EE 416 – Image Processing and Computer Vision **(UH Manoa, Fall 2020)**

Homework Assignment #3

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Problem 1, a)

$$|\nabla f(x,y)| > T$$
$$\nabla^2 f(x,y) = 0$$

Problem 1, b)

$$\begin{aligned}\nabla S[m,n] =& [\frac{S[m+1,n]-S[m,n]}{\Delta x} + \frac{S[m,n+1]-S[m,n]}{\Delta y}] \\ =& (S[m+1,n]-S[m,n]) + (S[m,n+1]-S[m,n])\end{aligned}$$

Problem 1, c)

$$\begin{aligned}\Delta S[m,n] &= \frac{\partial^2 f(x,y)}{\partial x^2} + \frac{\partial^2 f(x,y)}{\partial y^2} \\ &= S[m+2,n] - 2S[m+1,n] + S[m,n] + S[m,n+2] - 2S[m,n+1] + S[m,n] \\ &= S[m+2,n] + S[m,n+2] - 2(S[m+1,n] + S[m,n+1] - S[m,n])\end{aligned}$$

Problem 1, d)

$$|\nabla S[m,n]| > T$$
$$\Delta S[m,n] = 0$$

Problem 1, e)

If T is small, too many edges could be detected, causing false alarms to occur.
If T is large, too little edges could be detected.
Thus, T should be selected based on the situation.