DFT

DFT

Decimation-in-time

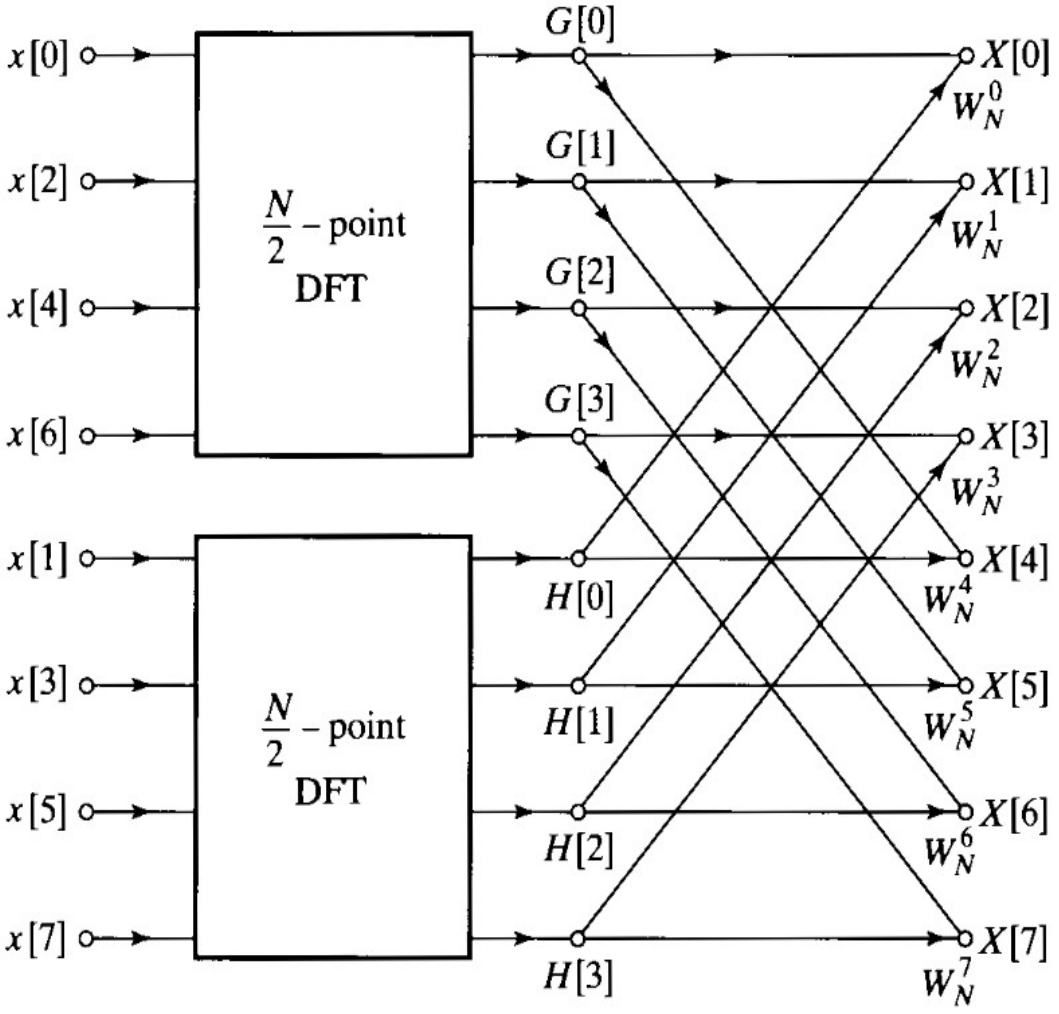


Figure 9.3 Flow graph of the decimation-in-time decomposition of an N-point DFT computation into two $(N/2)$-point DFT computations $(N = 8)$.

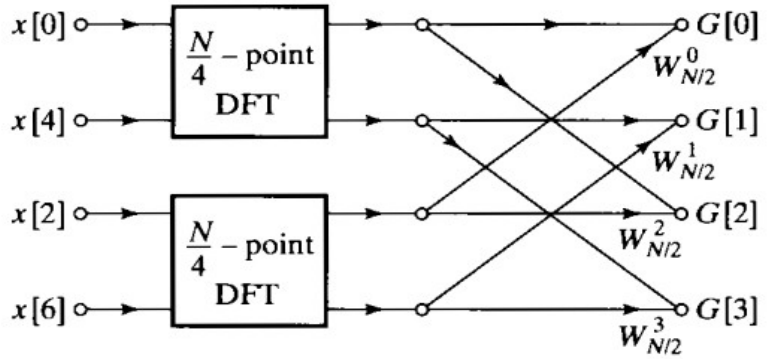


Figure 9.4 Flow graph of the decimation-in-time decomposition of an $(N/2)$-point DFT computation into two $(N/4)$-point DFT computations $(N = 8)$.

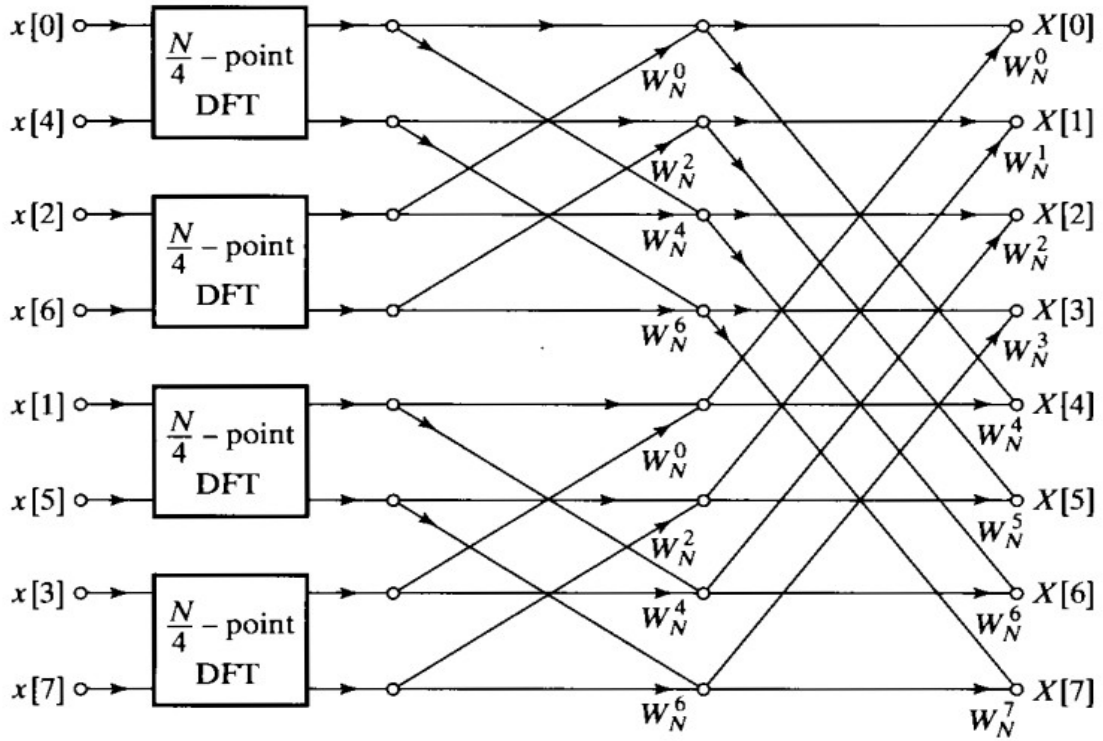


Figure 9.5 Result of substituting the structure of Figure 9.4 into Figure 9.3.

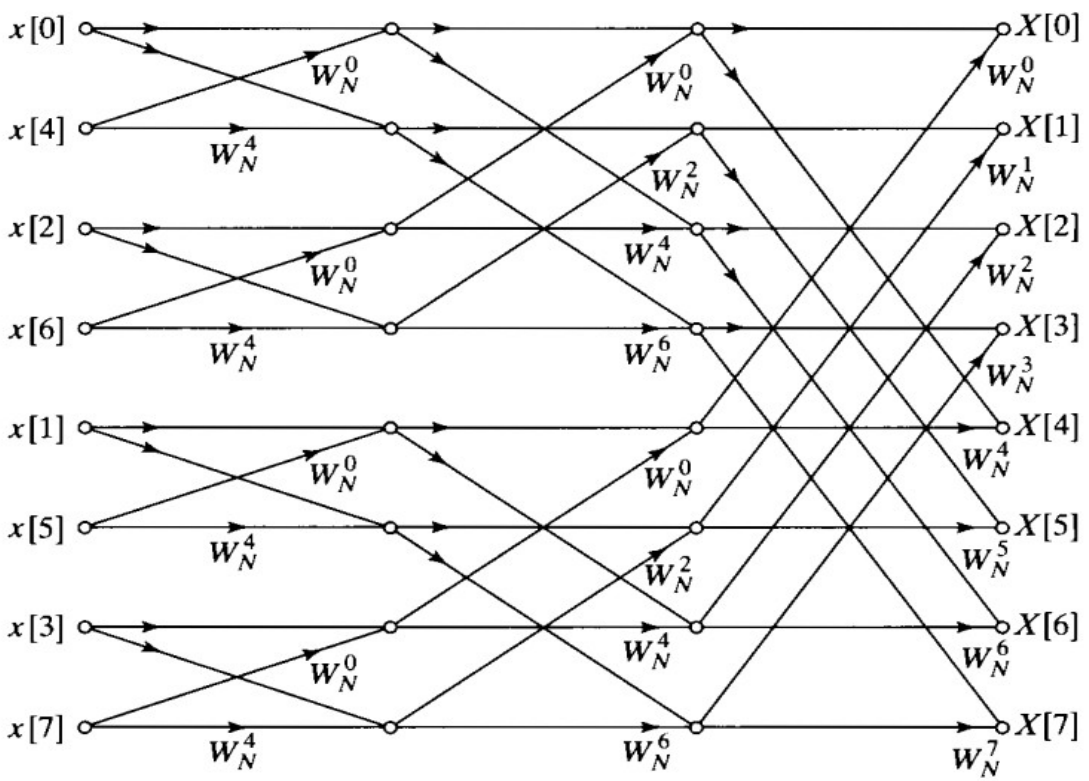


Figure 9.7 Flow graph of complete decimation-in-time decomposition of an 8-point DFT computation.

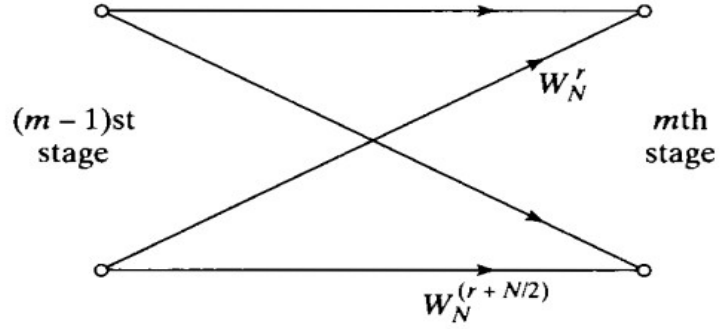


Figure 9.8 Flow graph of basic butterfly computation in Figure 9.7.

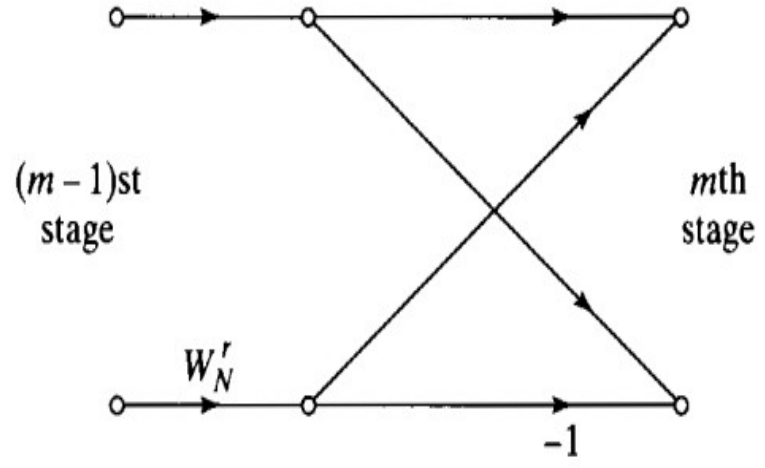


Figure 9.9 Flow graph of simplified butterfly computation requiring only one complex multiplication.

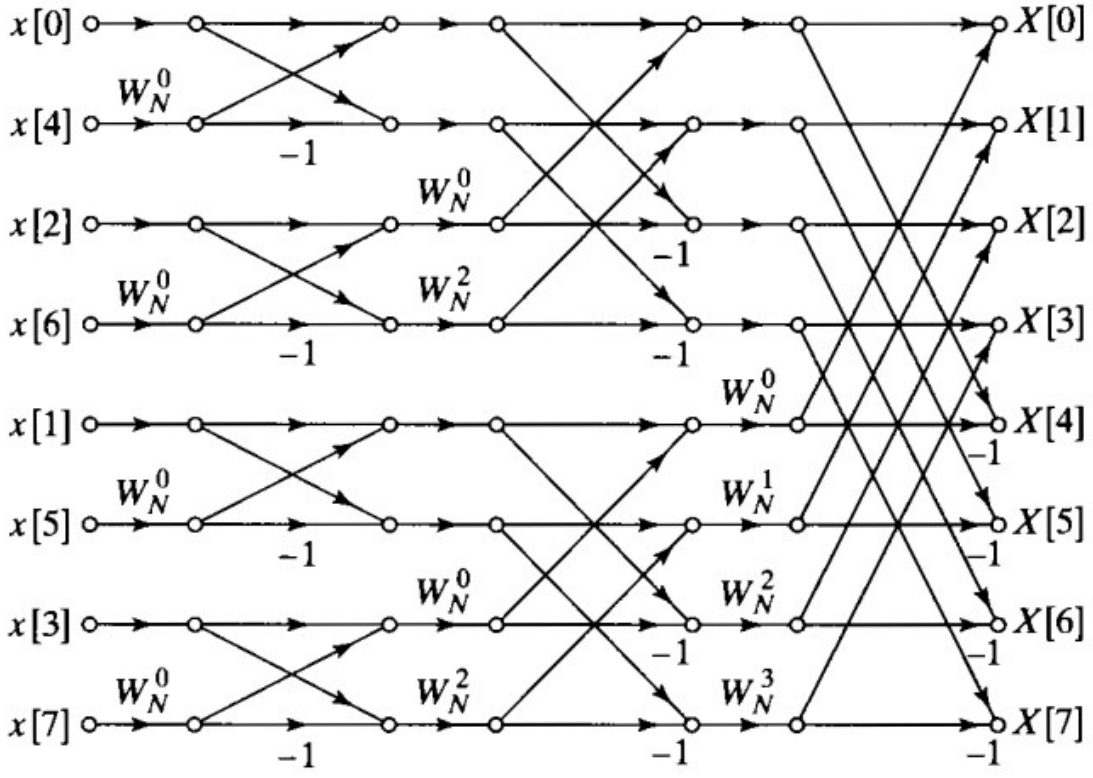


Figure 9.10 Flow graph of 8-point DFT using the butterfly computation of Figure 9.9.

Decimation-in-frequency

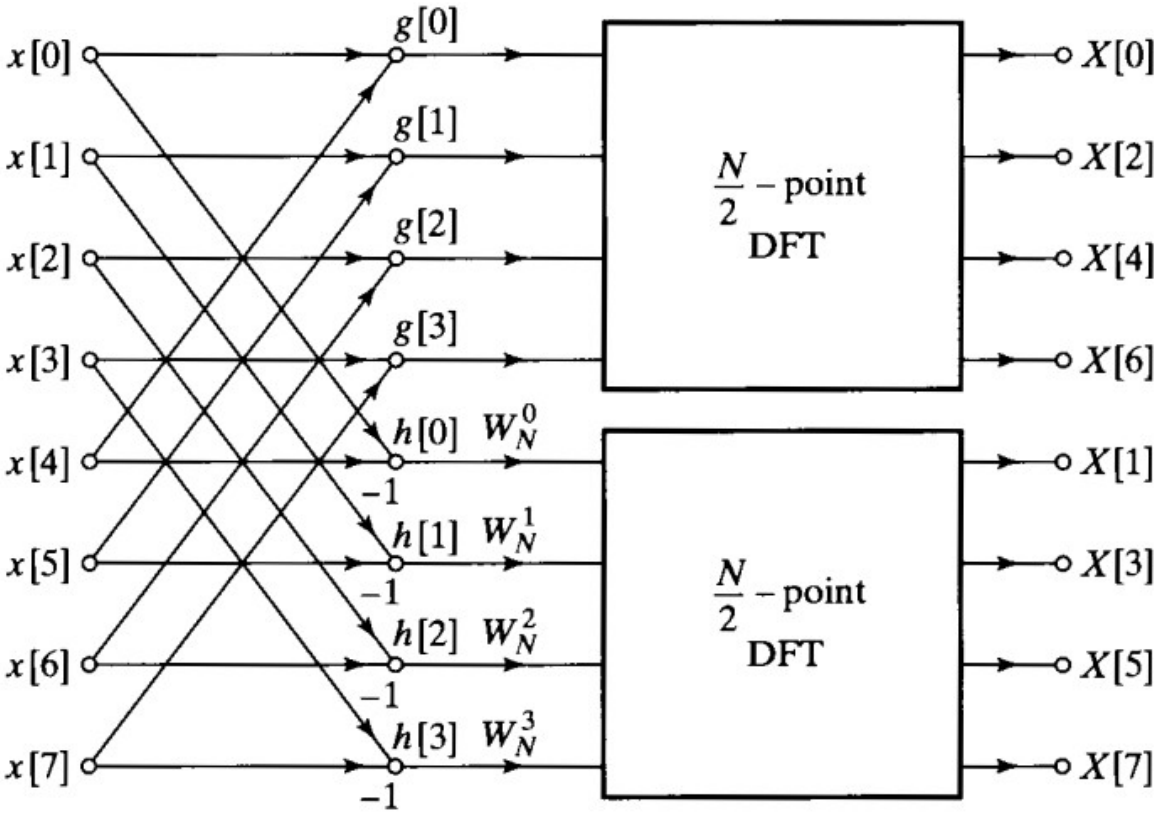


Figure 9.17 Flow graph of decimation-in-frequency decomposition of an N-point DFT computation into two $(N/2)$-point DFT computations $(N = 8)$.

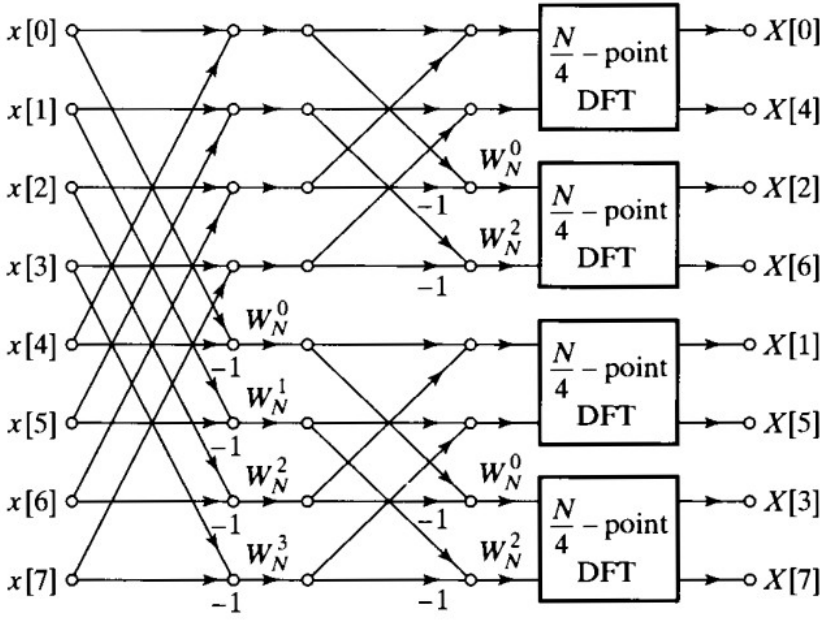


Figure 9.18 Flow graph of decimation-in-frequency decomposition of an 8-point DFT into four 2-point DFT computations.

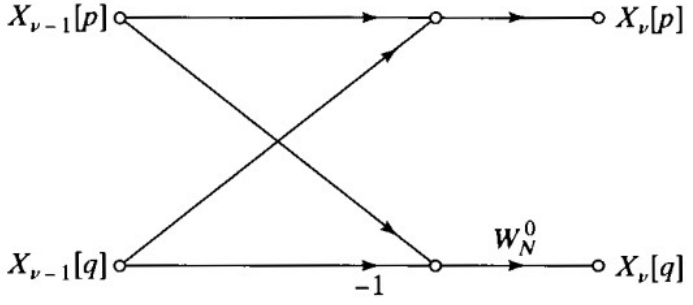


Figure 9.19 Flow graph of a typical 2-point DFT as required in the last stage of decimation-in-frequency decomposition.

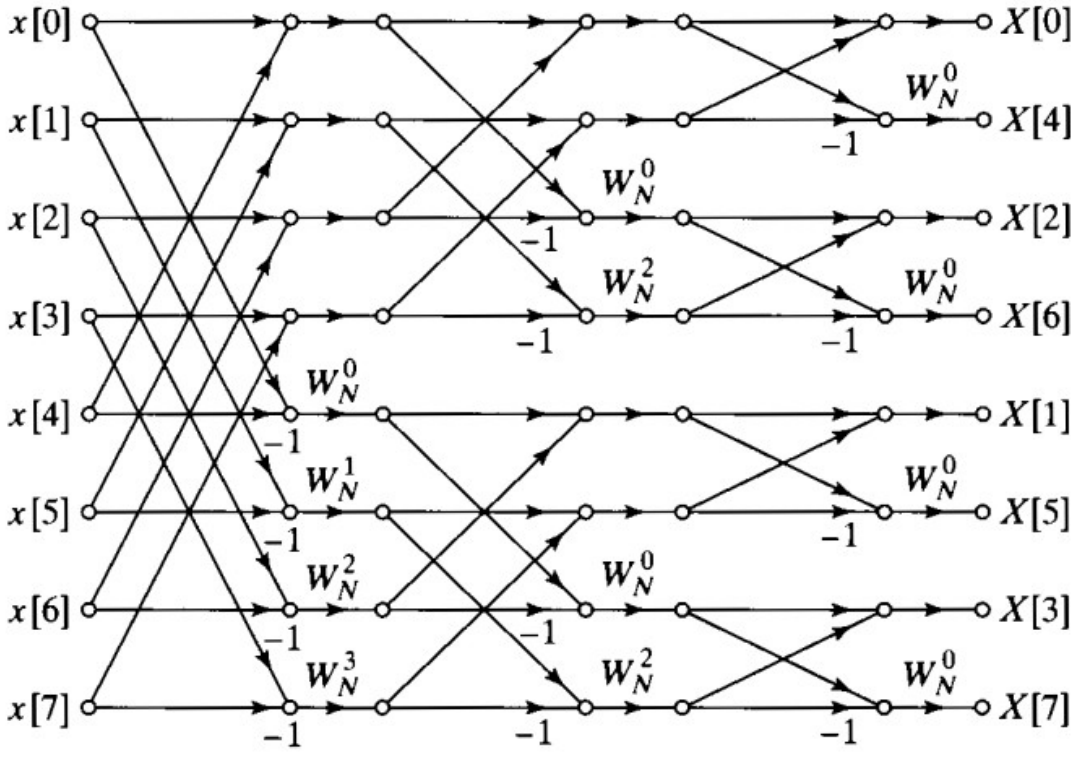


Figure 9.20 Flow graph of complete decimation-in-frequency decomposition of an 8-point DFT computation.

Significance of magnitude and phase of Fourier transform

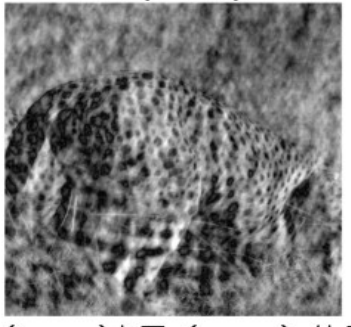
$f_1(x, y)$

$f_2(x, y)$

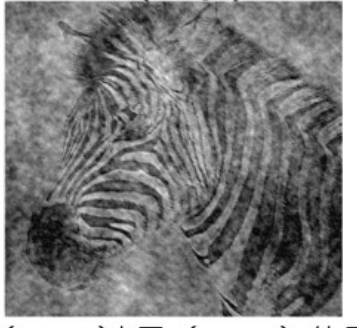
Significance of magnitude and phase of Fourier transform

$f_1(x, y)$

$f_2(x, y)$



IDFT$|F_1(u, v)|F_2(u, u)/|F_2(u, v)|$



IDFT$|F_2(u, v)|F_1(u, u)/|F_1(u, v)|$

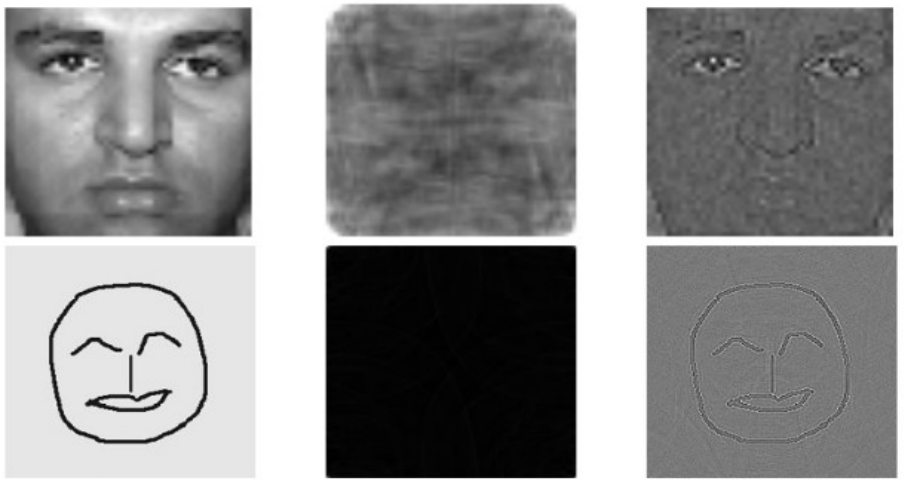
Phase of the Fourier transform of images contains significant information

Phase of Fourier transform

Let $F(u, v)$ be the DFT of the given image $f(x, y)$.

$$F(u, v) = |F(u, v)| \exp[j\theta(u, v)]$$

$$\begin{aligned} f_m(x, y) &= \text{IDFT}\{|F(u, v)|\} \\ f_p(x, y) &= \text{IDFT}\{\exp[j\theta(u, v)]\} \end{aligned}$$



$f(x, y)$ $f_m(x, y)$ $f_p(x, y)$