DIP Assignment - 3.

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1. given $\delta(x+1,y)+\delta(x-1,y)$

(From given Note)

For $\delta(x+1,y)$ = center lies at $(-1,0)$ → it is a -ve axes

so do modulo.

after mapping i.e., $(-1,0) \Rightarrow \left.\begin{array}{l} -1\,\%\,N = N-1 = x \\ 0\,\%\,M = 0 = y \end{array}\right\} \Rightarrow (x,y) = (N-1,0)$

For $\delta'(x-1,y)$ → at $(1,0)$ ✓ +ve axes ✓

- FFT equation is.

$F(x(n,m)) = X(K,l)$

$$X(K,l) = \sum_{n=0}^{N-1}\sum_{m=0}^{M-1} x(n,m)\, e^{\frac{-j2\pi kn}{N}} \cdot e^{\frac{-j2\pi lm}{M}}$$

∴ from lecture slide

so, for $\delta(x+1,y)$ → at $(N-1,0)$

$$F(x(N-1,0)) = \sum\sum x(n,m)\, e^{\frac{-j2\pi(N-1)n}{N}} \cdot \underbrace{e^{\frac{-j2\pi 0 m}{M}}}_{=1}$$

$$= \sum x(n,m)\, e^{\frac{-j2\pi n(N-1)}{N}}$$

for $\delta(x-1,y) \Rightarrow (1,0)$

$$F(x(1,0)) = x(n,m)\, e^{\frac{-j2\pi 1.n}{N}} \cdot \underbrace{e^{\frac{-j2\pi .0.m}{M}}}_{=0.}$$

$$= x(n,m)\, e^{\frac{-j2\pi n}{N}}$$

$$\Rightarrow F(\delta(x+1,y)+\delta(x-1,y)) = x(n,m)\, e^{\frac{-j2\pi(N-1)n}{N}} + x(n,m)\, e^{\frac{-j2\pi n}{N}}$$

At $k,l=0$.

$$F(x(K,l)) = x(n,m)e^{\frac{-j2\pi 0.n}{N}} + x(n,m)\, e^{\frac{-j2\pi .0.n}{N}}$$

$$= x(n,m).1 + x(n,m).1$$

$$= 2.x(n,m)$$

At $k = \frac{N}{2}$, $l = \frac{M}{2}$.

$$F[X(k,l)] = x(n,m)\, e^{-j 2\pi \frac{N n}{2 N}} + x(n,m)\, e^{-j 2\pi \frac{M}{2} \frac{n}{M}}$$

$$= x(n,m)\, e^{-j \cancel{2}\pi n} + x(n,m)\, e^{-j \pi n}$$

$$= x(n,m)\, e^{-j \pi n} + x(n,m)\, e^{-j \pi n}$$

$$=$$

given The highest frequencies are at $k = \frac{N}{2}$, $l = \frac{M}{2}$

it is either $= 0$ or $\neq 0$

i.e., band-pass filtering.

$\Downarrow$

Low-pass filtering.

[passes low frequencies]
[rejects high frequencies]

$$F\left(\delta(x + (N-1), y) + \delta(x-1, y)\right)$$

$$= x(n,m)\, e^{-j 2\pi \frac{(N-1) n}{N}} + x(n,m)\, e^{-j \frac{2\pi \cdot n}{M}}$$

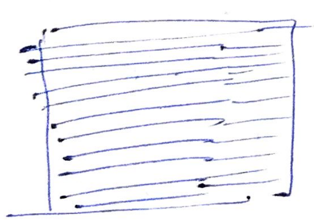
For N = odd ; N = even $\Rightarrow \neq 0$.

zero $\Rightarrow$ ~~$F[X(k,l)] = 0$~~.

it varies.

(2). given the image has strong & periodic horizontal lines

(∵ referred online source).



To remove this horizontal lines, use Notch filters which are helpful to remove these kind of noises.