Q1 (a) (1)

210	65	55
65	45	250
55	223	216

(a) $\Delta x = -(210*1 + 65*2 + 55*1) + (55*1 + 250*2 + 216*1)$

$= 376$

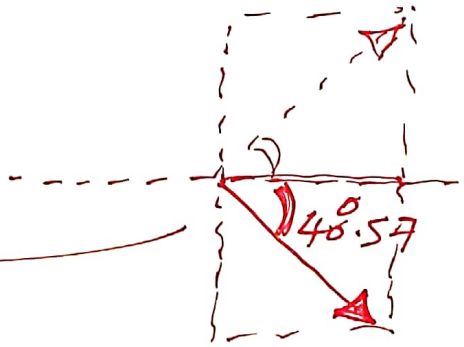
$\Delta y = (210 + 2*65 + 55) - (55 + 223*2 + 216)$

$= -322$

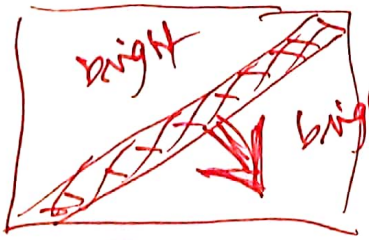
(b) $\|\Delta\| = \sqrt{(376)^2 + (-322)^2} = 495$

$\theta = \tan^{-1}\left(\frac{-322}{376}\right) \Rightarrow 40.57^\circ$

$\Rightarrow 0.7082$ Rad



Makes sense



normal to the edge

(2)

(c) canny → $[f(x,y) * g'_x(x,y)]$ then $* g'_y(x,y)$

we use 1st derivative of Gaussian

(d) (i) no $\frac{\partial}{\partial x}$ and $\frac{\partial}{\partial y}$ approx. since we already know g'_x g'_y

(ii) only (1 conv.) instead of two (conv.) (less computational)

(Q2)(a) Gaussian filter

new-pixel = (45 * 0.204 +

0.124 * (65 + 65 + 223 + 250) +

0.075 * (210 + 55 + 55 + 216)

(45) ⟹ ≅ (124) smoothed (Blurring the edge)

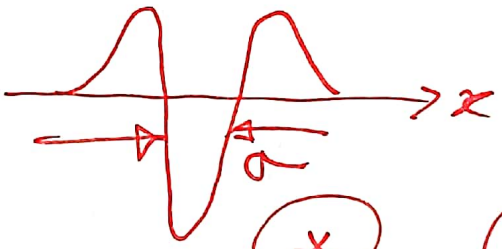
bad for edges

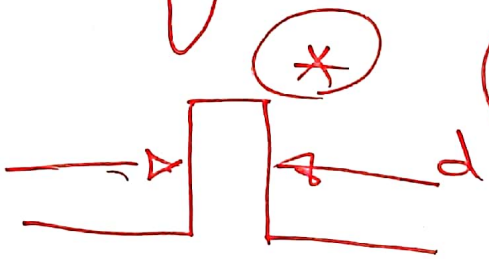
(3)

(b) from slides ← just the basic concepts of and the different weight during averaging

(c) Adaptive Median ← please solve and send me

(Q3) (a) LoG ⟹ g''





$\sigma \approx d$ same scale

when convolves with a blob of same scale produces an extreme value ← when σ for from d → Gives ≈ zero.

(b) DoG ⟹

$f * g(k^2\sigma_1)$

$f * g(k\sigma)$ → ⊖ →

blobs small scale → □

(4) So, for each blob scale we subtract

$$f \circledast g(k^n * \sigma) - f \circledast g(k^{n-1} * \sigma)$$

⇒ Gives blobs at a different scale, then we resize image and repeat

(c) the shown figure Gives only 8 different blob scales.

(d) $G(u,v) = H(u,v) \cdot F(u,v) +$ $N(u,v)$

$H(u,v)$: distortion e.g. blur

$N(u,v)$: additive Noise

So, we divide by $H(u,v)$

$$\therefore \hat{F}(u,v) \cong F(u,v) + \frac{N(u,v)}{H(u,v)}$$

→ this is in freq. domain

→ then $IFFT(\hat{F}(u,v)) \rightarrow \hat{f}(x,y)$ spatial