Digital Image Processing (Autumn 2020-21): Lecture 5

MATLAB Drive › DIP_codes › Codes

demo2_GeometricTransforms.m | Demo1_ImageBasics.m

```
%% Histogram visualization
clc
clear all
close all
I=rgb2gray(imread('low_contrast2.png'));
histogram(I)
figure, imshow(I)
%% Properties (advantage & Disadvntage)
close all
f=rgb2gray(imread('jc.jpg'));
histogram(f)
figure,imshow(f) %view image
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%
display(size(f))
%%
f_dummy=imread('color.jpg');
display(size(f_dummy))
%%%% Is this 3D data?
%%
figure, surf(f), colormap('gray')
%% Global information
```

CURRENT FOLDER

- check_fourier.m
- check_histogram.m
- circ_hough.m
- color.jpg
- dct_application.m
- dct_application2.m
- Demo1_ImageBasics.m
- demo2_GeometricTransforms.m
- demo_hough.m
- demo_inverse_filter.m

WORKSPACE

Name	Value	Size
f	264×191 ui...	264×191
I	223×223 ui...	223×223

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Fitting Colormap Statistics Camera Plot Edit Inspector

MATLAB Drive › DIP_codes › Codes

CURRENT FOLDER

check_fourier.m
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Name	Value	Size
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demo2_GeometricTransforms.m | Demo1_ImageBasics.m

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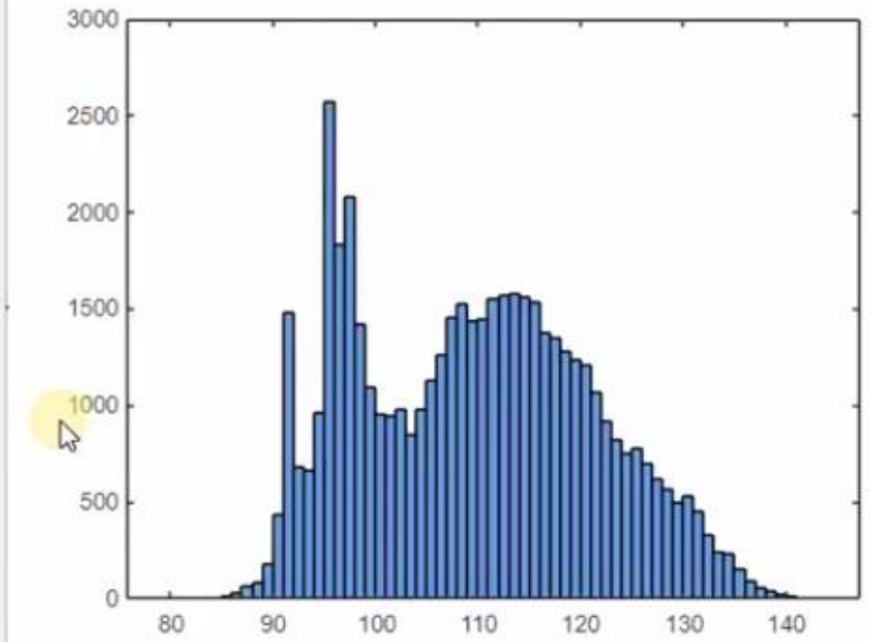
```

Figure 2 | Figure 1



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>>

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Digital Image Processing (Autumn 2020-21): Lecture 5

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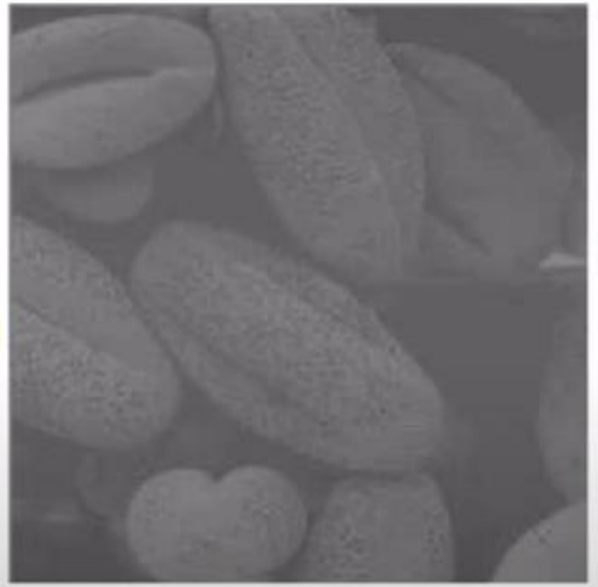

Digital Image Processing (Autumn 2020-21): Lecture 5

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```

Digital Image Processing (Autumn 2020-21): Lecture 5

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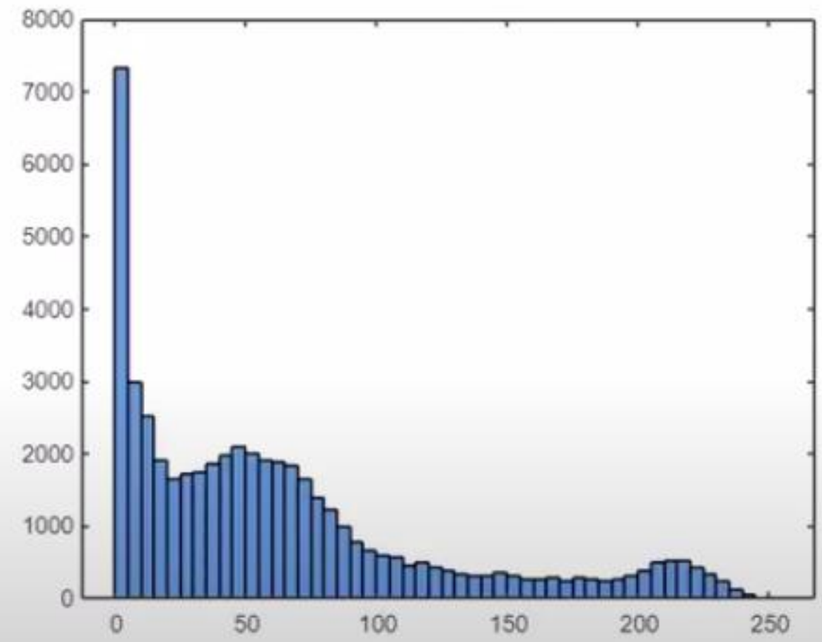
display(size(f_dummy))
%%%% Is this 3D data?
%%
figure, surf(f), colormap('gray')
```



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CURRENT FOLDER

- check_fourier.m
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- color.jpg
- dct_application.m
- dct_application2.m
- Demo1_ImageBasics.m
- demo2_GeometricTransforms.m
- demo_hough.m
- demo_inverse_filter.m

demo2_GeometricTransforms.m | Demo1_ImageBasics.m

```
figure,imshow(f) %view image
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%
display(size(f))
%%
f_dummy=imread('color.jpg');
display(size(f_dummy))
%%%% Is this 3D data?
%%
figure, surf(f), colormap('gray')
%% Global information
%%% Do not always trust histogram!
clear all
close all
I=rgb2gray(imread('low_contrast2.png'));
I1=I+90;
I2=I-60;
[m,n]=size(I);
I_n=uint8(zeros(m,n));
I_n(1:floor(m/2),:)=I1(1:floor(m/2),:);
```

Figure 2 | Figure 1

WORKSPACE

Name	Value	Size
f	264×191 ui...	264×191
f_dummy	275×183×3...	275×183×3
I	223×223 ui...	223×223

COMMAND WINDOW

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```
264   191

275   183   3

>>
```

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FILE ANNOTATIONS TOOLS EDIT

MATLAB Drive › DIP_codes › Codes

CURRENT FOLDER

check_fourier.m
check_histogram.m
circ_hough.m
color.jpg
dct_application.m
dct_application2.m
Demo1_ImageBasics.m
demo2_GeometricTransforms.m
demo_hough.m
demo_inverse_filter.m

WORKSPACE

Name	Value	Size
f	264×191 ui...	264×191
f_dummy	275×183×3...	275×183×3
I	223×223 ui...	223×223

demo2_GeometricTransforms.m | Demo1_ImageBasics.m

```
12 -  figure,imshow(f) %view image
13    %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
14    %%
15 -  display(size(f))
16    %%
17 -  f_dummy=imread('color.jpg');
18 -  display(size(f_dummy))
19    %%%% Is this 3D data?
20    %%
21 -  figure, surf(f), colormap('gray')
22    %% Gl
23    %%% Do not always trust histogram!
```

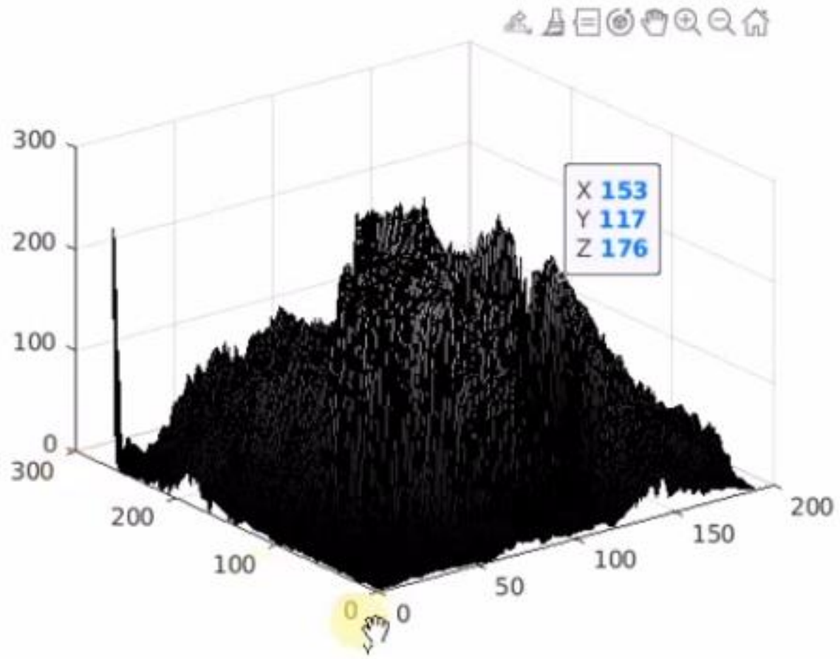
surf(Z,C,options) 1 of 4

z-coordinates

f	264×191 uint8
f_dummy	275×183×3 uint8
find	Find indices and values of nonzero elements
filterBuilder	Interactive filter design
fft	Fast Fourier transform

```
31 -  I_n(1:floor(m/2),:)=I1(1:floor(m/2),:);
32 -
```

Figure 2 Figure 3 Figure 1



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```
   264   191

   275   183     3

>>
```

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Open | Save | X-label | Y-Label | Title | Legend | Remove L... | Colorbar | Remove C... | Grid | Remove G... | X-Grid | Y-Grid | Text Arrow | Fitting | Statistics | Colormap | Camera | Plot Edit | Inspector

FILE | ANNOTATIONS | TOOLS | EDIT

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- Demo1_ImageBasics.m
- demo2_GeometricTransforms.m
- demo_hough.m
- demo_inverse_filter.m

WORKSPACE

Name	Value	S
f	264×191 ui...	2
f_dummy	275×183×3...	2
I	223×223 ui...	223×223

demo2_GeometricTransforms.m | Demo1_ImageBasics.m

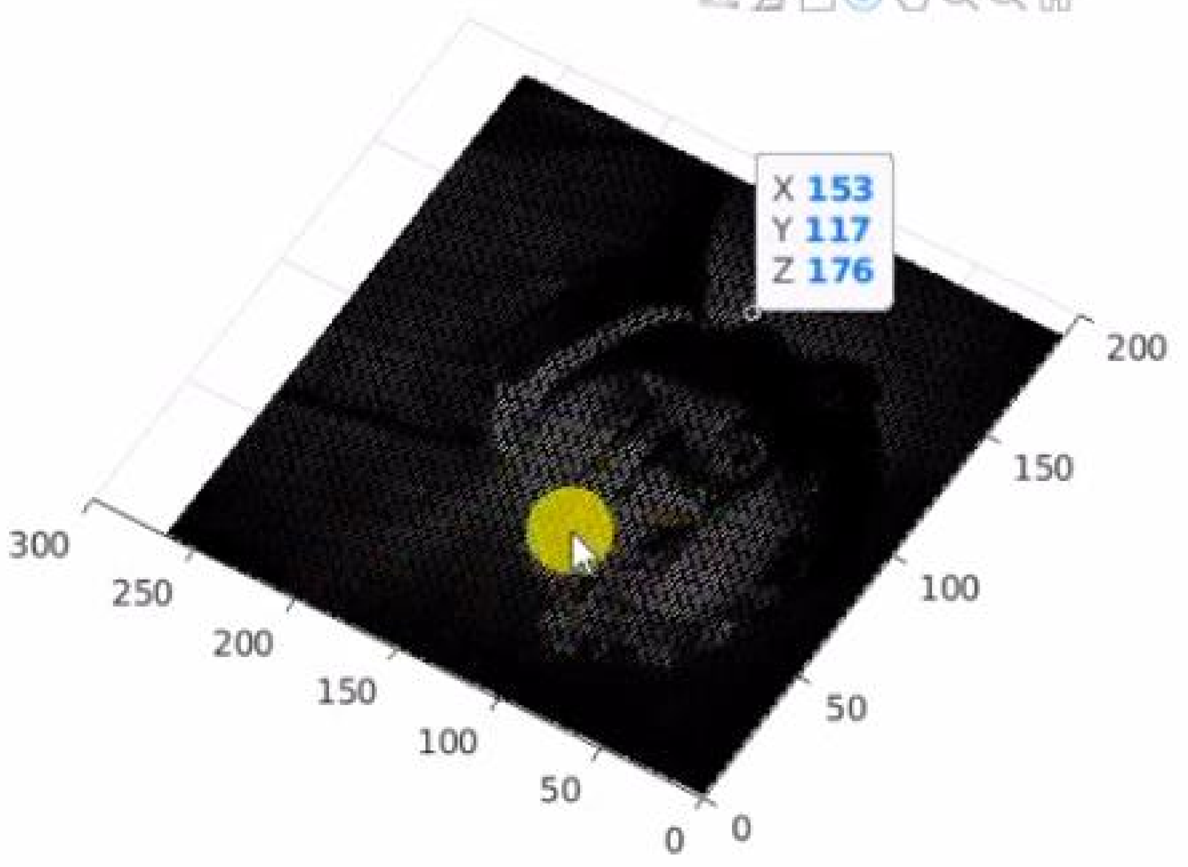
```
figure,imshow(f) %view image
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%
display(size(f))
%%
f_dummy=imread('color.jpg');
display(size(f_dummy))
%%%% Is this 3D data?
%%
figure, surf(f), colormap('gray')
%% Gl
%%% Do not always trust histogram!
));
I_n(1:floor(m/2),:)=I1(1:floor(m/2),:);
```

surf(Z,C,options) 1 of 4

Z-coordinates

f	264×191 uint8
f_dummy	275×183×3 uint8
find	Find indices and values of nonzero elements
filterBuilder	Interactive filter design
fft	Fast Fourier transform

Figure 2 | Figure 3 | Figure 1



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```
264   191

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```

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MATLAB Drive › DIP_codes › Codes

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Name	Value	Size
f	264×191 ui...	264×191
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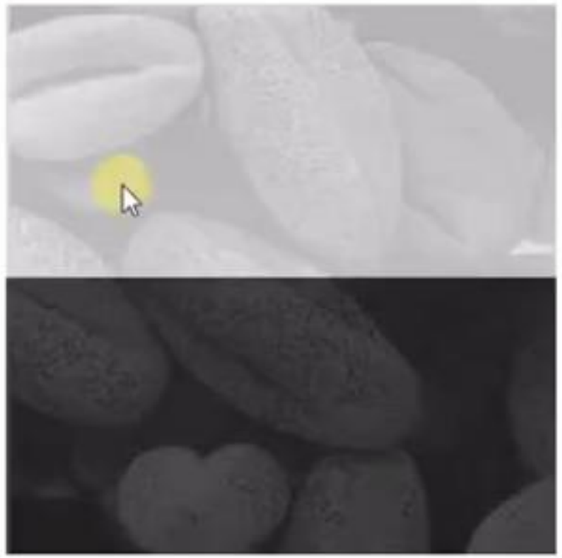
I	223×223 ui...	223×223
I1	223×223 ui...	223×223
I2	223×223 ui...	223×223
I_n	223×223 ui...	223×223
m	223	1×1
n	223	1×1

demo2_GeometricTransforms.m | Demo1_ImageBasics.m

```
%%% Is this 3D data?
%%
figure, surf(f), colormap('gray')
%% Global information
%%% Do not always trust histogram!
close all
I=rgb2gray(imread('low_contrast2.png'));
I1=I+90;
I2=I-60;
[m,n]=size(I);
I_n=uint8(zeros(m,n));
I_n(1:floor(m/2),:)=I1(1:floor(m/2),:);
I_n(floor(m/2)+1:end,:)=I2(floor(m/2)+1:end,:);
figure,imshow(I_n)
figure, imhist(I_n)
%%
figure, histogram(f+20)
figure, imshow(f+20)
%%
figure, imshow(imresize(imresize(f,0.5),2)) %effect
```

Figure 1 | Figure 2



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```
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```

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MATLAB Drive > DIP_codes > Codes

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check_fourier.m
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WORKSPACE

Name	Value	Size
f	264×191 ui...	264×191
f_dummy	275×183×3...	275×183×3
I	223×223 ui...	223×223
I1	223×223 ui...	223×223
I2	223×223 ui...	223×223
I_n	223×223 ui...	223×223
m	223	1×1
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demo2_GeometricTransforms.m | Demo1_ImageBasics.m

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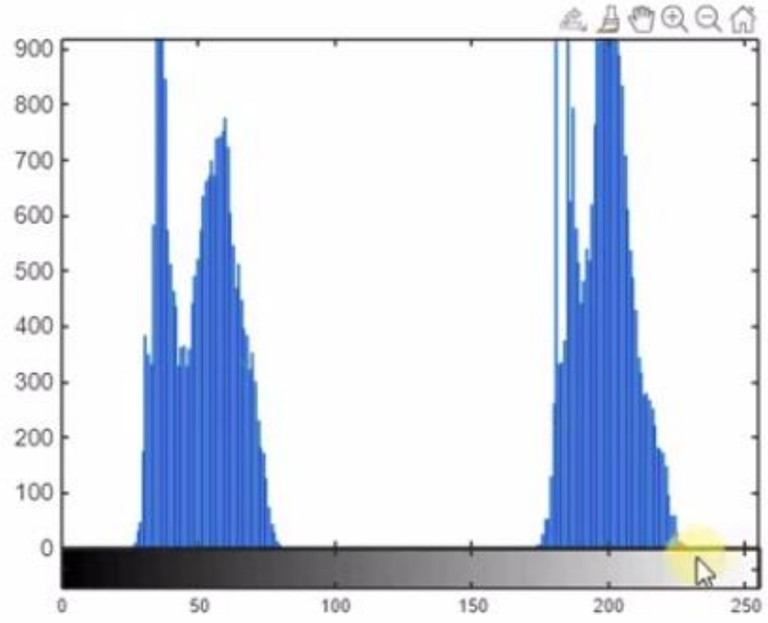
%%
figure, surf(f), colormap('gray')
%% Global information
%%% Do not always trust histogram!
close all
I=rgb2gray(imread('low_contrast2.png'));
I1=I+90;
I2=I-60;
[m,n]=size(I);
I_n=uint8(zeros(m,n));
I_n(1:floor(m/2),:)=I1(1:floor(m/2),:);
I_n(floor(m/2)+1:end,:)=I2(floor(m/2)+1:end,:);
figure,imshow(I_n)
figure, imhist(I_n)
%%
figure, histogram(f+20)
figure, imshow(f+20)
%%
figure, imshow(imresize(imresize(f,0.5),2)) %effect
```

Figure 1 | Figure 2



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   264   191

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CURRENT FOLDER

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demo2_GeometricTransforms.m | Demo1_ImageBasics.m

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I_n=uint8(zeros(m,n));
I_n(1:floor(m/2),:)=I1(1:floor(m/2),:);
I_n(floor(m/2)+1:end,:)=I2(floor(m/2)+1:end,:);
figure,imshow(I_n)
figure, imhist(I_n)
%%
figure, histogram(f+20)
figure, imshow(f+20)
%%
figure, imshow(imresize(imresize(f,0.5),2)) %effect
%%
figure, imshow(f*20)

%%
f_bw=im2bw(f);
figure, imshow(f_bw)
%%
figure, imshow(double(f))
```

Figure 1 | Figure 4 | Figure 2 | Figure 3

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```
   264   191

   275   183     3

>>
```

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MATLAB Drive > DIP_codes > Codes

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m	223	1×1
n	223	1×1

demo2_GeometricTransforms.m | Demo1_ImageBasics.m

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I2=I-60;
[m,n]=size(I);
I_n=uint8(zeros(m,n));
I_n(1:floor(m/2),:)=I1(1:floor(m/2),:);
I_n(floor(m/2)+1:end,:)=I2(floor(m/2)+1:end,:);
figure,imshow(I_n)
figure, imhist(I_n)
%%

figure, histogram(f+20)
figure, imshow(f)
figure, imshow(f+20)
%%
figure, imshow(imresize(imresize(f,0.5),2)) %effect
%%
figure, imshow(f*20)

%%
f_bw=im2bw(f);
figure, imshow(f_bw)
```

Figure 1 | Figure 2 | Figure 3

COMMAND WINDOW

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```
   264   191

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```

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FILE: Open, Save
ANNOTATIONS: X-label, Y-Label, Title, Legend, Remove L..., Colorbar, Remove C..., Grid, Remove G..., X-Grid, Y-Grid, Text Arrow
TOOLS: Fitting, Statistics, Colormap, Camera
EDIT: Plot Edit, Inspector

/ > MATLAB Drive > DIP_codes > Codes

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I_n=uint8(zeros(m,n));
I_n(1:floor(m/2),:)=I1(1:floor(m/2),:);
I_n(floor(m/2)+1:end,:)=I2(floor(m/2)+1:end,:);
figure,imshow(I_n)
figure, imhist(I_n)
%%

figure, histogram(f+20)
figure, imshow(f)
figure, imshow(f+20)
%%
figure, imshow(imresize(imresize(f,0.5),2)) %effect
%%
figure, imshow(f*20)

%%
f_bw=im2bw(f);
figure, imshow(f_bw)
```

Figure 1 | Figure 2 | Figure 3

COMMAND WINDOW

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>>
```

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Fitting | Colormap | Statistics | Camera | TOOLS

Plot Edit | Inspector | EDIT

/ > MATLAB Drive > DIP_codes > Codes

CURRENT FOLDER

Name

- check_fourier.m
- check_histogram.m
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I_n	223×223 ui...	223×223
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demo2_GeometricTransforms.m | Demo1_ImageBasics.m

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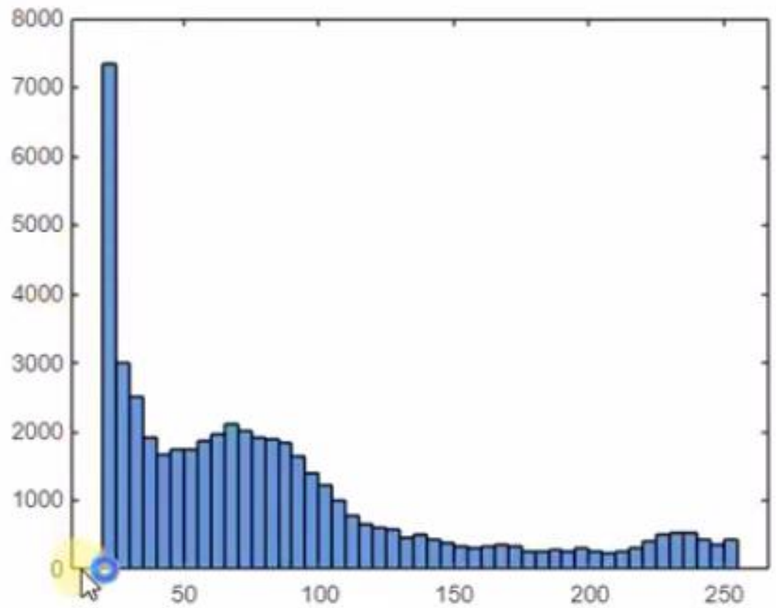
I2=I-60;
[m,n]=size(I);
I_n=uint8(zeros(m,n));
I_n(1:floor(m/2),:)=I1(1:floor(m/2),:);
I_n(floor(m/2)+1:end,:)=I2(floor(m/2)+1:end,:);
figure,imshow(I_n)
figure, imhist(I_n)
%%

figure, histogram(f+20)
figure, imshow(f)
figure, imshow(f+20)
%%
figure, imshow(imresize(imresize(f,0.5),2)) %effect
%%
figure, imshow(f*20)

%%
f_bw=im2bw(f);
figure, imshow(f_bw)
```

Figure 1 | Figure 2 | Figure 3



COMMAND WINDOW

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```
   264   191

   275   183     3

>>
```

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CURRENT FOLDER

check_fourier.m
check_histogram.m
circ_hough.m
color.jpg
dct_application.m
dct_application2.m
Demo1_ImageBasics.m
demo2_GeometricTransforms.m
demo_hough.m
demo_inverse_filter.m

WORKSPACE

Name	Value	Size
f	264×191 ui...	264×191
f_dummy	275×183×3...	275×183×3
I	223×223 ui...	223×223
I1	223×223 ui...	223×223
I2	223×223 ui...	223×223
I_n	223×223 ui...	223×223
m	223	1×1
n	223	1×1

demo2_GeometricTransforms.m | Demo1_ImageBasics.m

```
I2=I-60;
[m,n]=size(I);
I_n=uint8(zeros(m,n));
I_n(1:floor(m/2),:)=I1(1:floor(m/2),:);
I_n(floor(m/2)+1:end,:)=I2(floor(m/2)+1:end,:);
figure,imshow(I_n)
figure, imhist(I_n)
%%

figure, histogram(f-20)
figure, imshow(f)
figure, imshow(f-20)
%%
figure, imshow(imresize(imresize(f,0.5),2)) %effect
%%
figure, imshow(f*20)

%%
f_bw=im2bw(f);
figure, imshow(f_bw)
```

Figure 4 | Figure 1

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```
   264   191

   275   183     3

>>
```

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- Demo1_ImageBasics.m
- demo2_GeometricTransforms.m
- demo_hough.m
- demo_inverse_filter.m

WORKSPACE

Name	Value	Size
f	264×191 ui...	264×191
f_dummy	275×183×3...	275×183×
I	223×223 ui...	223×223
I1	223×223 ui...	223×223
I2	223×223 ui...	223×223
I_n	223×223 ui...	223×223
m	223	1×1
n	223	1×1

demo2_GeometricTransforms.m | Demo1_ImageBasics.m

```
30 - I_n(1:floor(m/2),:)=I1(1:floor(m/2),:);
31 - I_n(floor(m/2)+1:end,:)=I2(floor(m/2)+1:end,:);
32 - figure,imshow(I_n)
33 - figure, imhist(I_n)
34 - %%
35
36 - figure, histogram(f-20)
37 - figure, imshow(f)
38 - figure, imshow(f-20)
39 - %%
40 - figure, imshow(imresize(imresize(f,0.5),2)) %effect
41 - %%
42 - figure, imshow(f*20)
43
44 - %%
45 - f_bw=im2bw(f);
46 - figure, imshow(f_bw)
47 - %%
48 - figure, imshow(double(f))
49 - %%
```

Figure 4 | Figure 1

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```
   264   191

   275   183     3

>>
```

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- demo2_GeometricTransforms.m
- demo_hough.m
- demo_inverse_filter.m

WORKSPACE

Name	Value	Size
f	264×191 ui...	264×191
f_bw	264×191 lo...	264×191
f_dummy	275×183×3...	275×183×3
I	223×223 ui...	223×223
I1	223×223 ui...	223×223
I2	223×223 ui...	223×223
I_n	223×223 ui...	223×223
m	223	1×1
n	223	1×1

demo2_GeometricTransforms.m | Demo1_ImageBasics.m

```
35
36 -  figure, histogram(f-20)
37 -  figure, imshow(f)
38 -  figure, imshow(f-20)
39    %%
40 -  figure, imshow(imresize(imresize(f,0.5),2)) %effect
41    %%
42 -  figure, imshow(f*20)
43
44    %%
45 -  f_bw=im2bw(f);
46 -  figure, imshow(f_bw)
47    %%
48 -  figure, imshow(double(f))
49    %%
50 -  close all
51 -  f_en=histeq(f);
52 -  imshow(f)
53 -  figure, imshow(f_en)
54 -  figure, histogram(f)
55 -
```

Figure 4 | Figure 1

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```
   264   191

   275   183     3

>>
```

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WORKSPACE

Name	Value	Size
f	264×191 ui...	264×191
f_bw	264×191 lo...	264×191
f_dummy	275×183×3...	275×183×3
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I2	223×223 ui...	223×223
I_n	223×223 ui...	223×223
m	223	1×1
n	223	1×1

demo2_GeometricTransforms.m | Demo1_ImageBasics.m

```
35
36 -  figure, histogram(f-20)
37 -  figure, imshow(f)
38 -  figure, imshow(f-20)
39    %%
40 -  figure, imshow(imresize(imresize(f,0.5),2)) %effect
41    %%
42 -  figure, imshow(f*20)
43
44    %%
45 -  f_bw=im2bw(f);
46 -  figure, imshow(f_bw)
47    %%
48 -  figure, imshow(double(f))
49    %%
50 -  close all
51 -  f_en=histeq(f);
52 -  imshow(f)
53 -  figure, imshow(f_en)
54 -  figure, histogram(f)
55 -
```

Figure 4 | Figure 1 | Figure 2

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```
   264   191

   275   183     3

>>
```

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demo_hough.m
demo_inverse_filter.m

WORKSPACE

Name	Value	Size
ans	1	1×1
f	264×191 ui...	264×191
f_bw	264×191 lo...	264×191
f_dummy	275×183×3...	275×183×3
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I2	223×223 ui...	223×223
I_n	223×223 ui...	223×223
m	223	1×1
n	223	1×1

demo2_GeometricTransforms.m | Demo1_ImageBasics.m

```
39  %%
40  figure, imshow(imresize(imresize(f,0.5),2)) %effect
41  %%
42  figure, imshow(f*20)
43
44  %%
45  f_bw=im2bw(f);
46  figure, imshow(f_bw)
47  %%
48  figure, imshow(double(f/255))
49  %%
50  close all
51  f_en=histeq(f);
52  imshow(f)
53  figure, imshow(f_en)
54  figure, histogram(f)
55  figure, histogram(f_en)
56
```

Figure 4 | Figure 1 | Figure 3

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```
ans =

  uint8

   1
```

34:12 / 44:26 >>

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- dct_application2.m
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- demo2_GeometricTransforms.m
- demo_hough.m
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ans	1	1×1
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I1	223×223 ui...	223×223
I2	223×223 ui...	223×223
I_n	223×223 ui...	223×223
m	223	1×1
n	223	1×1

demo2_GeometricTransforms.m | Demo1_ImageBasics.m

```
39  %%
40  figure, imshow(imresize(imresize(f,0.5),2)) %effect
41  %%
42  figure, imshow(f*20)
43
44  %%
45  f_bw=im2bw(f);
46  figure, imshow(f_bw)
47  %%
48  figure, imshow(double(f)/255)
49  %%
50  close all
51  f_en=histeq(f);
52  imshow(f)
53  figure, imshow(f_en)
54  figure, histogram(f)
55  figure, histogram(f_en)
56
57
58
59  %%%%% Check imshow(double(f/255))
60  %%%%% Check imshow(double(f)/255)
```

Figure 4 | Figure 1 | Figure 3 | Figure 2

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f	264×191 ui...	264×19
f_bw	264×191 lo...	264×19
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f_en	264×191 ui...	264×19
I	223×223 ui...	223×22
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I2	223×223 ui...	223×22
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m	223	1×1
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demo2_GeometricTransforms.m | Demo1_ImageBasics.m *

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45 - f_bw=im2bw(f);
46 - figure, imshow(f_bw)
47 - %%
48 - figure, imshow(double(f)/255)
49 - %%
50 - close all
51 - f_en=histeq(I);
52 - imshow(f)
53 - figure, imshow(f_en)
54 - figure, histogram(f)
55 - figure, histogram(f_en)
56
57
58
59 - %%%%% Check imshow(double(f/255))
60 - %%%%% Check imshow(double(f)/255)
61 - %%%%% Check uint8(200/255) uint8(127/255) uint8(128/
```

Figure 1 | Figure 2 | Figure 3 | Figure 4

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CURRENT FOLDER

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- demo_hough.m
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WORKSPACE

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f_bw	264×191 lo...	264×19
f_dummy	275×183×3...	275×18
f_en	223×223 ui...	223×22
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demo2_GeometricTransforms.m | Demo1_ImageBasics.m

```
40 -  figure, imshow(imresize(imresize(f,0.5),2)) %effect
41    %%
42 -  figure, imshow(f*20)
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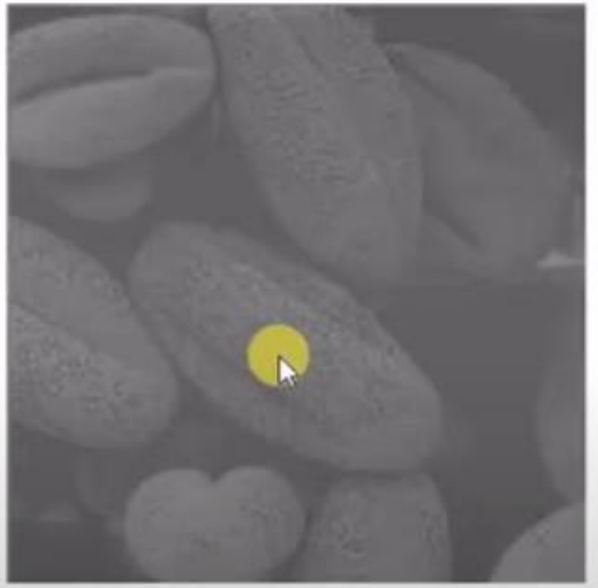
44    %%
45 -  f_bw=im2bw(f);
46 -  figure, imshow(f_bw)
47    %%
48 -  figure, imshow(double(f)/255)
49    %%
50 -  close all
51 -  f_en=histeq(I);
52 -  imshow(I)
53 -  figure, imshow(f_en)
54    % figure, histogram(f)
55    % figure, histogram(f_en)
56
57
58
59    %%%%% Check imshow(double(f/255))
60    %%%%% Check imshow(double(f)/255)
61    %%%%% Check uint8(200/255) uint8(127/255) uint8(128/
```

Figure 1 | Figure 2



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```
figure, imshow(imresize(imresize(f,0.5),2)) %effect
%%
figure, imshow(f*20)

%%
f_bw=im2bw(f);
figure, imshow(f_bw)
%%
figure, imshow(double(f)/255)
%%
close all
f_en=histeq(I);
imshow(I)
figure, imshow(f_en)
% figure, histogram(f)
% figure, histogram(f_en)



%%%%% Check imshow(double(f/255))
%%%%% Check imshow(double(f)/255)
%%%%% Check uint8(200/255) uint8(127/255) uint8(128/
```

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- demo_inverse_filter.m

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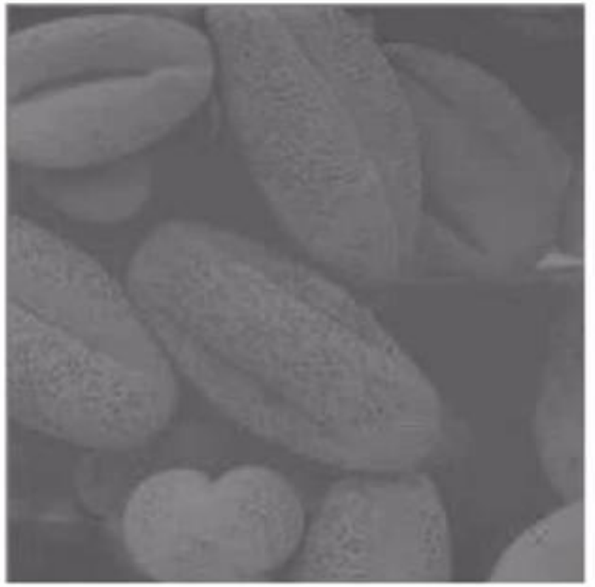
f	264×191 ui...	264×19
f_bw	264×191 lo...	264×19
f_dummy	275×183×3...	275×18
f_en	223×223 ui...	223×22
I	223×223 ui...	223×22
I1	223×223 ui...	223×22
I2	223×223 ui...	223×22
I_n	223×223 ui...	223×22
m	223	1×1
n	223	1×1

demo2_GeometricTransforms.m | Demo1_ImageBasics.m

```
clc
clear all
close all
im1=rgb2gray(imread('color.jpg'));
[m,n,p]=size(im1);
imshow(im1)
%% Translation
im_t = imtranslate(im1,[15, 25]);
figure; imshow(im_t);
%% Scaling
im_sc=imresize(im1,[0.5*m,2*n]);
figure, imshow(im_sc)
%% Rotation
thet = 30;
im_r=imrotate(im1,-30,'bilinear','crop');
figure, imshow(im_r)
%% Shearing
a = 0.45;
T = maketform('affine', [1 0 0; a 1 0; 0 0 1] );
im_s = imtransform(im1,T);
figure; imshow(im_s);
%% Projective
```

Figure 1 | Figure 2



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1
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```

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