

Idea (1A)

- Rising Clock Edge
- Falling Clock Edge
-

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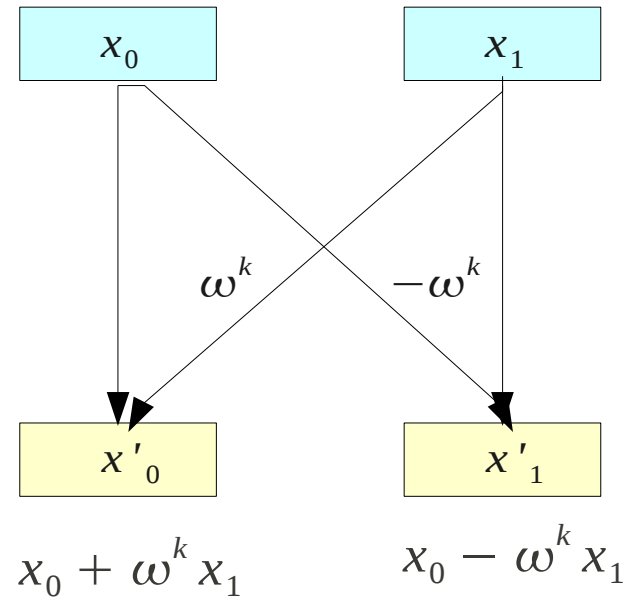
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The Butterfly Operations

$$x'_0 = x_0 + \omega^k x_1$$

$$x'_1 = x_0 - \omega^k x_1$$



The Butterfly Operations

$$\begin{cases} x'_0 = x_0 + \omega^k x_1 \\ x'_1 = x_0 - \omega^k x_1 \end{cases}$$

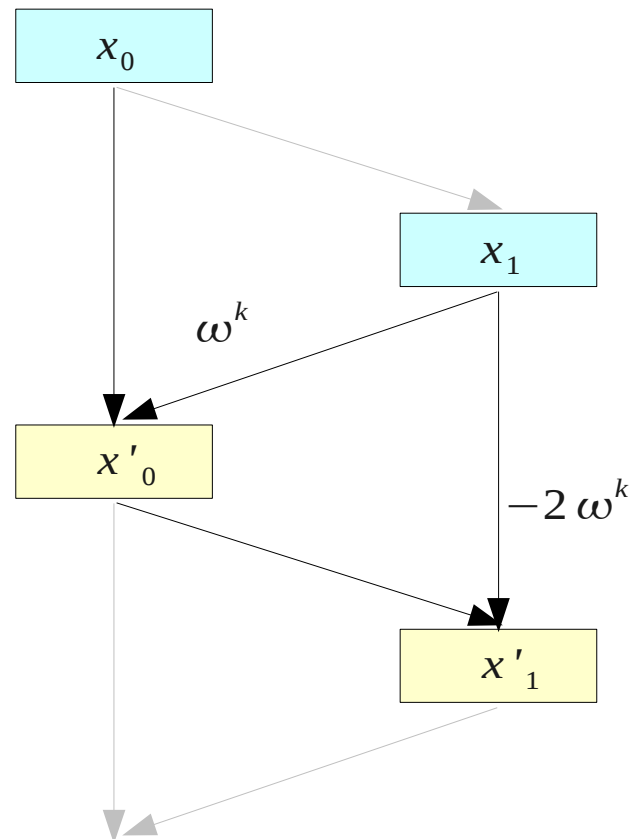
$$x'_0 = x_0 + \omega^k x_1$$

$$x_0 = x'_0 - \omega^k x_1$$

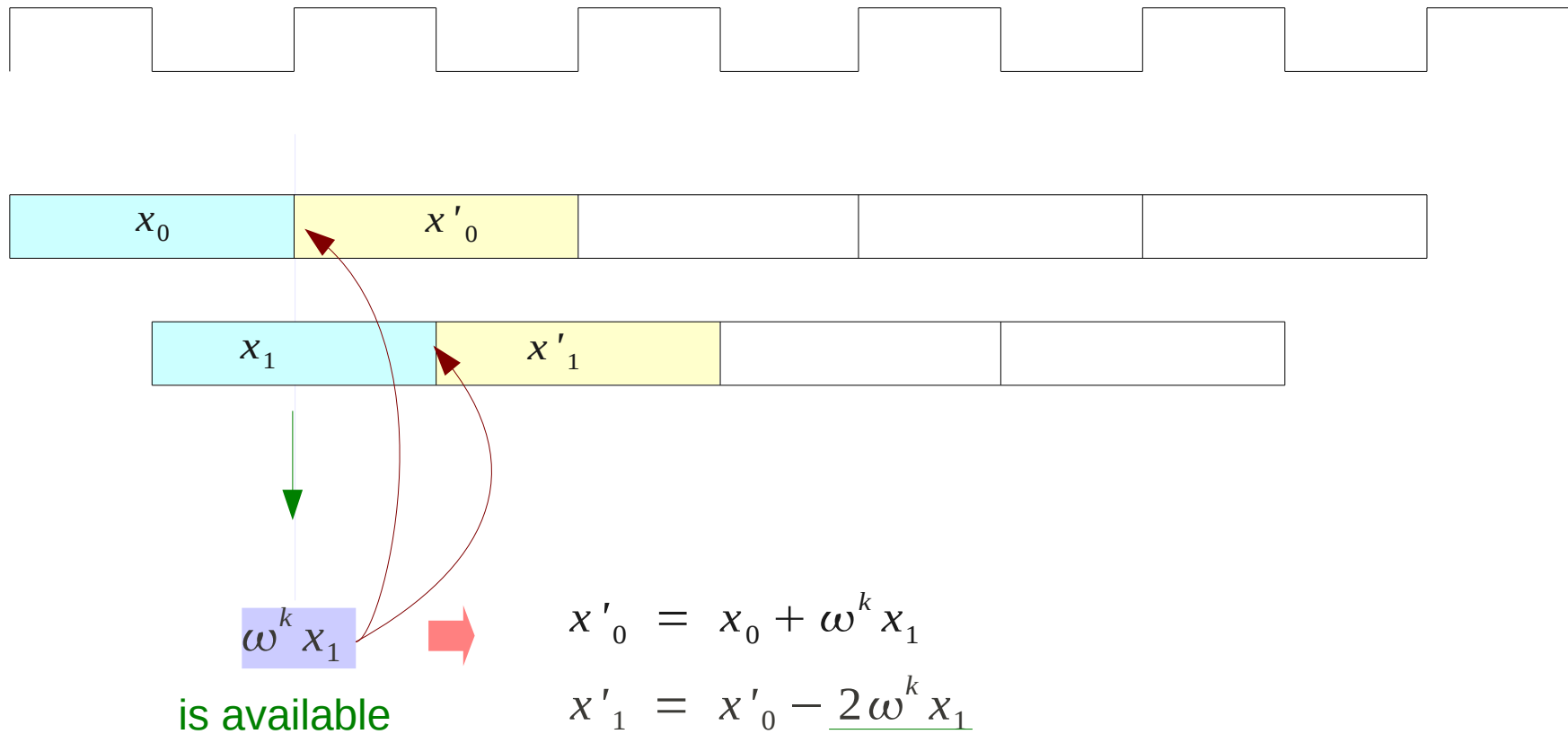
$$x'_1 = x_0 - \omega^k x_1$$

→ $x'_1 = x'_0 - \omega^k x_1 - \omega^k x_1$

$$x'_1 = x'_0 - 2\omega^k x_1$$



The Butterfly Operations



only one multiplier
is needed

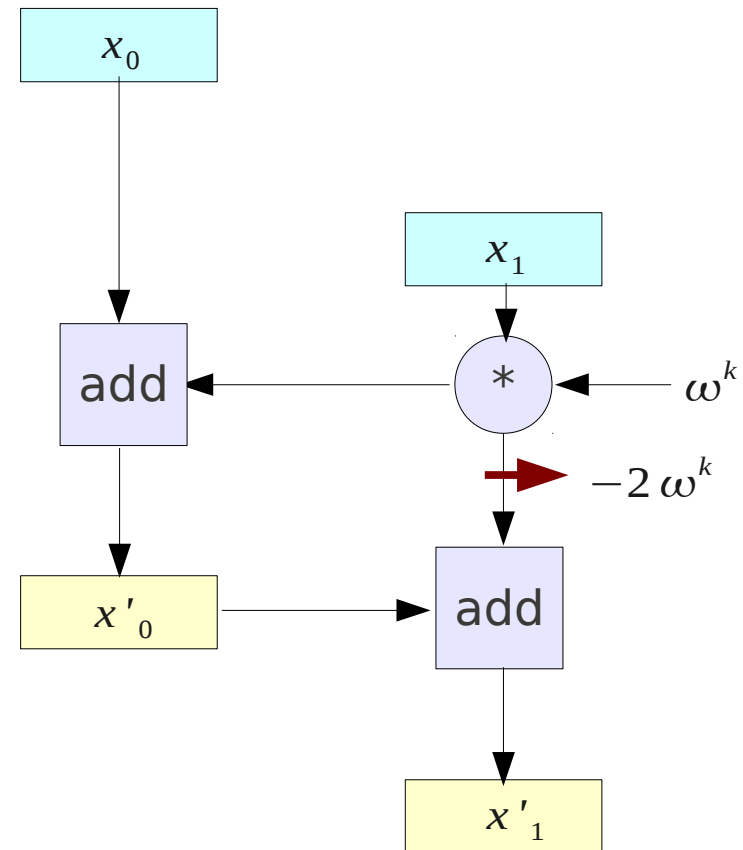
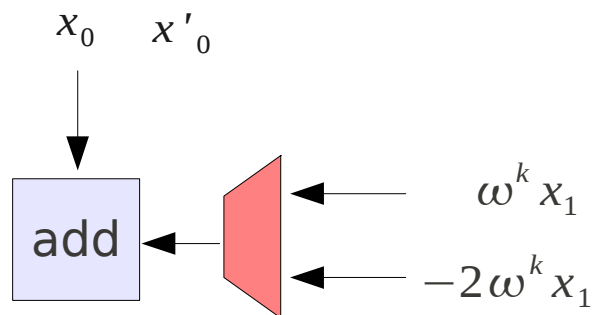
Shift left \rightarrow wiring

The Butterfly Operations

$$\begin{cases} x'_0 = x_0 + \omega^k x_1 \\ x'_1 = x_0 - \omega^k x_1 \end{cases}$$

$$x'_0 = x_0 + \omega^k x_1$$

$$x'_1 = x'_0 - 2\omega^k x_1$$



Combining CORDIC architecture ?

Some background survey on CORDIC + FFT Architecture

Different level of parallelism

High fanout - mux , adder

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