HOME PLOTS APPS EDITOR PUBLISH VIEW

Search Documentation

Open Save Compare Print — FILE

Go To Find Bookmark — NAVIGATE

Refactor — CODE

Profiler Analyze — ANALYZE

Run Section Section Break Run and Advance Run to End — SECTION

Run Step Stop — RUN

D: ▸ faculty ▸ AI ▸ Courses ▸ Computer Sound ▸ Section ▸ Matlab Code ▸ sec5

Current Folder

Name

- zerocrossmat.m
- zerocross2.m
- zerocross.m
- untitled.m
- speech.au
- overlapping.m
- LevelCross2.m
- framing.m
- energy.m

energy.m (Script)

Editor - D:\faculty\AI\Courses\Computer Sound\Section\Matlab Code\sec5\energy.m

zerocross.m | zerocross2.m | energy.m

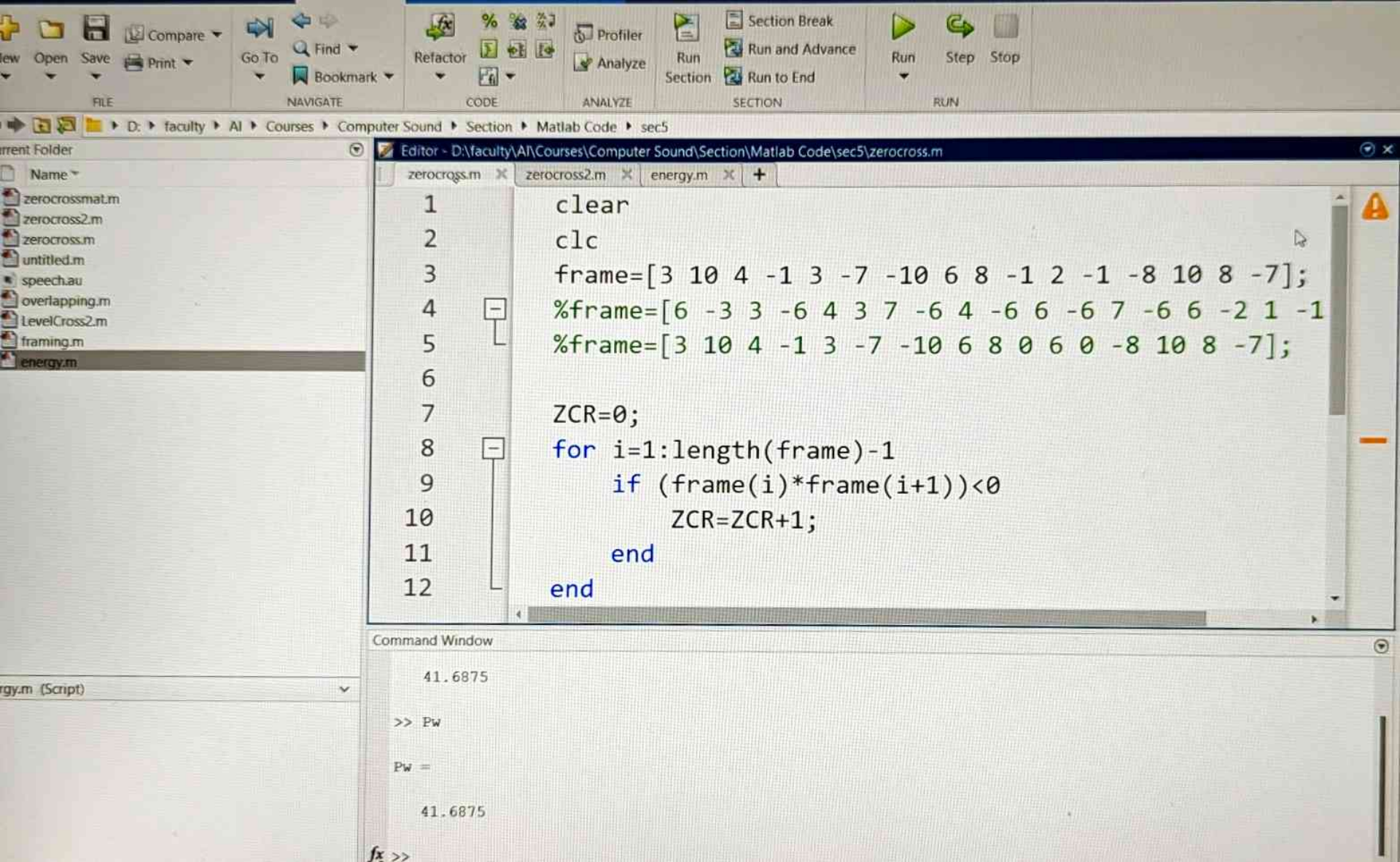
```
1   clear
2   clc
3   frame=[3 10 4 -1 3 -7 -10 6 8 -1 2 -1 -8 10 8 -7];
4   %frame=[6 -3 3 -6 4 3 7 -6 4 -6 6 -6 7 -6 6 -2 1 -1
5   L=length(frame);
6   sum=0;
7   for i=1:length(frame)
8       sum=sum+frame(i).^2;
9   end
10      STE=(1/L)*sum
11
12  %   v = [-2 3 -1];
```

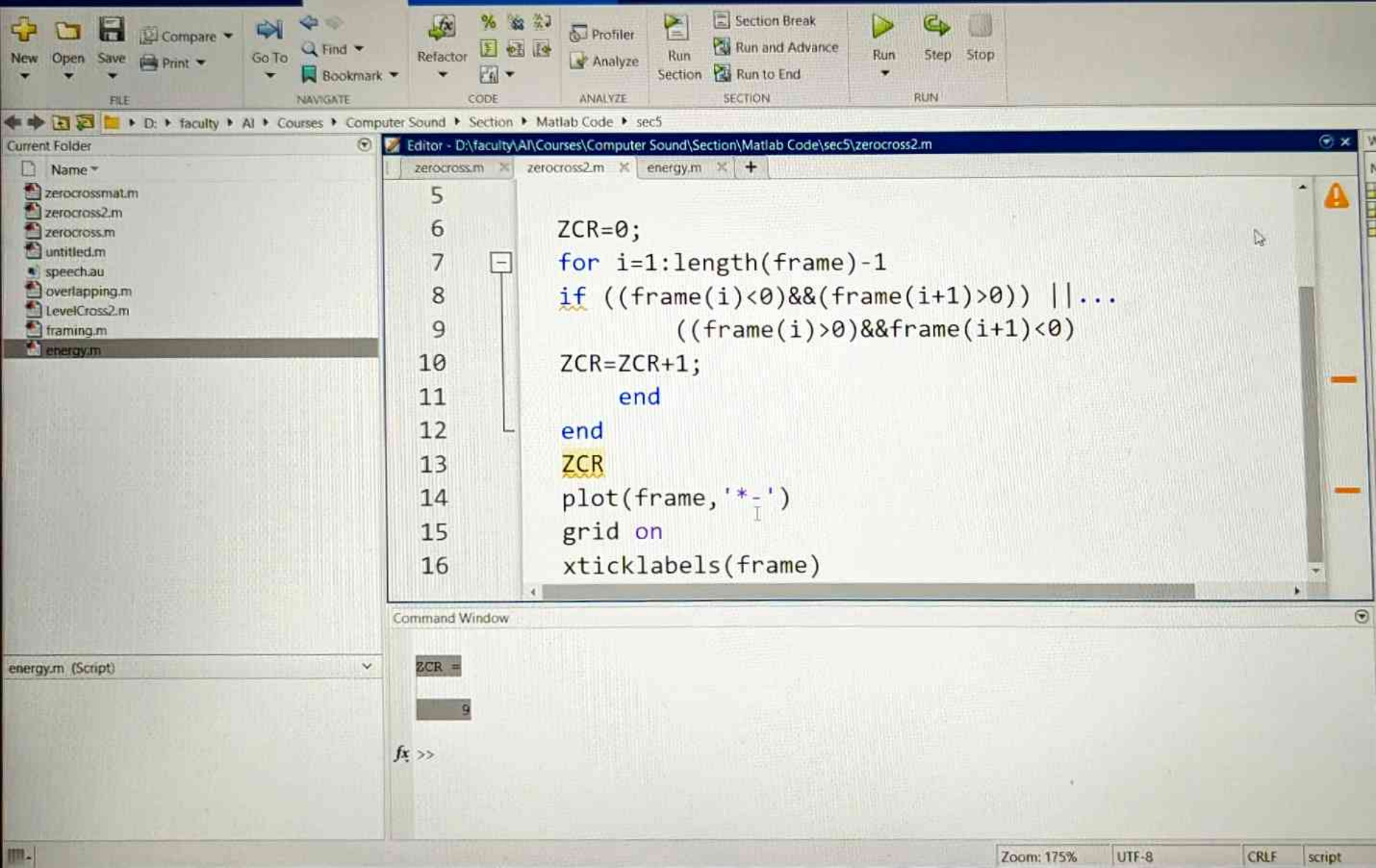
Command Window

fx >>

Workspace

Name | Value


New
Open
Save
Compare
Print
Go To
Find
Bookmark
FILE
NAVIGATE
Refactor
CODE
Profiler
Analyze
ANALYZE
Run Section
Section Break
Run and Advance
Run to End
SECTION
Run
Step
Stop
RUN
D: ▸ faculty ▸ AI ▸ Courses ▸ Computer Sound ▸ Section ▸ Matlab Code ▸ sec5
Current Folder
Name
zerocrossmat.m
zerocross2.m
zerocross.m
untitled.m
speech.au
overlapping.m
LevelCross2.m
framing.m
energy.m
Editor - D:\faculty\AI\Courses\Computer Sound\Section\Matlab Code\sec5\zerocross.m
zerocross.m
zerocross2.m
energy.m
1 clear
2 clc
3 frame=[3 10 4 -1 3 -7 -10 6 8 -1 2 -1 -8 10 8 -7];
4 %frame=[6 -3 3 -6 4 3 7 -6 4 -6 6 -6 7 -6 6 -2 1 -1
5 %frame=[3 10 4 -1 3 -7 -10 6 8 0 6 0 -8 10 8 -7];
6
7 ZCR=0;
8 for i=1:length(frame)-1
9 if (frame(i)*frame(i+1))<0
10 ZCR=ZCR+1;
11 end
12 end
Command Window
41.6875
>> Pw
Pw =
41.6875
fx >>


New
Open
Save
Compare
Print
FILE
Go To
Find
Bookmark
NAVIGATE
Refactor
CODE
Profiler
Analyze
ANALYZE
Run Section
Section Break
Run and Advance
Run to End
SECTION
Run
Step
Stop
RUN
D: ▸ faculty ▸ AI ▸ Courses ▸ Computer Sound ▸ Section ▸ Matlab Code ▸ sec5
Current Folder
Name
zerocrossmat.m
zerocross2.m
zerocross.m
untitled.m
speech.au
overlapping.m
LevelCross2.m
framing.m
energy.m
energy.m (Script)
Editor - D:\faculty\AI\Courses\Computer Sound\Section\Matlab Code\sec5\zerocross2.m
zerocross.m
zerocross2.m
energy.m
5
6 ZCR=0;
7 for i=1:length(frame)-1
8 if ((frame(i)<0)&&(frame(i+1)>0)) ||...
9 ((frame(i)>0)&&frame(i+1)<0)
10 ZCR=ZCR+1;
11 end
12 end
13 ZCR
14 plot(frame,'*-')
15 grid on
16 xticklabels(frame)
Command Window
ZCR =
9
fx >>
Zoom: 175%
UTF-8
CRLF
script

Editor - D:\faculty\AI\Courses\Computer Sound\Section\Matlab Code\sec5\zerocrossmat.m *

zerocross.m | zerocross2.m | energy.m | zerocrossmat.m * | untitled.m | +

```
1   clear
2   clc
3   frame=[3 10 4 -1 3 -7 -10 6 8 -1 2 -1 -8 10 8 -7];
4   %frame=[3 10 4 -1 3 -7 -10 6 8 0 6 0 -8 10 8 -7];
5
6   % [rate,count]=zerocrossrate(frame)
7    [rate,count,indices]=zerocrossrate(frame)
8    %[rate,count]=zerocrossrate(frame,InitialState=fra
9
10  %[~,count]=zerocrossrate(frame,InitialState=frame(1
11  %[rate,count,indices]=zerocrossrate(frame,InitialSt
12  %[rate,count,indices]=zerocrossrate(frame,Method="c
```

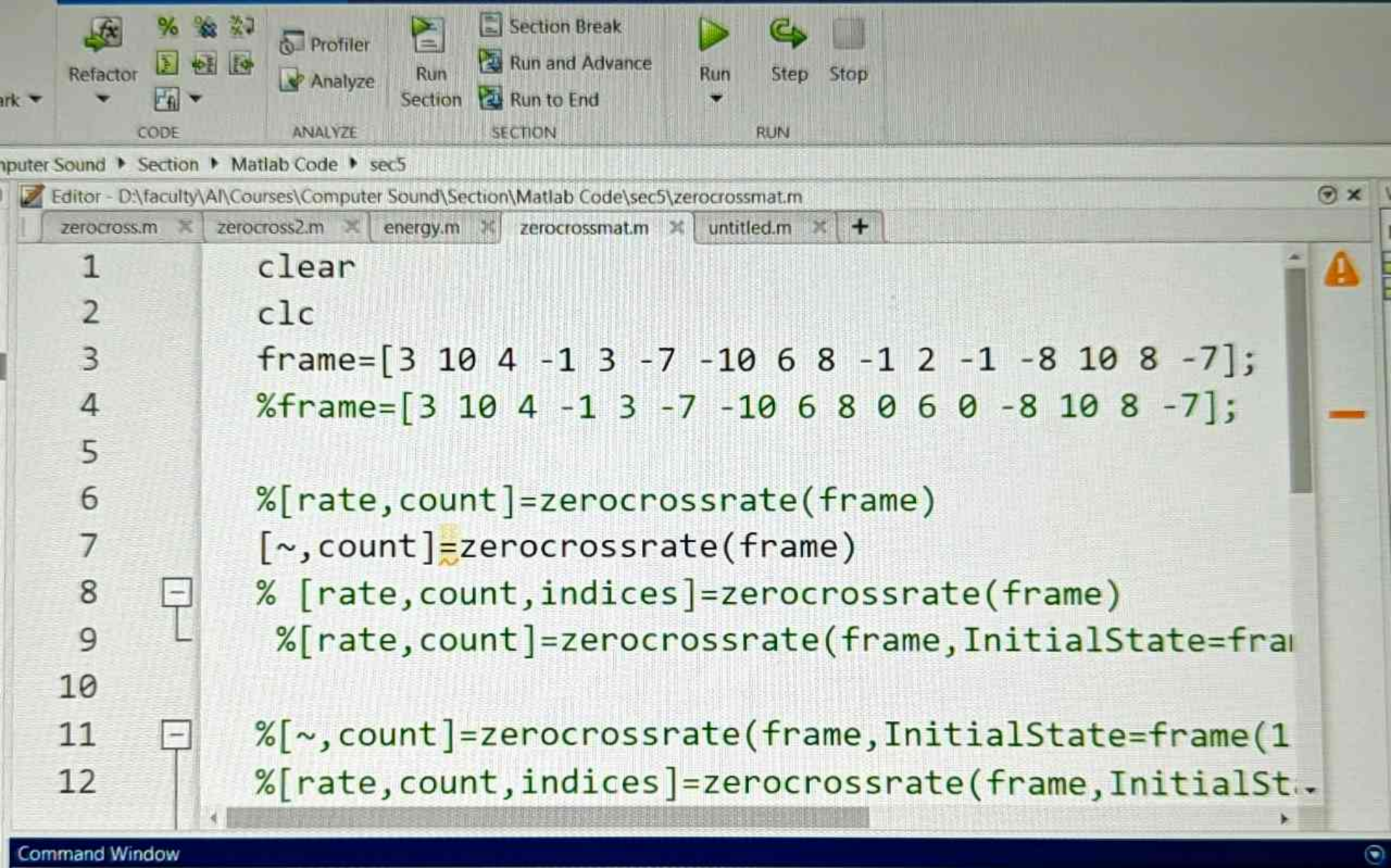
Workspace

Name	Value
frame	1x16 double
i	15
ZCR	9

Command Window

```
ZCR =

     9

fx >>
```

Zoom: 175% | UTF-8 | CRLF | script | Ln 7


Refactor
CODE
Profiler
Analyze
ANALYZE
Run Section
Section Break
Run and Advance
Run to End
SECTION
Run
Step
Stop
RUN
nputer Sound ▸ Section ▸ Matlab Code ▸ sec5
Editor - D:\faculty\AI\Courses\Computer Sound\Section\Matlab Code\sec5\zerocrossmat.m
zerocross.m
zerocross2.m
energy.m
zerocrossmat.m
untitled.m
1 clear
2 clc
3 frame=[3 10 4 -1 3 -7 -10 6 8 -1 2 -1 -8 10 8 -7];
4 %frame=[3 10 4 -1 3 -7 -10 6 8 0 6 0 -8 10 8 -7];
5
6 %[rate,count]=zerocrossrate(frame)
7 [~,count]=zerocrossrate(frame)
8 % [rate,count,indices]=zerocrossrate(frame)
9 %[rate,count]=zerocrossrate(frame,InitialState=fra
10
11 %[~,count]=zerocrossrate(frame,InitialState=frame(1
12 %[rate,count,indices]=zerocrossrate(frame,InitialSt
Command Window

zerocross.m | zerocross2.m | energy.m | zerocrossmat.m | untitled.m | +

```
11  %[~,count]=zerocrossrate(frame,InitialState=frame(1
12  %[rate,count,indices]=zerocrossrate(frame,InitialSt
13  %[~,count]=zerocrossrate(frame,Method="comparison",
14  %[rate,count,indices]=zerocrossrate(frame,Method="c
15  %[rate,count,indices]=zerocrossrate(frame,Method="c
16  %[rate,count,indices]=zerocrossrate(frame,ZeroPosit
17  %[~,count,~]=zerocrossrate(frame,WindowLength=10,Me
18  %[~,count,~]=zerocrossrate(frame,OverlapLength=5)
19  %[~,count,~]=zerocrossrate(frame,Level=5)
20  %[~,count,~]=zerocrossrate(frame,Threshold=5)
21  %[~,count,~]=zerocrossrate(frame,TransitionEdge="bo
22  [~,count,~]=zerocrossrate(frame,TransitionEdge="ris
```

Editor - D:\faculty\AI\Courses\Computer Sound\Section\Matlab Code\sec5\LevelCross2.m

LevelCross2.m

```
1   clear
2   clc
3   frame=[3 10 4 -1 3 -7 -10 6 8 -1 2 -1 -8 10 8 -7];
4   %frame=[3 10 4 -1 3 -7 -10 6 8 0 6 0 -8 10 8 -7];
5
6    levelp=5;
7    leveln=-5;
8
9   %  levelp=0;
10  % leveln=0;
11
12  % levelp=5;
```

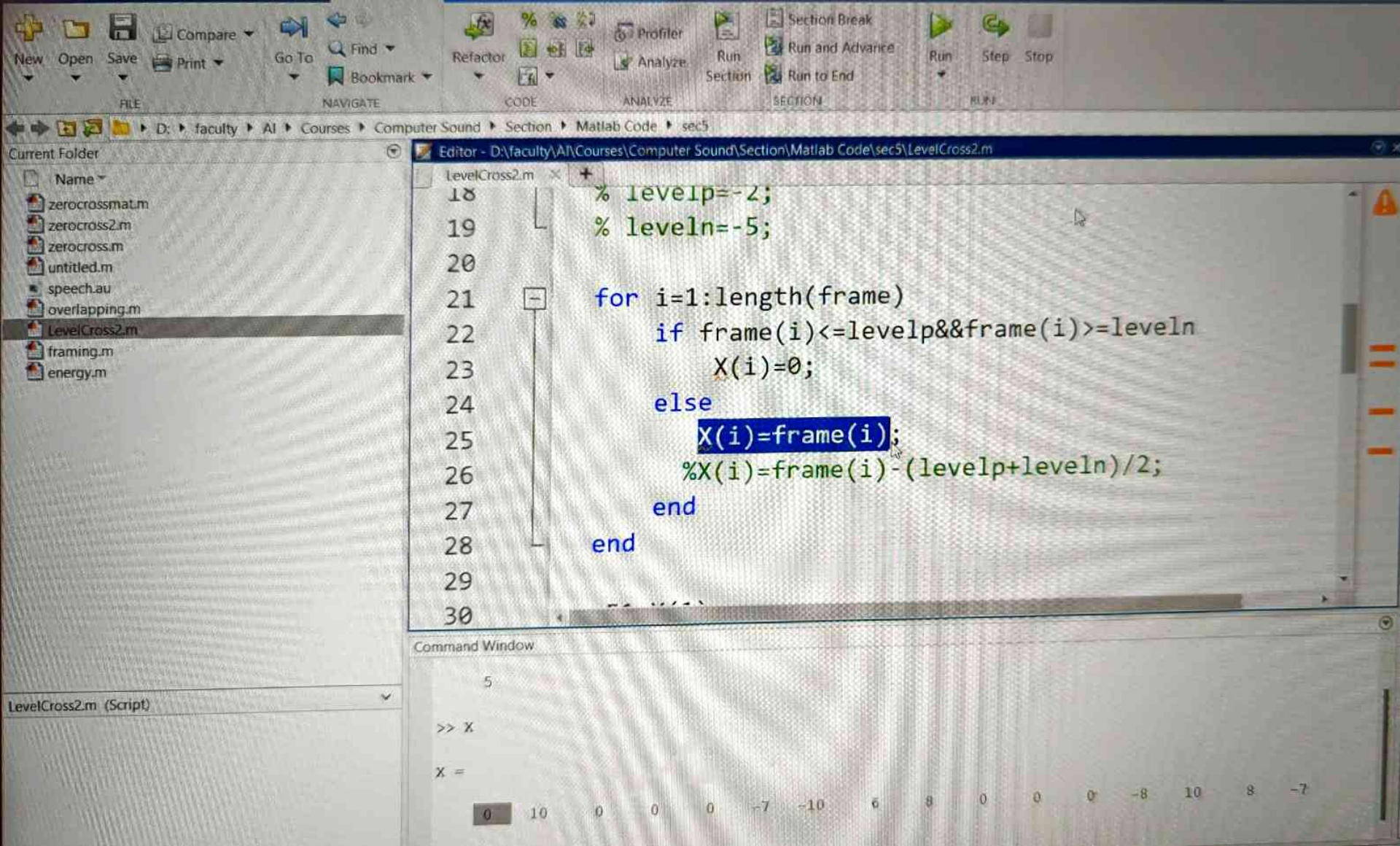
Workspace

Name	Value
F1	-7
frame	1x16 double
i	16
LCR	5
leveln	-5
levelp	5
X	1x16 double

Command Window

```
     5

>> X

X =

    10     0     0     0    -7   -10     6     8     0     0     0    -8    10     8    -7

fx >>
```

Zoom: 175% UTF-8 CRLF script Ln 3


New
Open
Save
Compare
Print
Go To
Find
Bookmark
FILE
NAVIGATE
Refactor
Profiler
Analyze
CODE
ANALYZE
Run Section
Section Break
Run and Advance
Run to End
SECTION
Run
Step
Stop
RUN
D: ▸ faculty ▸ AI ▸ Courses ▸ Computer Sound ▸ Section ▸ Matlab Code ▸ sec5
Current Folder
Name
zerocrossmat.m
zerocross2.m
zerocross.m
untitled.m
speech.au
overlapping.m
LevelCross2.m
framing.m
energy.m
LevelCross2.m (Script)
Editor - D:\faculty\AI\Courses\Computer Sound\Section\Matlab Code\sec5\LevelCross2.m
LevelCross2.m
% levelp=-2;
% leveln=-5;
for i=1:length(frame)
if frame(i)<=levelp&&frame(i)>=leveln
X(i)=0;
else
X(i)=frame(i);
%X(i)=frame(i)-(levelp+leveln)/2;
end
end
Command Window
5
>> X
X =
0 10 0 0 0 -7 -10 6 8 0 0 0 -8 10 8 -7

Editor - D:\faculty\AI\Courses\Computer Sound\Section\Matlab Code\sec5\LevelCross2.m

LevelCross2.m

```
29
30      F1=X(1);
31      LCR=0;
32    for i=2:length(frame)
33        if X(i)~=0
34            if (F1*X(i))<0
35                LCR=LCR+1;
36    end
37            F1=X(i);
38        end
39    end
40    LCR
```

LevelCross2.m

```
48   on
49   s(1:length(frame))
50   abels(frame)
51
52
53   ount]=zerocrossrate(frame,Level=(leveln+levelp)/2,...
54    Threshold=(levelp-leveln)/2,...
55    Method="comparison",InitialState=frame(1))
56
57   nt]=zerocrossrate(frame,Level=0,Threshold=5,...
58   thod="comparison",InitialState=frame(1))
59
```

framing.m

```
clear
clc

[wave,fs]=audioread('speech.au');
% wave=audioread('speech.au');
% fs=10000;
%sound(wave)

frame_duration=.02;
frame_length=frame_duration*fs;
L=length(wave);
No_of_frames=floor(L/frame_length);
```

framing.m

```
% frame2=wave(frame_length+1:frame_length*2);
% frame3=wave(frame_length*2+1:frame_length*3);

temp=0;
for i = 1 : No_of_frames
    frames(i,:) = wave(temp + 1 : temp + frame_leng
    temp = temp + frame_length;
end
```

Press ESC or double-click to exit full screen mode

```
% for i=1:No_of_frames
%     frames(i,:)=wave((i-1)*frame_length+1:...
%         frame_length*i);
```

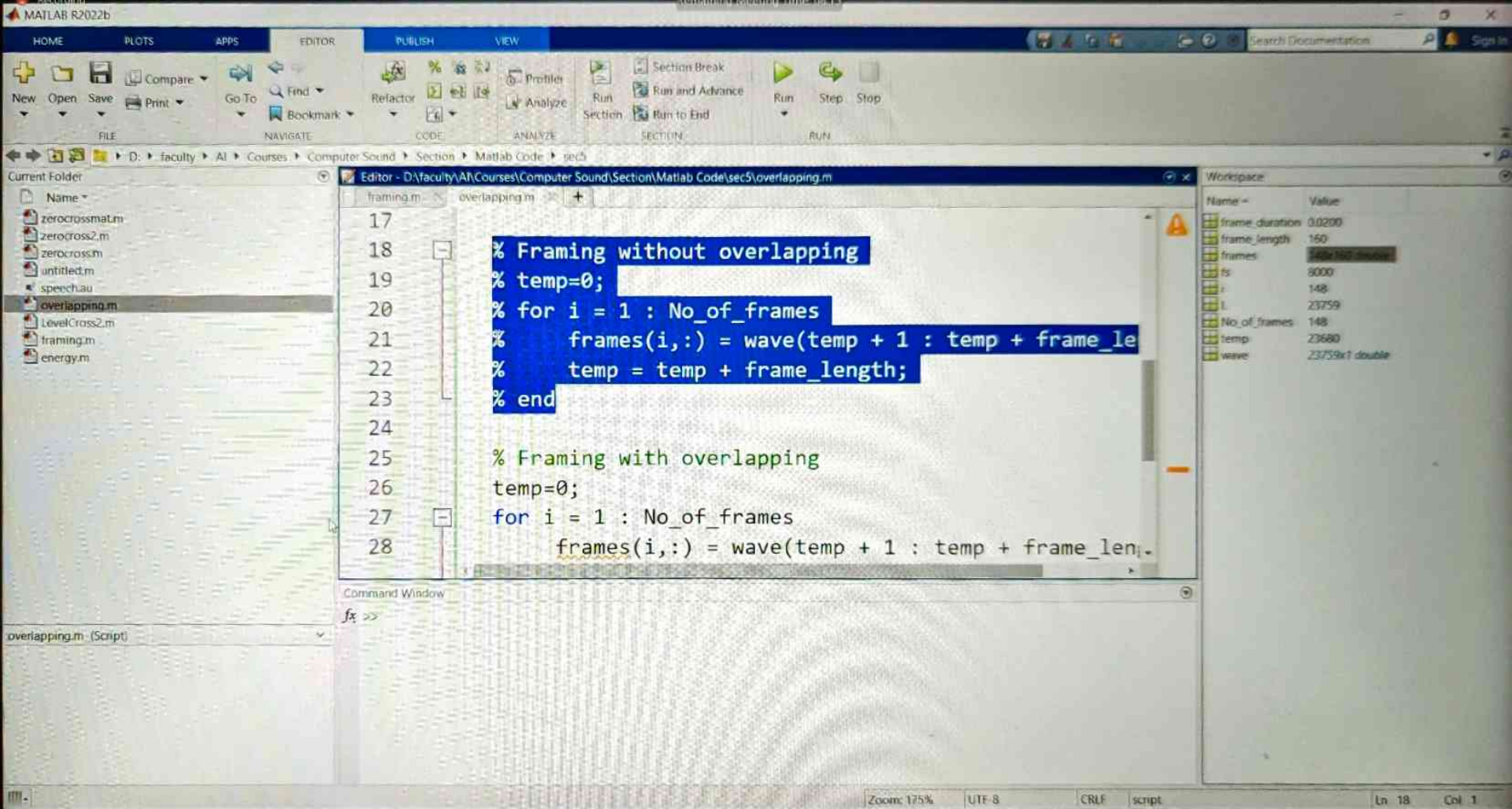
framing.m

```
21      temp = temp + frame_length;
22  end
23
24  % for i=1:No_of_frames
25  %     frames(i,:)=wave((i-1)*frame_length+1:...
26  %         frame_length*i);
27  % end
28
29  % frames: returns a Matrix in which each row repres
30  % a frame of specific duration
31  stem(wave)
32  hold on
```

```
% frames: returns a Matrix in which each row repres
% a frame of specific duration
stem(wave)
hold on
stem(frames(1,:))
% stem(frames(2,:))
hold off
```

framing.m | overlapping.m | +

```
% t=(1:1:length(wave),length(wave))';
frame_duration=.02;
overlap_duration=.005;
frame_length=frame_duration*fs;
L=length(wave);
overlap_length=overlap_duration*fs;
No_of_frames=1+floor((L-frame_length)/...
    (frame_length-overlap_length));

% Framing without overlapping
% temp=0;
% for i = 1 : No_of_frames
```


MATLAB R2022b
HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
New
Open
Save
Compare
Print
Go To
Find
Bookmark
Refactor
Profile
Analyze
Run Section
Section Break
Run and Advance
Run to End
Run
Step
Stop
D: ▸ faculty ▸ AI ▸ Courses ▸ Computer Sound ▸ Section ▸ Matlab Code ▸ sec5
Current Folder
Name
zerocrossmat.m
zerocross2.m
zerocross.m
untitled.m
speech.au
overlapping.m
LevelCross2.m
framing.m
energy.m
Editor - D:\faculty\AI\Courses\Computer Sound\Section\Matlab Code\sec5\overlapping.m
framing.m
overlapping.m
17
18 % Framing without overlapping
19 % temp=0;
20 % for i = 1 : No_of_frames
21 % frames(i,:) = wave(temp + 1 : temp + frame_le
22 % temp = temp + frame_length;
23 % end
24
25 % Framing with overlapping
26 temp=0;
27 for i = 1 : No_of_frames
28 frames(i,:) = wave(temp + 1 : temp + frame_len
Command Window
>>
overlapping.m (Script)
Workspace
Name
Value
frame_duration 0.0200
frame_length 160
frames
fs 8000
i 148
l 23759
No_of_frames 148
temp 23680
wave 23759x1 double
Zoom: 175%
UTF-8
CRLF
script
Ln 18
Col 1

framing.m | overlapping.m | +

```
22      temp = temp + frame_length;
23  end
24
25  Framing with overlapping
26  temp=0;
27  for i = 1 : No_of_frames
28      frames(i,:) = wave(temp + 1 : temp + frame_length);
29  % tfram(i,:)=t(temp+1:(temp+frame_length));
30      temp = temp + frame_length-overlap_length;
31  end
32
33
```

untitled2.m

```
clear
clc
sample=[1.2 -.4 3.3 1.6 -.9 0 4.1 1.25 3 2.3];
bits=2;
N=2^bits;
levels=[0:N-1];
range=max(sample)-min(sample);
step=range/N;

ss=min(sample);
for i=1:N
    Limit(i,1)=ss;
    ss=ss+step;
    Limit(i,2)=ss;
end
```

Command Window

```
Columns 1 through 10

   -1.0000   -1.0000   -1.0000   -1.0000    0.5000    0.5000    2.0000    2.0000    2.0000    2.0000

Columns 11 through 13
```

Editor - D:\faculty\AI\Courses\Computer Sound\Section\Matlab Code\sec4\quantization\untitled2.m

untitled2.m

```
26
27      elseif sample(i)>=Limit(4,1)&sample(i)<=Limit(4,2)
28          I=levels(4);
29
30      end
31      stream(i)=I;
32      bitstream=(int2bit(stream,bits))';
33      AVG=(Limit(:,1)+Limit(:,2))./2;
34      Error(i)=abs(sample(i)-AVG(I+1));
35      end
36      Tot_Error=sum(Error);
37      stem(stream)
38      xticklabels(sample)
39      yticks(levels)
```

untitled2.m | untitled3.m | untitled.m | +

```
1   %%
2   partition = [0,1,3];
3   codebook = [-1, 0.5, 2 3];
4   samp = [-2.4, -1, -.2, 0, .2, 1, 1.2, 1.9, 2, 2.9, 3, 3.5, 5];
5   [index,quantized] = quantiz(samp,partition,codebook)
6   %%
```

```
N=2 bits;
levels=[0:N-1];
range=max(sample)-min(sample);
step=range/N;

ss=min(sample);
for i=1:N
    Limit(i,1)=ss;
    ss=ss+step;
    Limit(i,2)=ss;
end
partition=[Limit(1,2),Limit(2,2),Limit(3,2),Limit(4,2)];
codebook=[0 1 2 3 4];
quantized = quantiz(sample,partition,codebook)

```

Name

- untitled3.m
- untitled2.m
- untitled.m
- quantizationxx.m
- quantization.m

untitled.m (Script)

untitled2.m | untitled3.m | untitled.m | +

```
10  ss=min(sample);
11  for i=1:N
12      Limit(i,1)=ss;
13      ss=ss+step;
14      Limit(i,2)=ss;
15  end
16  partition=[Limit(1,2),Limit(2,2),Limit(3,2),Limit(4,2)];
17  codebook=[0 1 2 3 4];
18  quantized = quantiz(sample,partition,codebook)
19
20  bitstream=(int2bit(quantized,bits))'
21  stem(quantized)
22  xticklabels(sample)
23  yticks(levels)
```

Command Window

```
>> Limit

Limit =

   -0.9000    0.3500
    0.3500    1.6000
    1.6000    2.8500
    2.8500    4.1000
```

UTF-8 CRLF