Cordic Design

Description

-CORDIC algorithm is used here to rotate the received input samples by phase defined to reach a specific point of (x,y).

• It basically divides the rotation required into a set of micro rotations by predefined angles

"$arch\ tan(2^{-i})$" which are stored in the CORDIC ROM.

• Number of stages = 15 stage but I used only 1 stage and I will wait 15 clock cycles

Theory

$$X_{new} = X_{old} * \cos(\theta) - y_{old} * \sin(\theta)$$

$$y_{new} = y_{old} * \cos(\theta) + x_{old} * \sin(\theta)$$

If we made that equation, we need huge look up table for the angle cos and sin for each angle from $\ ]-\frac{\pi}{2},\frac{\pi}{2}[$

So, we will change that multiplication and look up table to shift and add, subtractor, (2^{-i})

By taking $\cos(\theta)\ common\ facotr\ and\ make\ values\ of\ \tan = 2^{-i}$

$$X_{i+1} = X_i - (d)\ y_i * 2^{-i}$$

$$y_{i+1} = y_i + (d)\ x_i * 2^{-i}$$

The (d) describe the sign for the angle we rotate to approach our point

The error in angle is calculated by

$$z_{i+1} = z_i - (d)\tan_i(alpha), \therefore\ \tan(alpha) = 2^{-i}$$

Implementation