

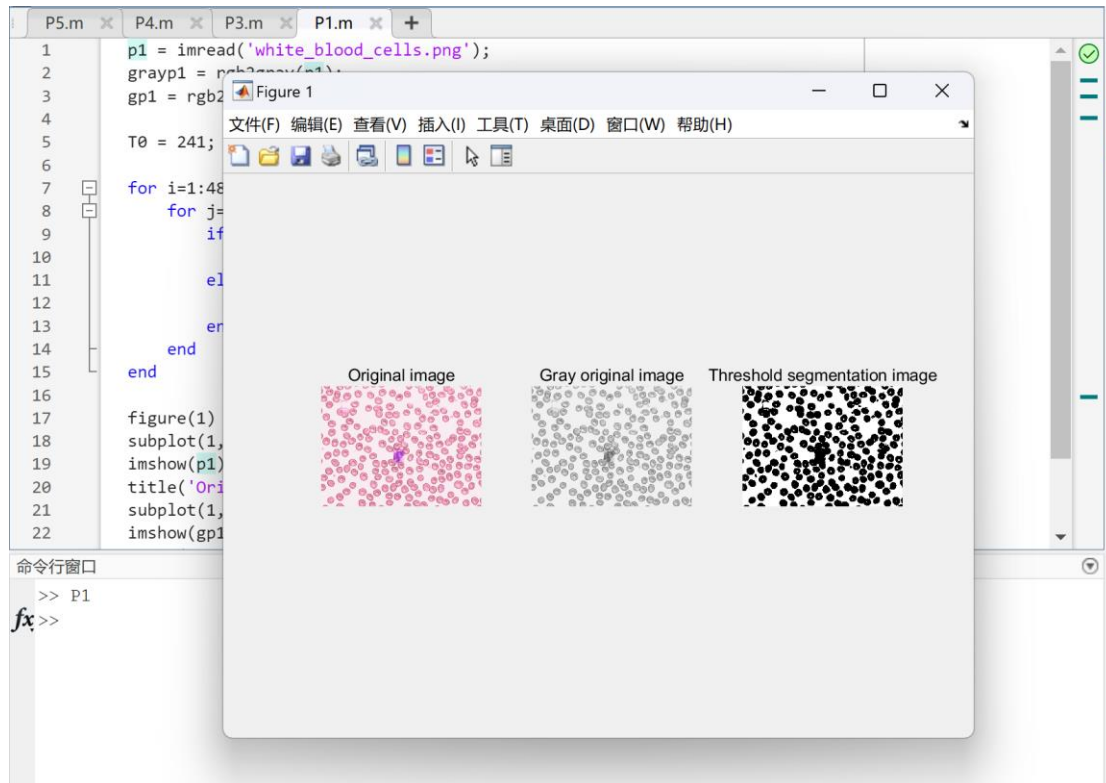
# ENGN 1610/2605 Image Understanding

## Lab # 1: PointWise Image Processing

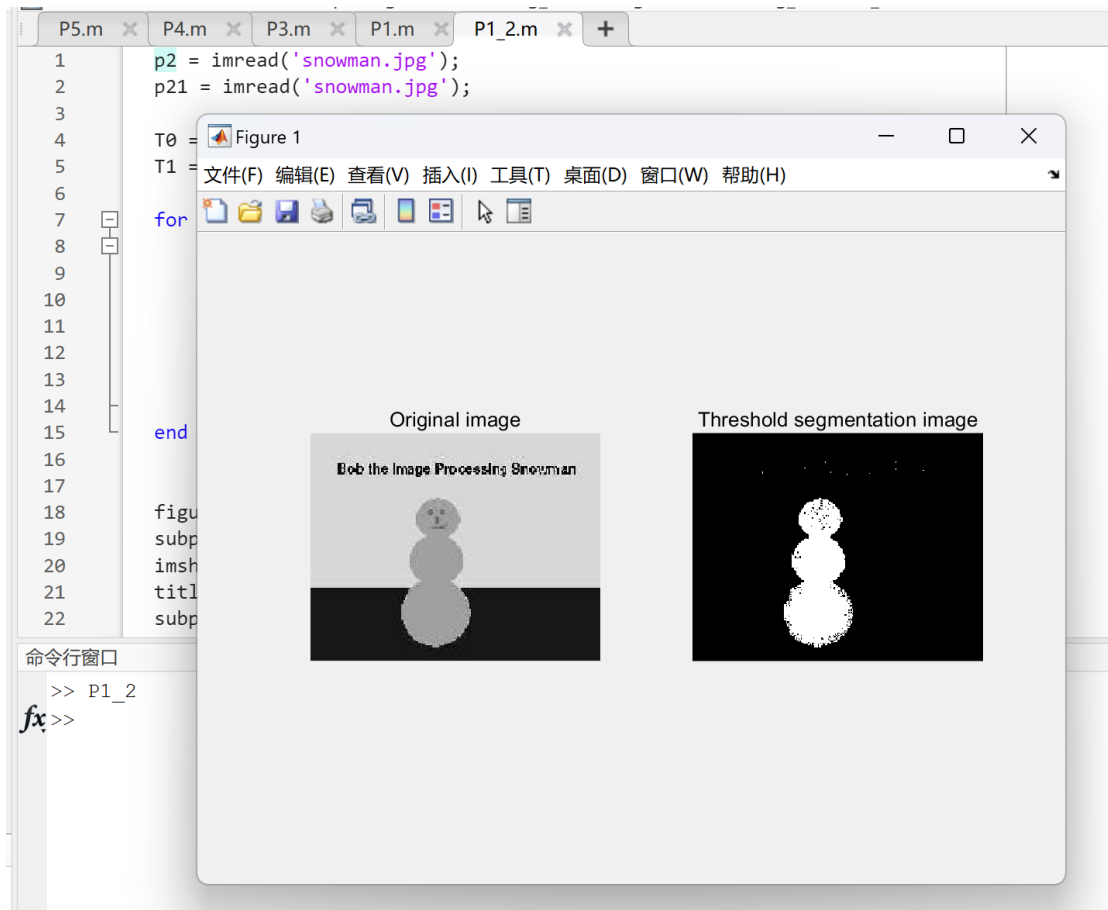
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### Problem 1. Thresholding

1.

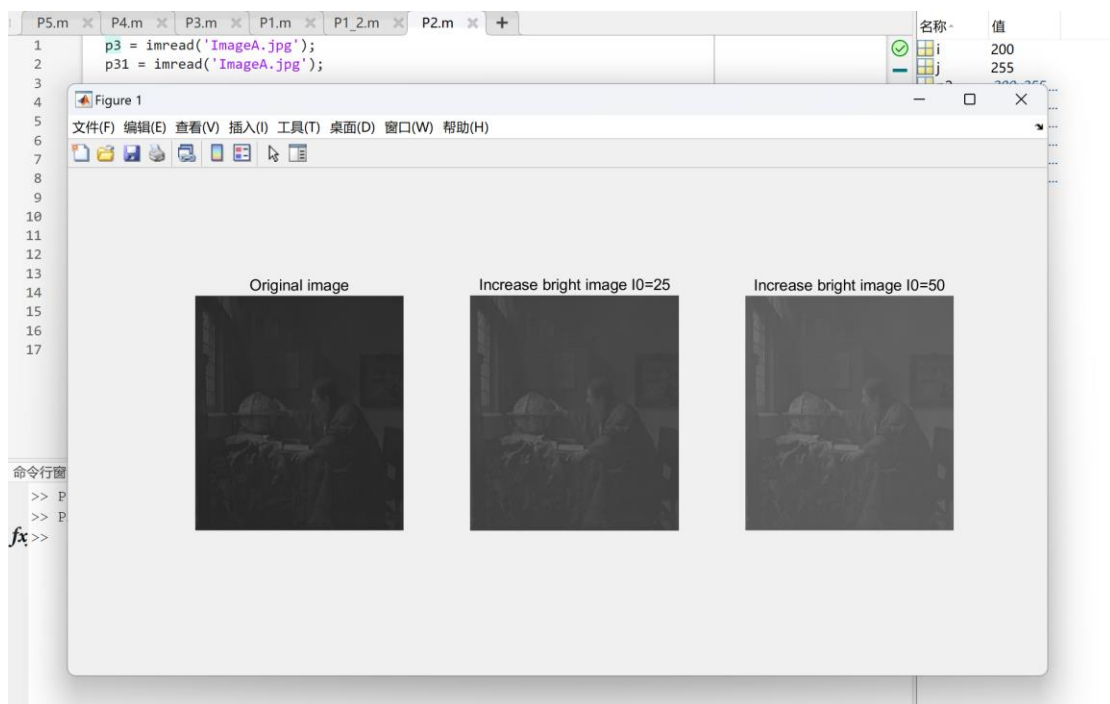


2.

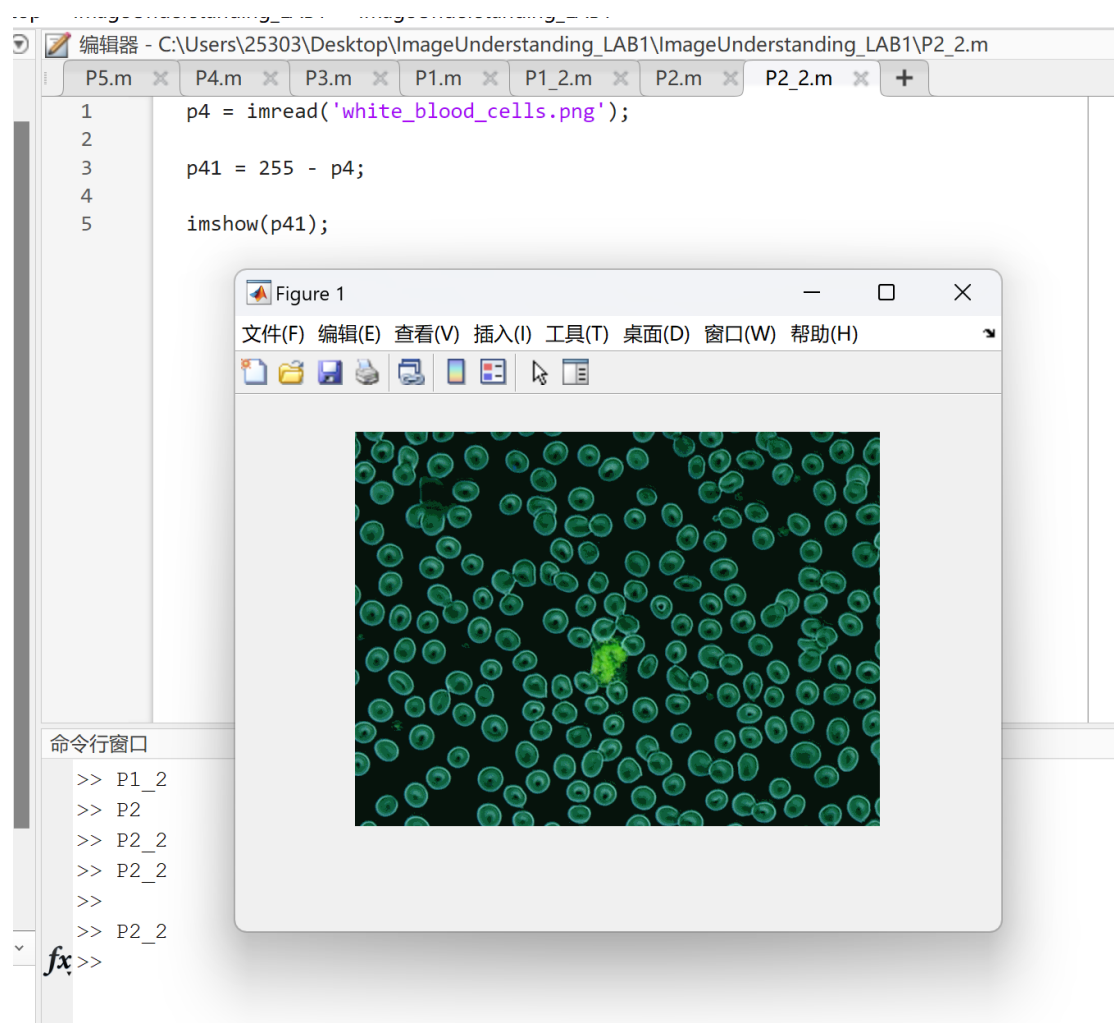


## Problem 2. Contrast/Inversion

1.



2.



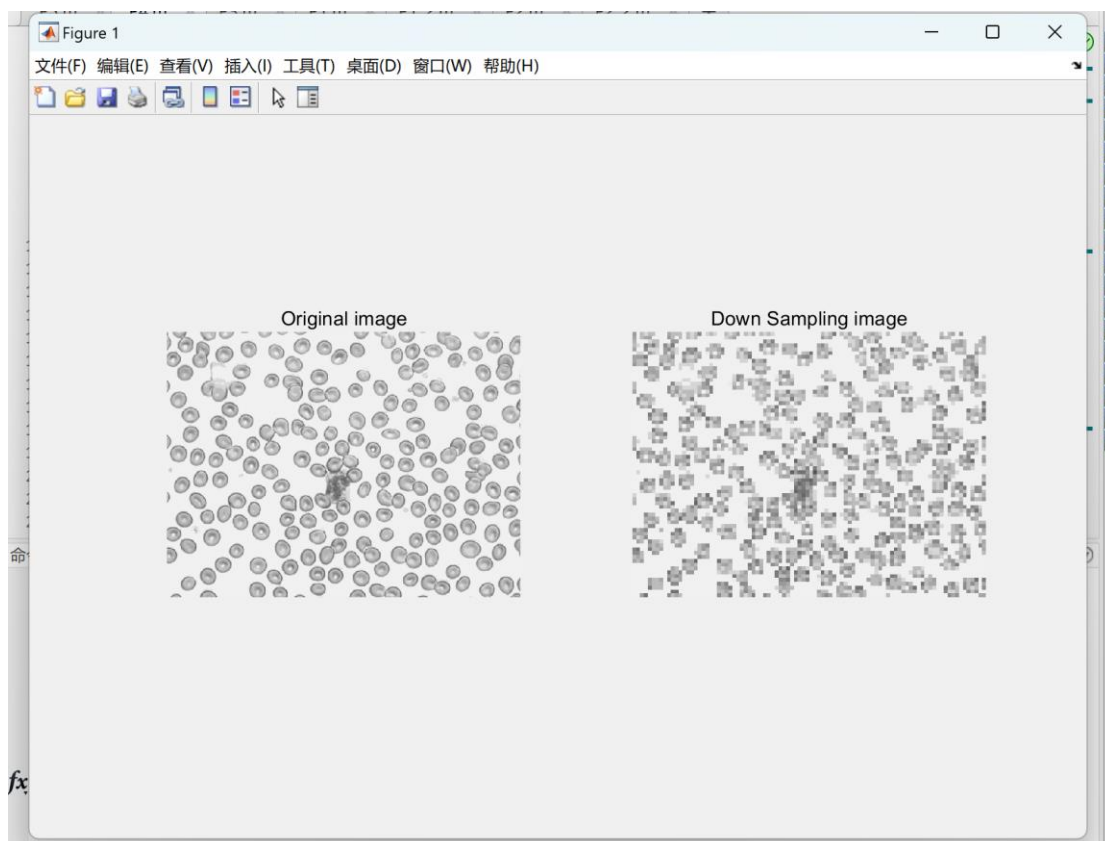
### Problem 3: Quantization



How would you do this for 16 levels?

Divide 256 by 16 and divide it evenly into 16 layers. And set the value of each layer to the median of the range of layers. Therefore, all pixel values in each range are the median of the range of the layer.

#### Problem 4: Sampling

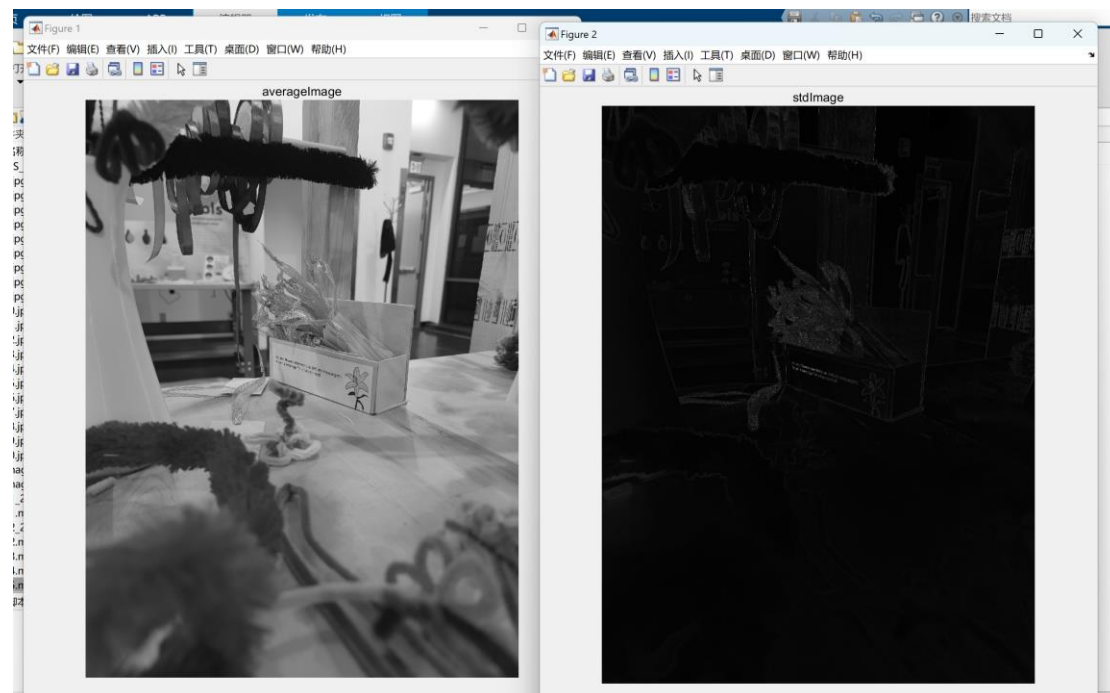


How would you reduce the resolution by a factor of 7?  
Set the sampling step to every seven pixels.

## Sensor Noise

Problem 5: Take 20 images with your digital camera of the same scene under the same illumination condition. Make sure nothing changes in between taking these images, so using a tripod is best. We have tripods in our lab if you do not have one. If you do not have a tripod rest on a set of books or something that has a steady surface.

- Show the mean image and the standard deviation image. Matlab functions `mean()` and `std()` are available.

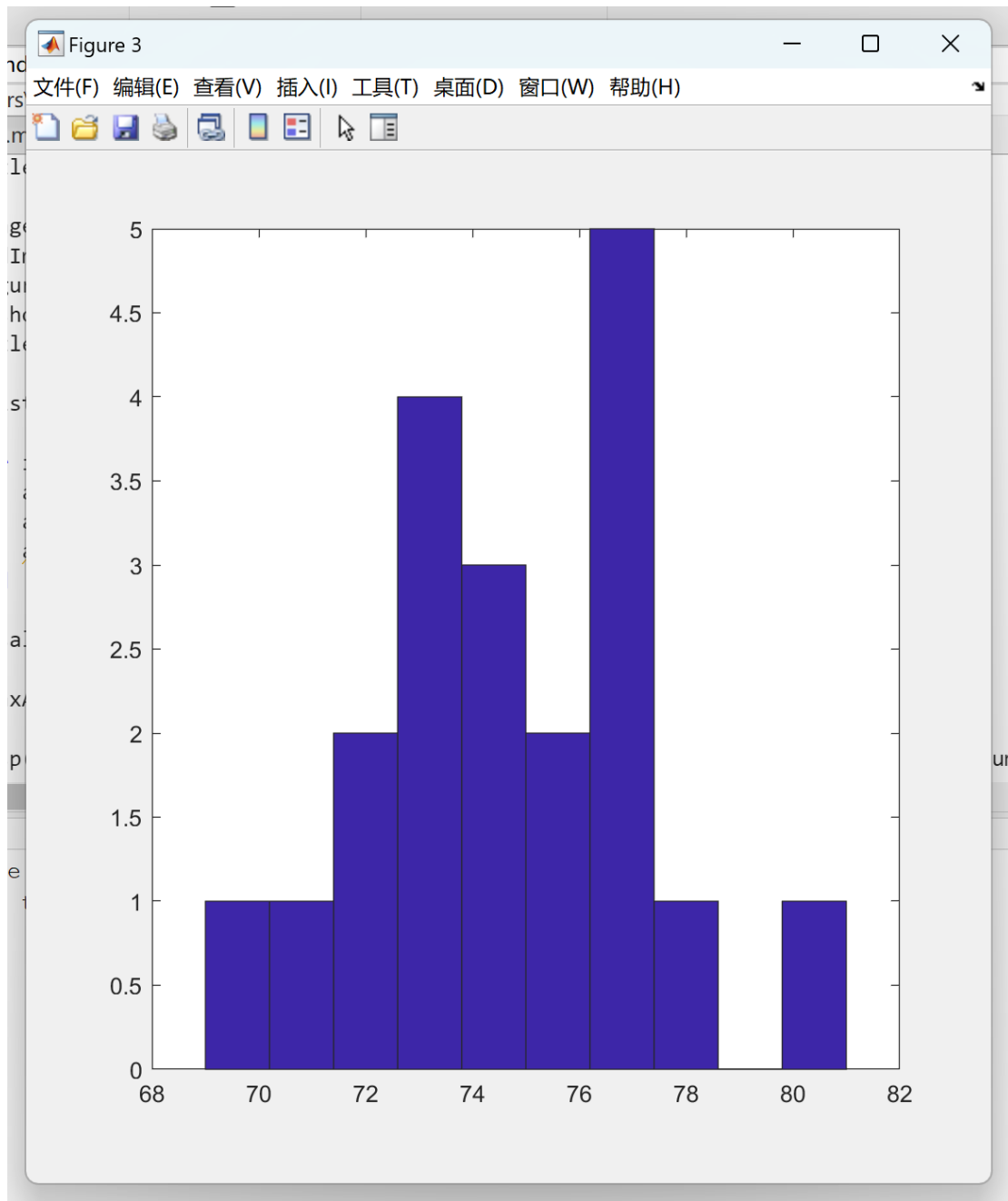


- Show the maximum difference from this mean image. How big is this?

```
命令行窗口
The absolute value of the maximum difference between the mean images: 20472333.25
Position in the list (which image): 5
fx>>
```

Is 20472333.25.

- Pick one pixel across the 20 images, and plot the histogram `hist()`. Discuss what the distribution of pixel intensity looks like. Why does it look like that?



Kind of like a Gaussian distribution. The main reason may be that the environment of the image sensor is not bright enough when shooting, the brightness is not uniform enough, and the noise and mutual influence of the circuit components.