

# Idea (1A)

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- Two Phase Clock (Rising Falling)
- Multi-Phase Clock
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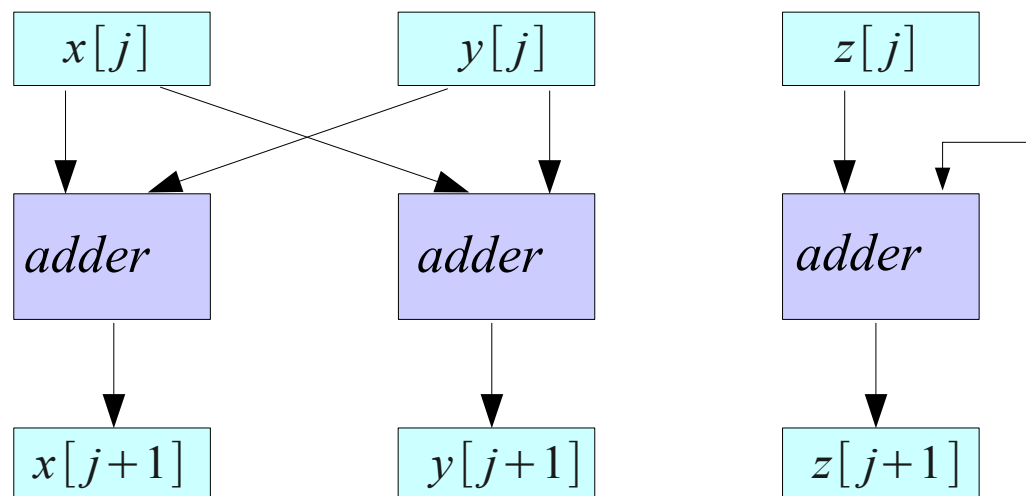
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# The CORDIC Equations

$$x[j+1] = x[j] - \sigma_j 2^{-j} y[j]$$

$$y[j+1] = y[j] + \sigma_j 2^{-j} x[j]$$

$$z[j+1] = z[j] - \sigma_j \tan^{-1}(2^{-j})$$



# The New CORDIC Equations (1)

$$x[j+1] = x[j] - \sigma_j 2^{-j} y[j]$$



$$x[j] = x[j+1] + \sigma_j 2^{-j} y[j]$$

$$y[j+1] = y[j] + \sigma_j 2^{-j} x[j]$$

$$y[j+1] = y[j] + \sigma_j 2^{-j} (x[j+1] + \sigma_j 2^{-j} y[j])$$

$$y[j+1] = (1 + \sigma_j^2 2^{-2j}) y[j] + \sigma_j 2^{-j} x[j+1]$$

$$y[j+1] = (1 + 2^{-2j}) y[j] + \sigma_j 2^{-j} x[j+1]$$

$$z[j+1] = z[j] - \sigma_j \tan^{-1}(2^{-j})$$

$$x[j+1] = x[j] - \sigma_j 2^{-j} y[j]$$

$$y[j+1] = y[j] + \sigma_j 2^{-j} x[j]$$

$$z[j+1] = z[j] - \sigma_j \tan^{-1}(2^{-j})$$

# The New CORDIC Equations (2)

$$x[j+1] = x[j] - \sigma_j 2^{-j} y[j]$$

$$x[j] = x[j+1] + \sigma_j 2^{-j} y[j]$$

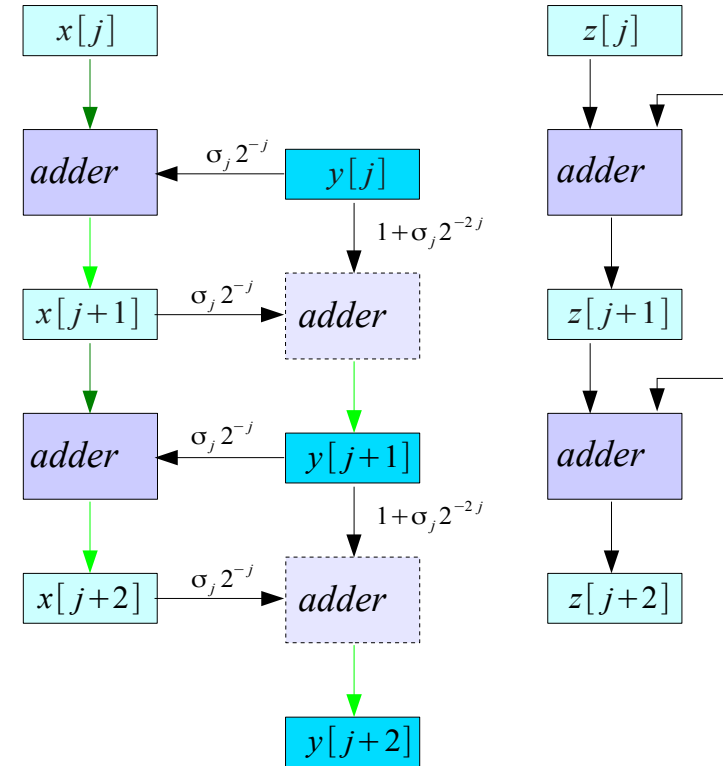
$$y[j+1] = y[j] + \sigma_j 2^{-j} x[j]$$

$$y[j+1] = y[j] + \sigma_j 2^{-j} (x[j+1] + \sigma_j 2^{-j} y[j])$$

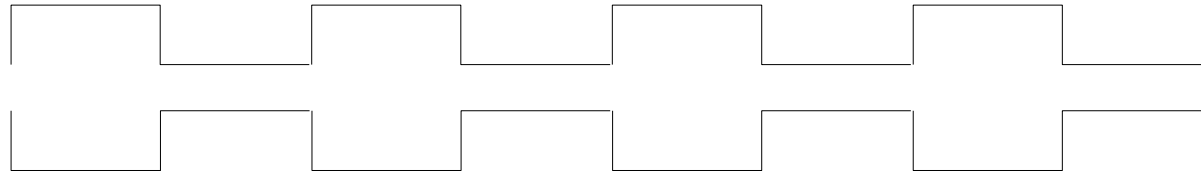
$$y[j+1] = (1 + \sigma_j^2 2^{-2j}) y[j] + \sigma_j 2^{-j} x[j+1]$$

$$y[j+1] = (1 + 2^{-2j}) y[j] + \sigma_j 2^{-j} x[j+1]$$

$$z[j+1] = z[j] - \sigma_j \tan^{-1}(2^{-j})$$



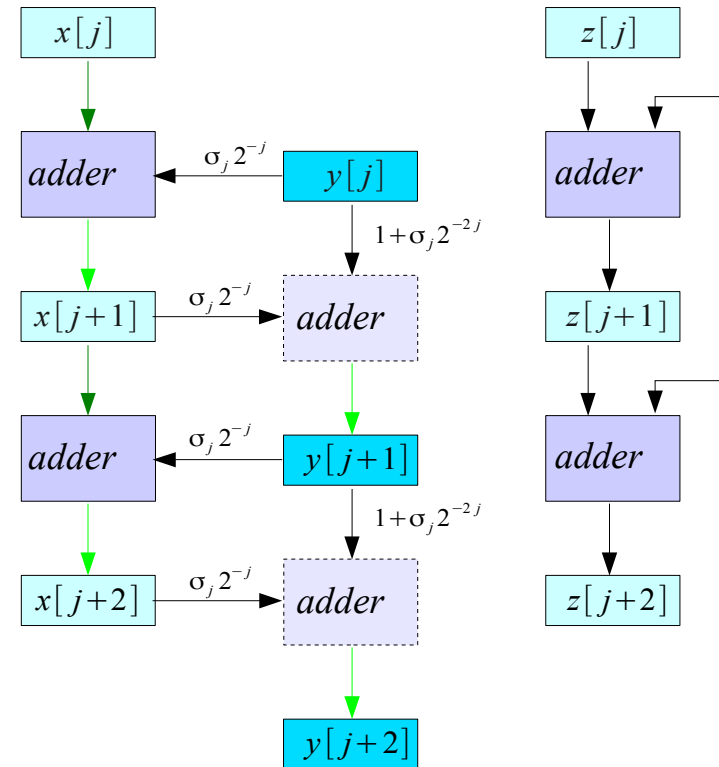
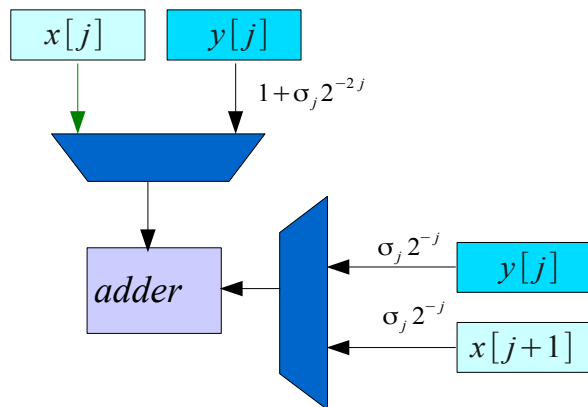
# Two-Phase Clock



time division multiplexing    resource sharing

Area advantage in the loop unrolled architecture  
 Timing penalty?

High fan in in the adder inputs  
 Multiplex in the adder inputs









## References

- [1] <http://en.wikipedia.org/>
- [2] J.H. McClellan, et al., Signal Processing First, Pearson Prentice Hall, 2003
- [3] A “graphical interpretation” of the DFT and FFT, by Steve Mann