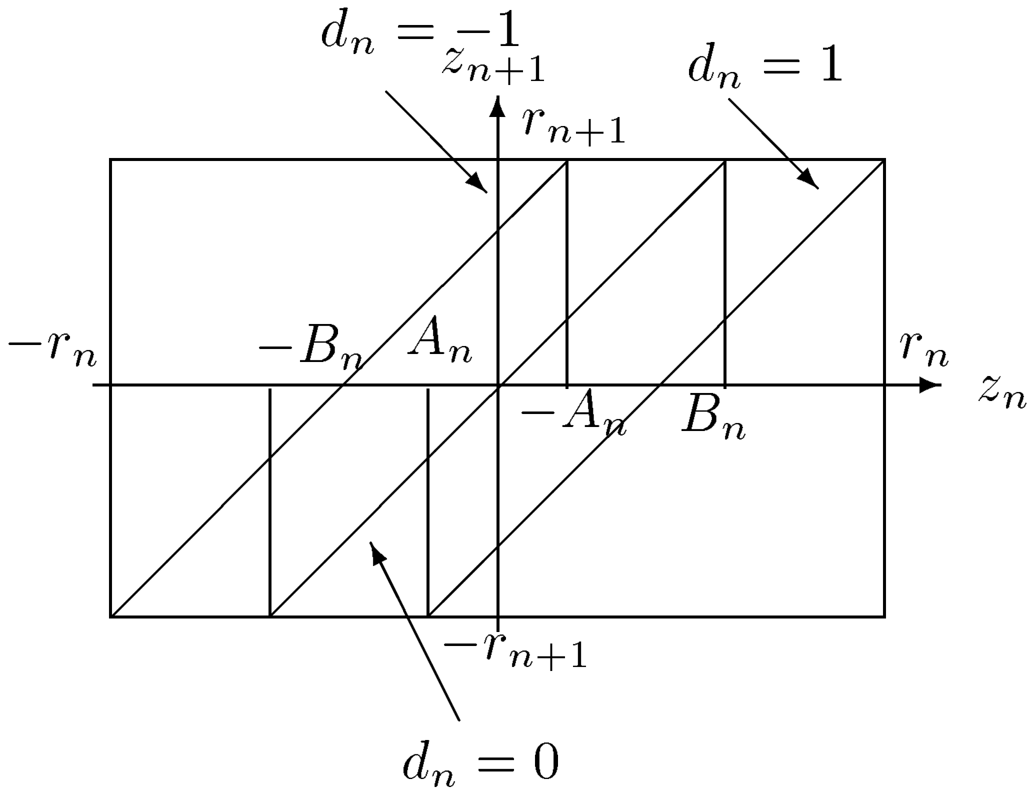

FIG. 2 - Robertson Diagram of CORDIC.

n	$2^n r_n$	$2^n A_n$	$2^n B_n$
0	1.74328	-0.172490	0.957888
1	1.91577	-0.061186	0.988481
2	1.97696	-0.017134	0.997048
3	1.99409	-0.004417	0.999257
4	1.99851	-0.001113	0.999814
∞	2	0	1

TAB. 3 - First four values of $2^n r_n$, $2^n A_n$ and $2^n B_n$.

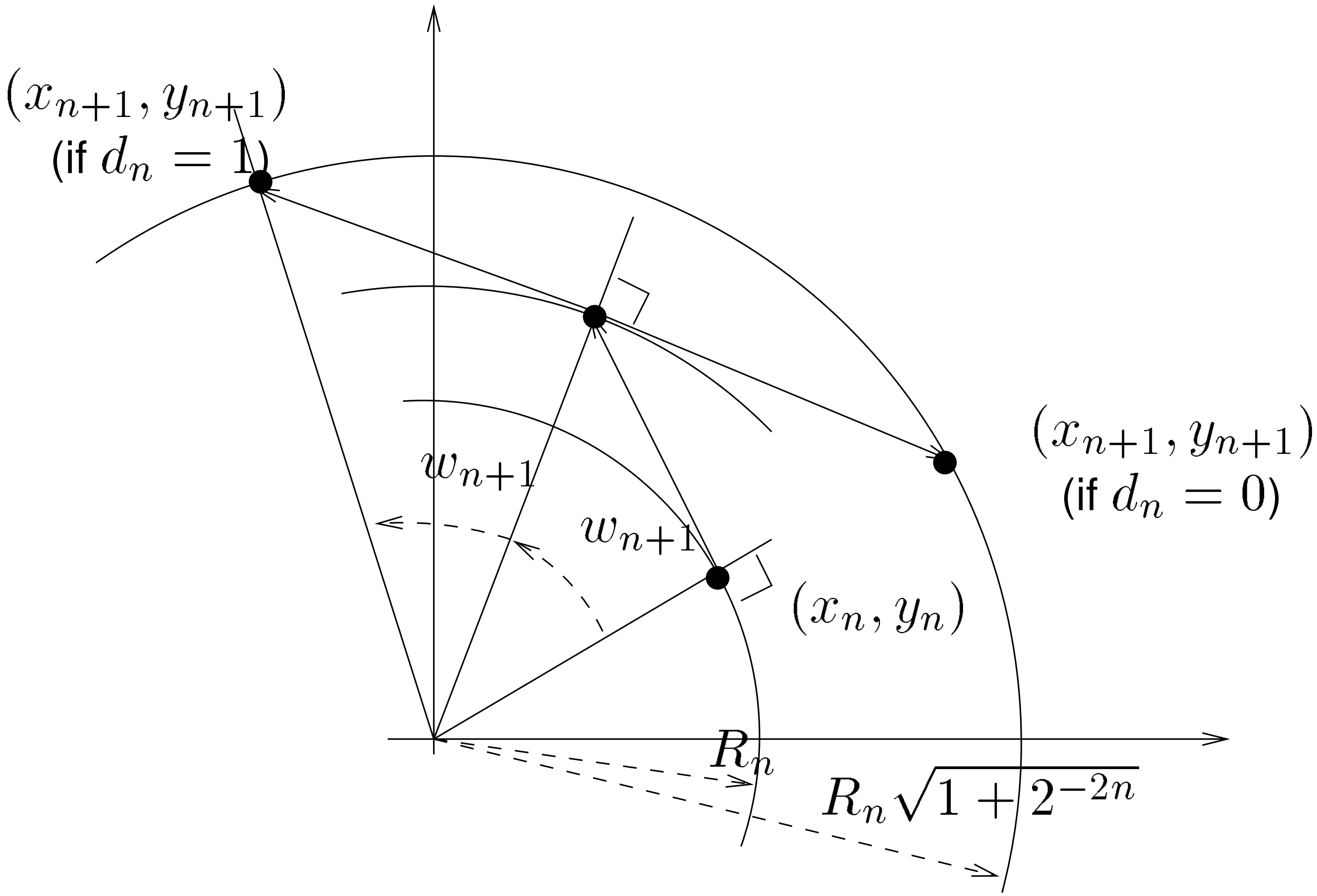

FIG. 3 - One iteration of the double rotation method.

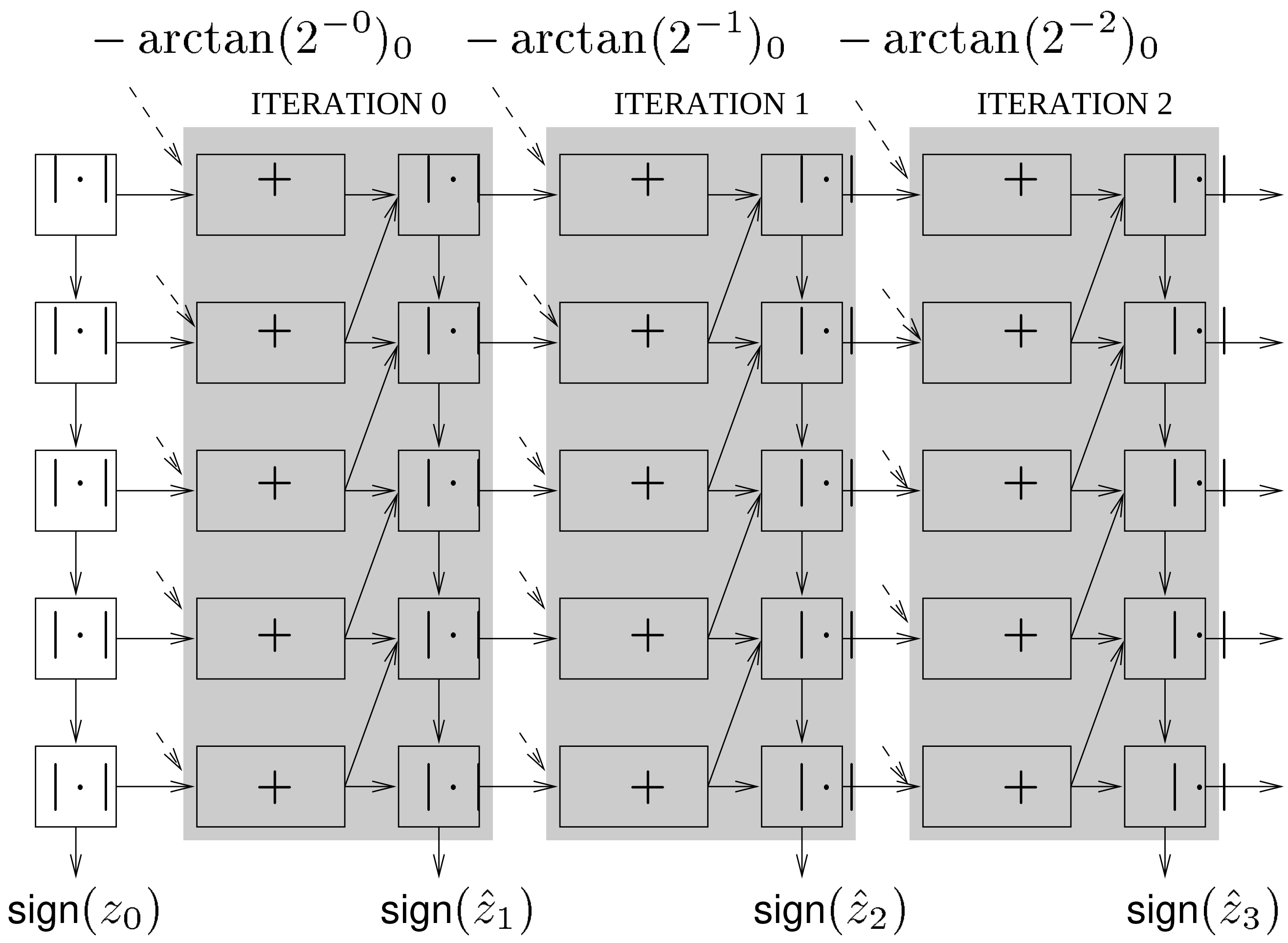

FIG. 4 - Computation of the values sign$(\hat{z}_i)$ in the differential CORDIC algorithm (rotation mode).