

EE7374 – Digital Image Processing

Homework 6

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Deliverables & Questions:

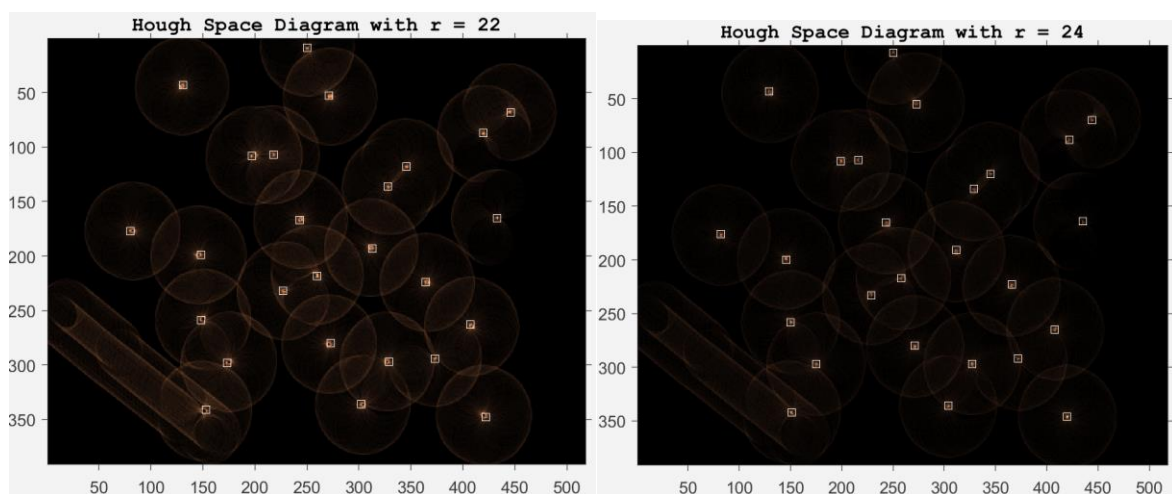
1. MATLAB code for `houghTransform_for_Circles.m` and `HWK6_DetectCircles.m`
2. Explain why the expressions for a, b listed in Eq.(2) have different sign for $\rho(\cos \theta)$ and $\rho(\sin \theta)$?

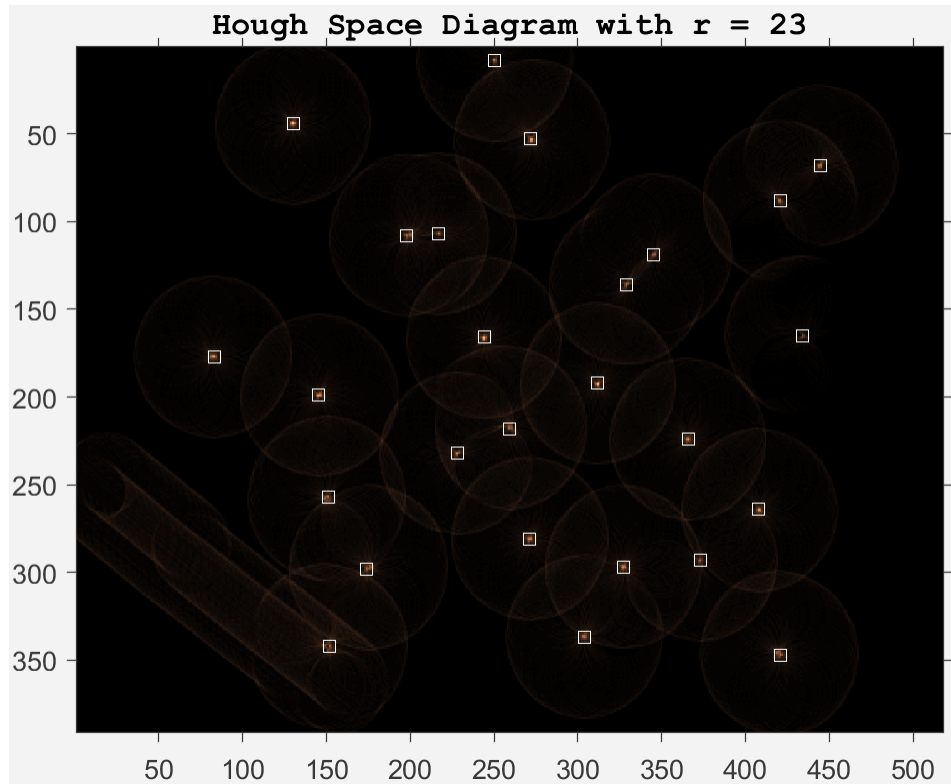
Because the abscissa of the Hough space (analogous to the x-axis in Cartesian coordinates) is a , while the ordinate is b . According to trigonometric function, ρ is hypotenuse, a is neighbor side and b is Diagonal side.

3. What is your estimate of the radius of the colored chips? What were your parameters for the Canny edge detector? Please justify your choice.

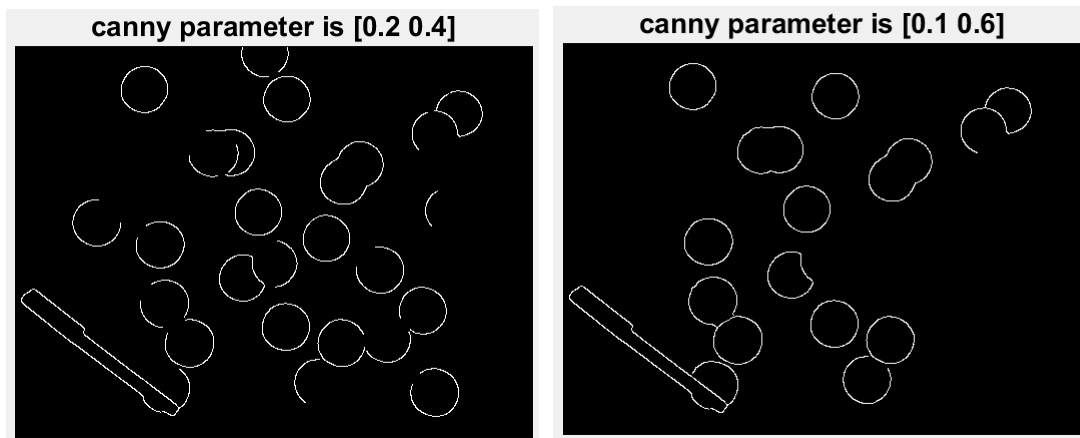
23, my parameters for the canny edge detector is [0.1 0.4].

Tried radius = 22 and 24, it shows in Hough space Diagram that some the center of circles can't merge into one point, while $r = 23$ most centers are merging into one point.



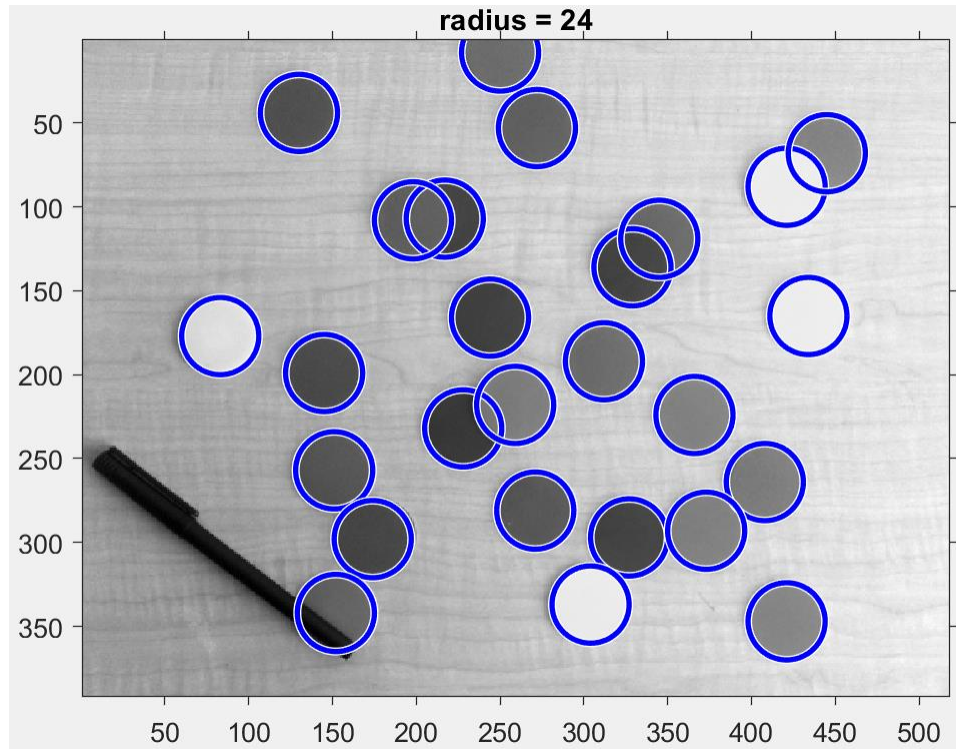


Tried different parameters for canny detector, it shows that when low threshold is larger than 0.1, less parts of circles would be detected. And when high threshold is larger than 0.4, less circles would be detected. And the high threshold is better to be $0.4 \times \text{low threshold}$, so I choose [0.1 0.4].



4. Were you able to detect the 26 circles in the image? If not comment on why you are unable to detect all the circles.

Yes, all of the 26 circles are be detected.



5. What happens to the number of detected circles when you pick a large value for the threshold in `houghpeaks`?

If the value for the threshold is too larger, the number of detected circles would decrease.

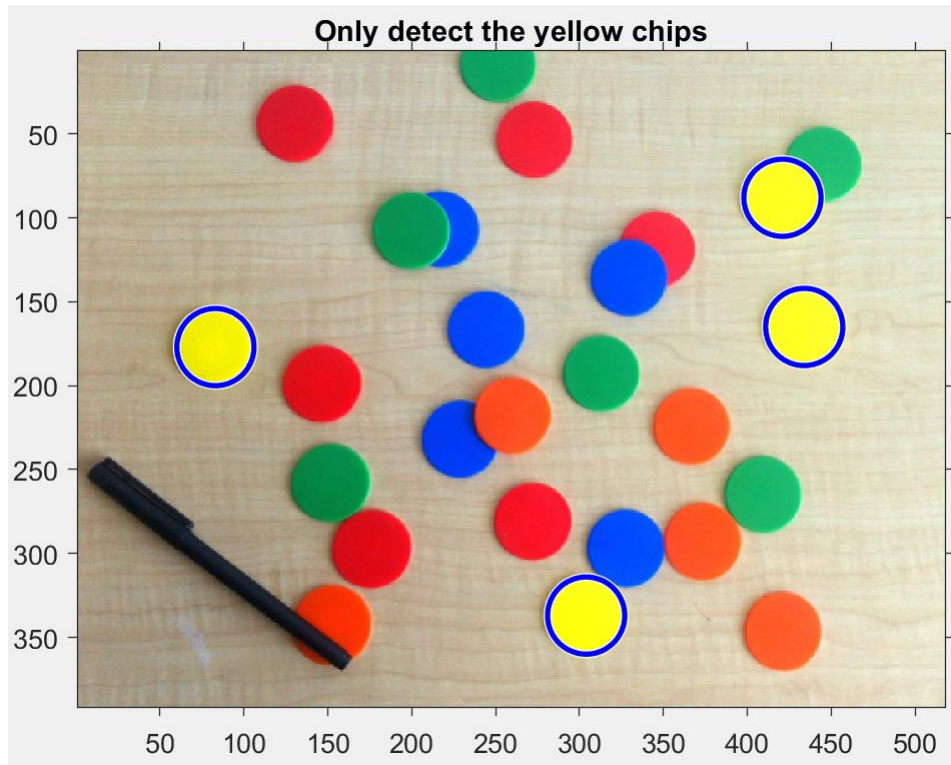
For example, when `threshold = 200`, the number of detected circles is only 6.

But if the value is not that larger like 20, there is no influence.

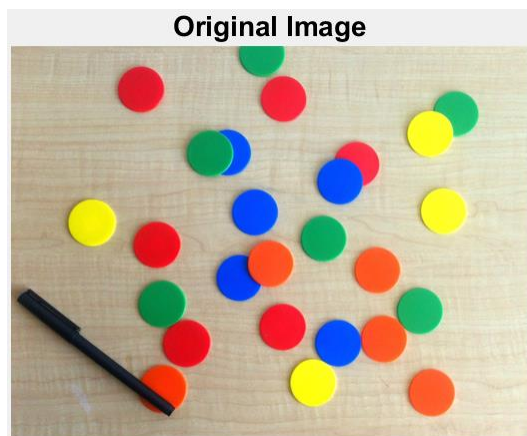
6. What happens to the number of detected circles when you pick a small value for the threshold in `houghpeaks`?

The number of detected circles would not change when I set the value for the threshold to 0.

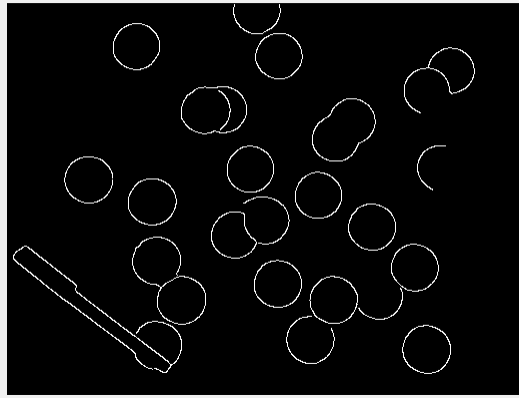
7. Modify the code so that you only detect the yellow chips in the image `coloredChips.png`. (HINT: Check the RGB values of the center of each circle).



8. Screenshots of the original image, output of Canny edge detector, the Hough Space diagram with the peaks overlaid. Label each screenshot clearly. Failure to do so will result in deduction of points.



Output of Canny Edge Detector



Hough Space Diagram with $r = 23$

