EECS 442 F14 HW #4

WU Tongshuang 40782356

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Problem 1 Harris Corner Detection

a

Please refer to source code for explanation. w = 3 in this problem, except in (b).

b

Take the window size w = 3, 4, 6, 7, and this results in the following figure. From the figure, we can see that while w = 3 gives ellipses with the most distinguishable shapes, and w = 4 gives reasonable result. However, when w = 6 and w = 9, the ellipses' changes are too small to be noticed.

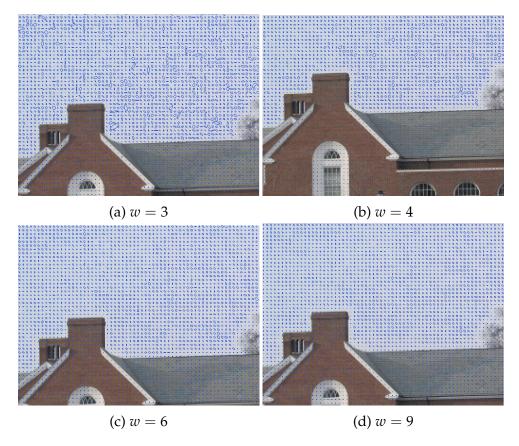


Figure 1: Harris Corner Detection results with different threshold $T = tR_{max}$

C

The thresholds are chosen as $T = tR_{max}$, where R_{max} is defined as the maximum corner response and takes value of $9.4191 \cdot 10^9$ for I1.png, and $1.0751 \cdot 10^{10}$ for I3.png. Take t = 0.001, 0.01, 0.05, 0.1, and this results in the following figure. From the figure, we can see that while $T = 0.01_{max}$ captures a reasonable result, $T = 0.001R_{max}$ results including a lot of edge points besides corner points, indicating this threshold is too low. Also, $T = 0.1R_{max}$ and $T = 0.05R_{max}$ tends to lose some corner points, which is more apparently in the former case, indicating the threshold is too high.

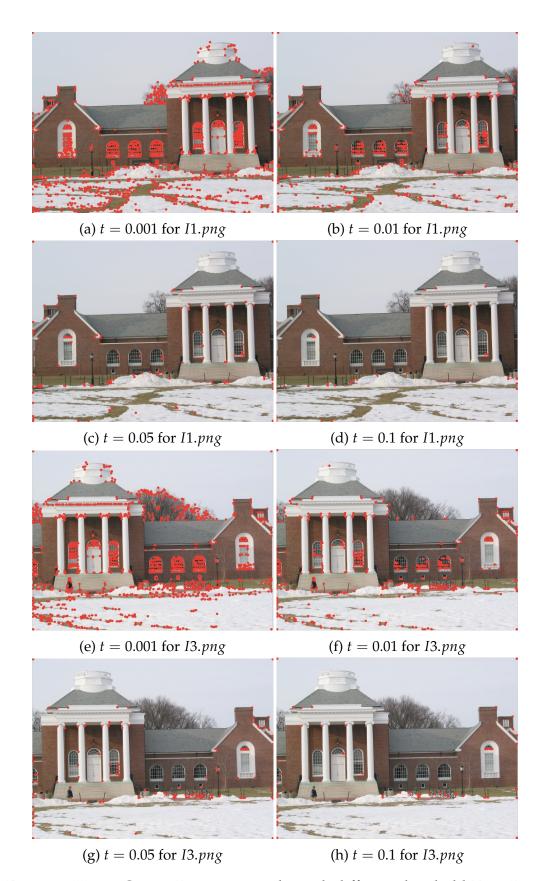


Figure 2: Harris Corner Detection results with different threshold $T = tR_{max}$

Problem 2 Blob Detection

a

The thresholds are chosen as $T = t \cdot scaleSpace_{max}$, where $scaleSpace_{max}$ is defined as the maxinum scale space representation and takes value of $1.1669 \cdot 10^4$. Take t = 0.1, 0.2, 0.3, 0.4, and this results in the following figure. From the figure, we can see that while t = 0.2 captures a reasonable result and t = 0.3 gives less blobs but still good result, t = 0.1 results including some less important points (e.g. those in the sky), indicating this threshold is too low. Also, t = 0.4 and can only capture very limited nearby blobs, indicating the threshold is too high. The exact threshold can be seen on the top of the figures.

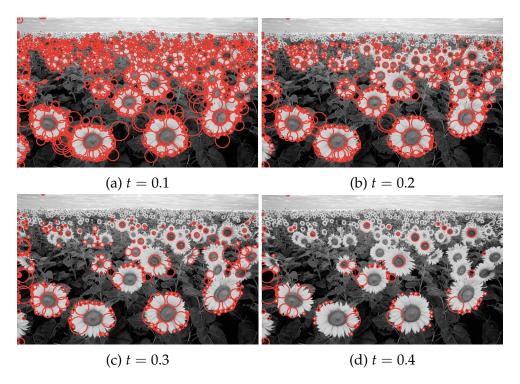


Figure 3: Harris Corner Detection results with different threshold $T = t \cdot scaleSpace_{max}$

b

The histogram is shown below.

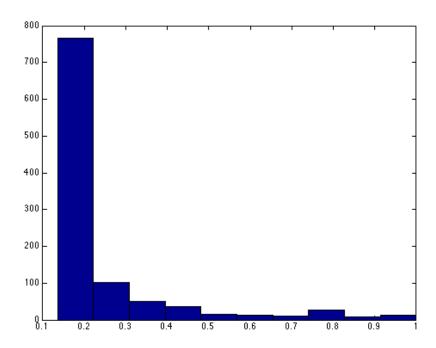


Figure 4: Histogram for blobs' radii, with radii ranging from 0 to 1, bin=10 and threshold T=1500