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Program : M.Tech Aerospace Engineering (Aerodynamics)

Subject: Measurement & Data Analysis

Assignment - 1

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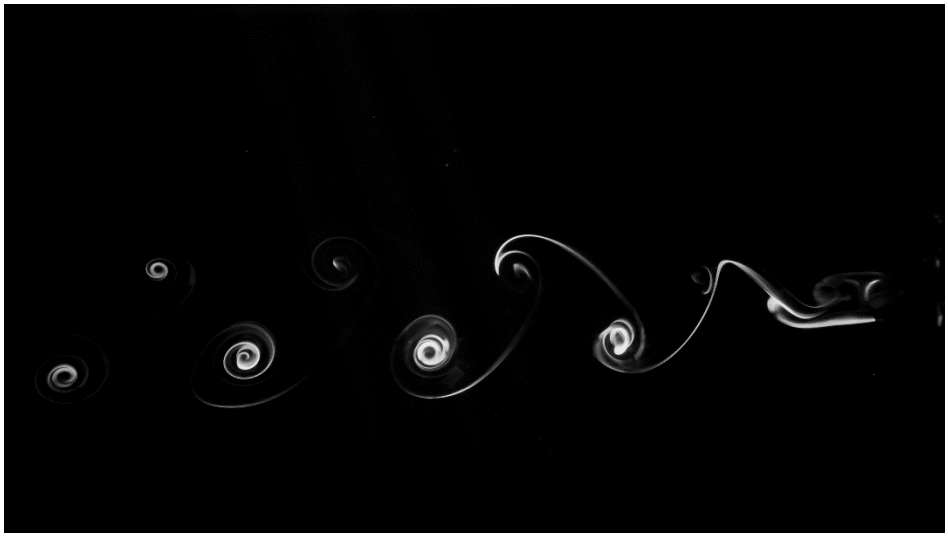
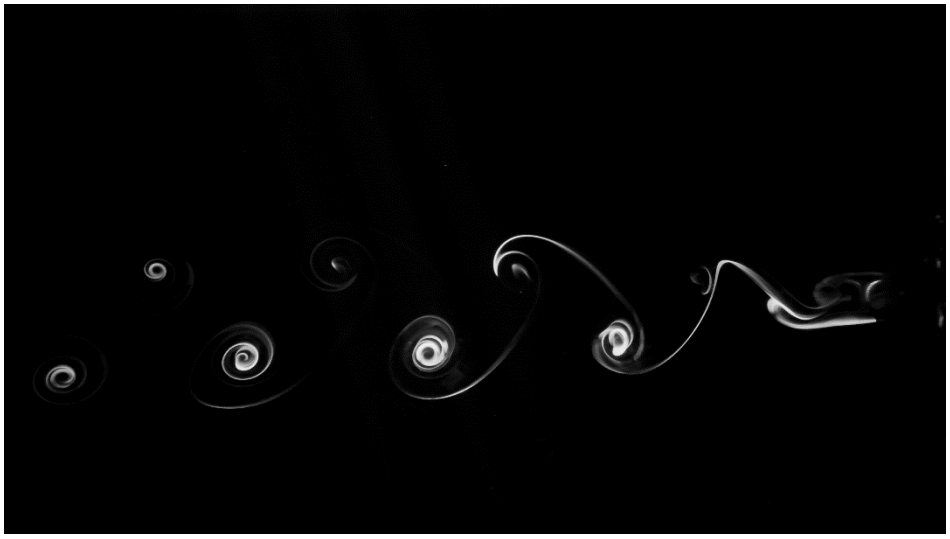
(1)

```
%% MATLAB Code for importing the frames from the video
clc
clear
% Read the video file using video reader
v =
VideoReader('ACM_2716_cylinder_water_tunneltrim_3.MP4');
n = 1;
% While loop iterates through each and every frame and
saves up the grayscale image
% of each frame in PNG file format...
while hasFrame(v)
    img = readFrame(v);
    imwrite(rgb2gray(img),strcat('img_', num2str(n),
'.png'));
    n=n+1;
end
```

(P.T.O for the six-consecutive attached images)

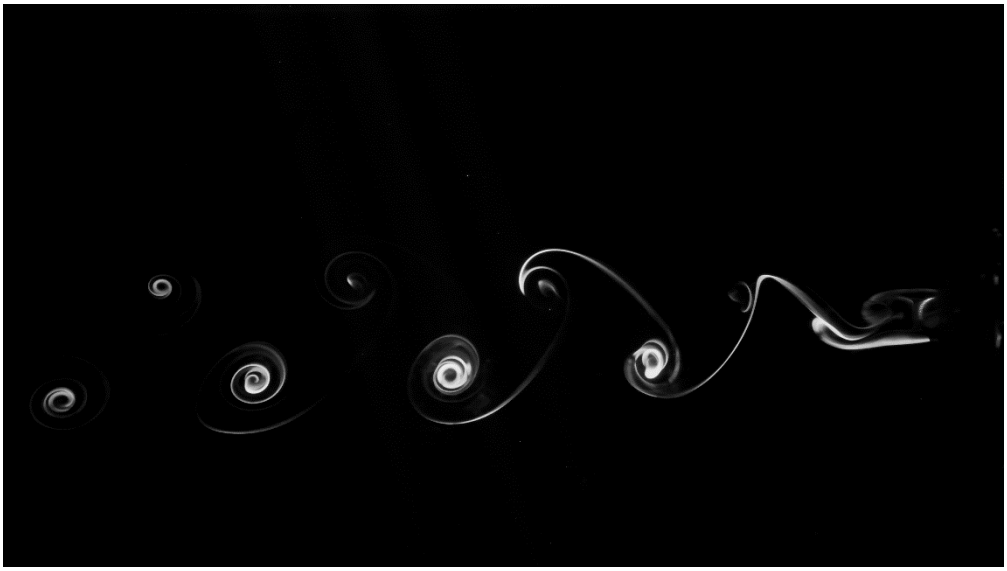


Frame #361

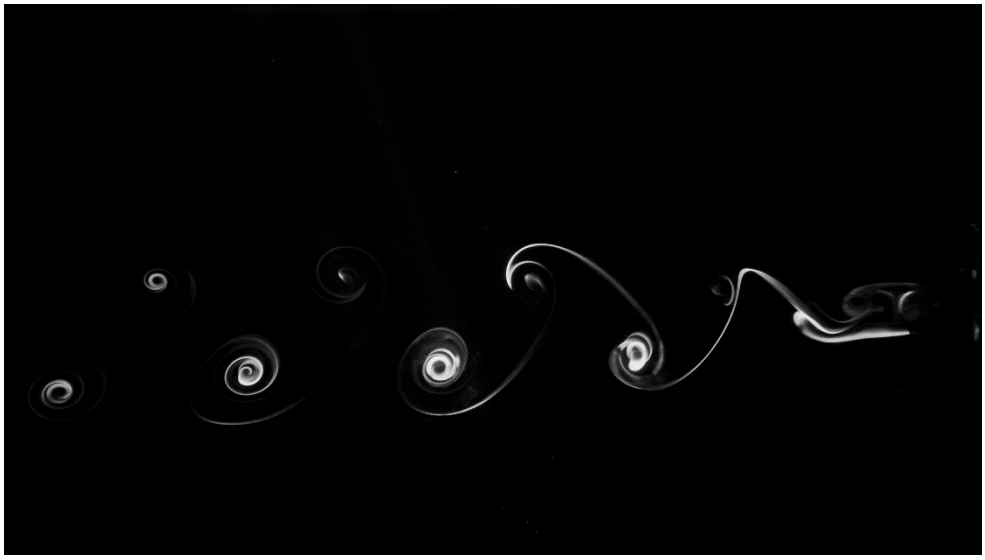


Frame #362

Frame #363



Frame #364

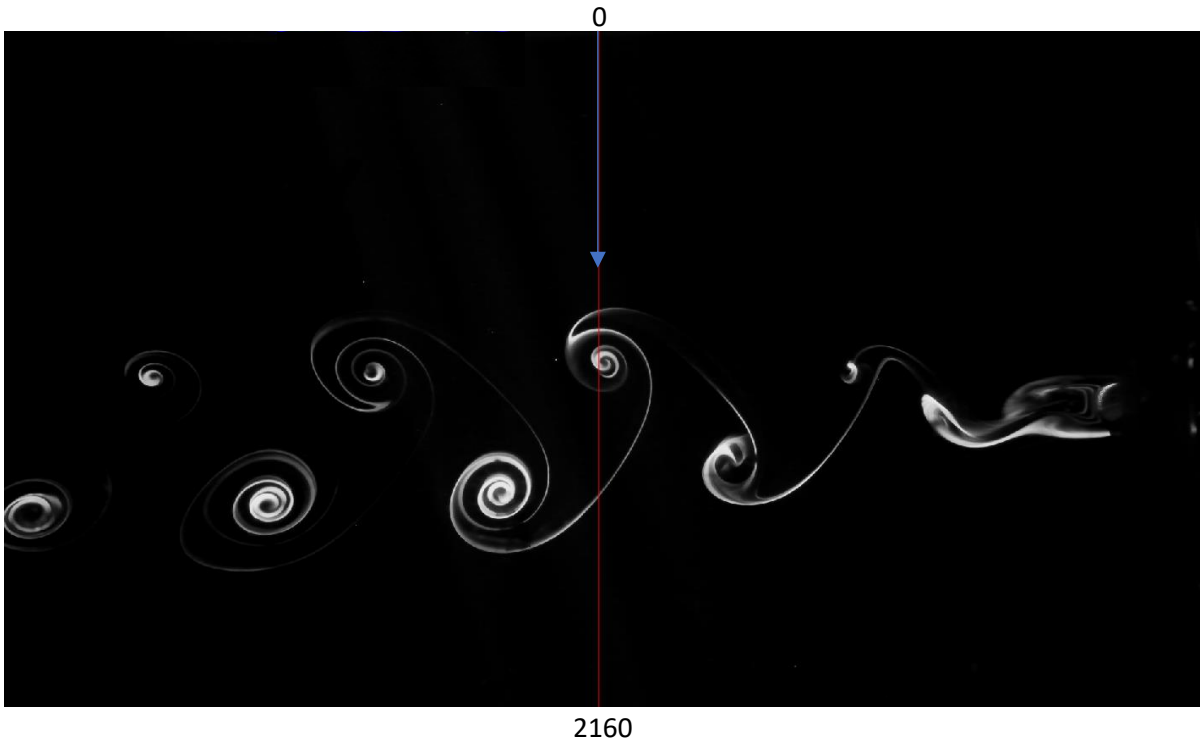


Frame #365

Frame #366

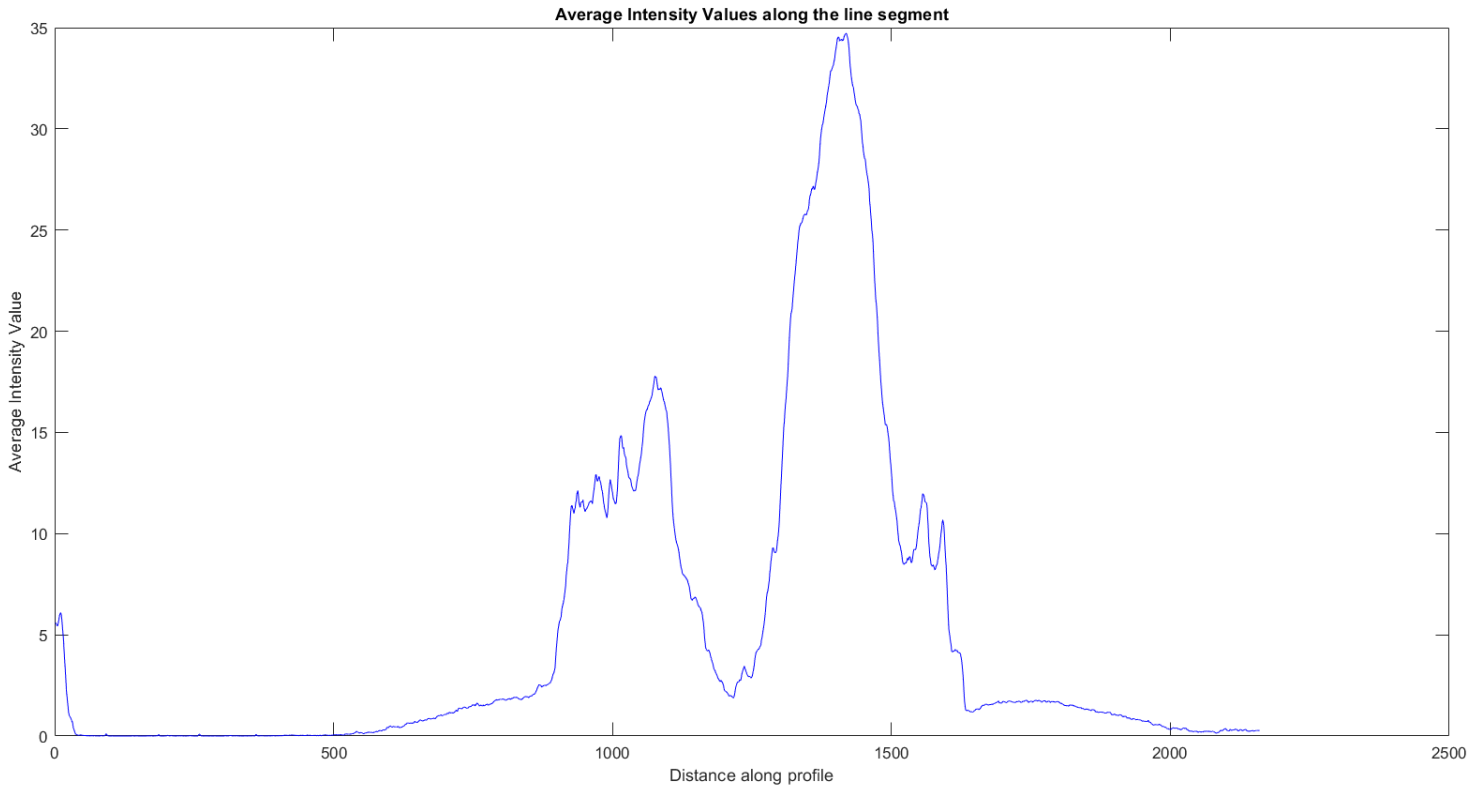
(2)

SIGN CONVENTION



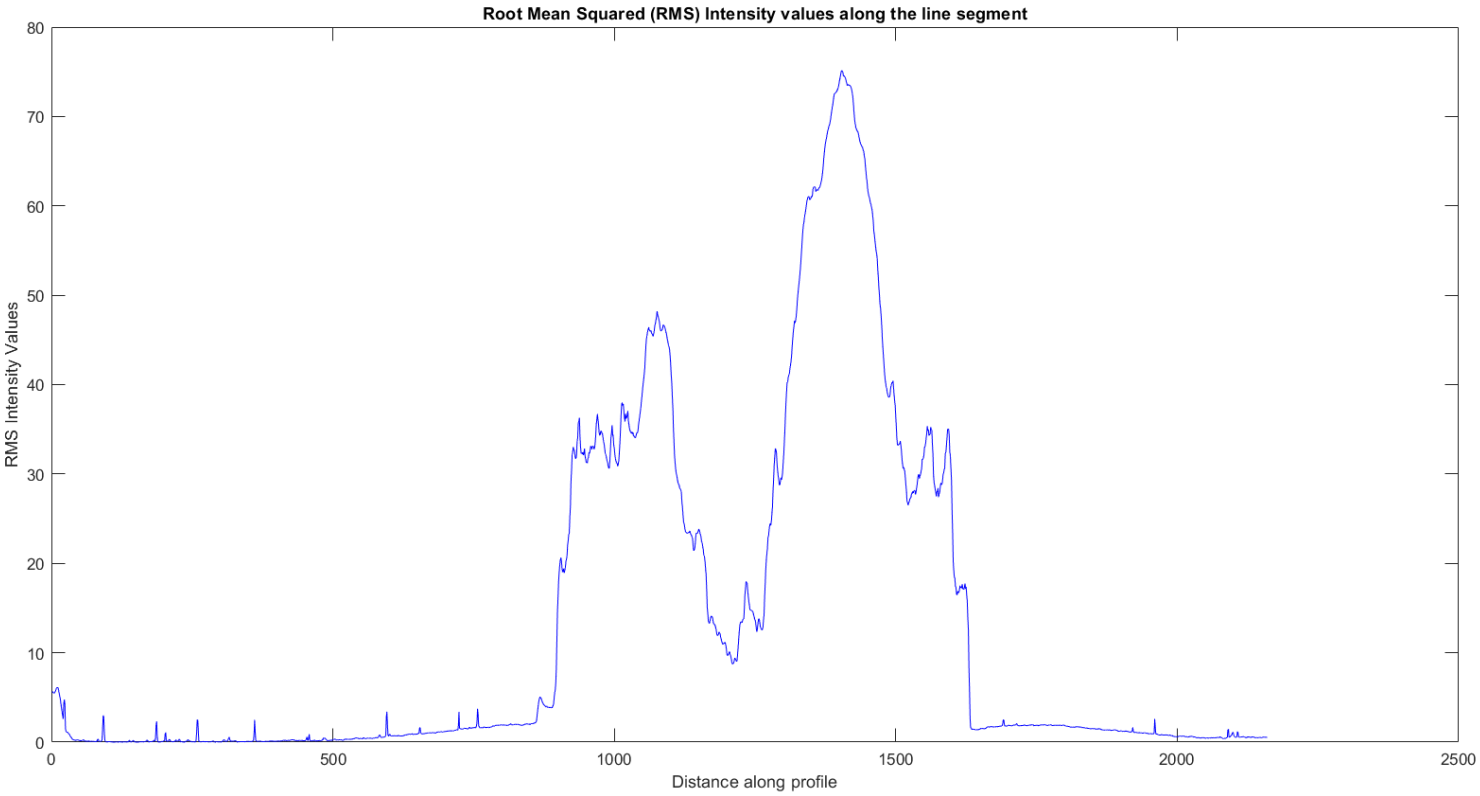

```
%%MATLAB Code to plot the Average Intensity along the
vertical line (middle
% of the image)
clc
clear
%Creation of an empty array of values '0'
I1 = zeros(2160, 3840, 'double');
i=1;
%While loop reads each and every frame (i.e. an image) of
the video saved in the directory (images are saved in the
form of img_1.png, img_2.png ..... upto img_1059.png)
while i<=1059
    I = imread(strcat('img_', num2str(i), '.png'));
    %In each iteration the elements of the array are added
up in the I1 array.
    I1 = I1 + double(I);
    i = i+1;
end
% x and y vectors contains the x & y coordinates of the
endpoints of the line segment.
```

```
x = [size(I,2)/2 size(I,2)/2];
y = [0 size(I,1)];
figure(1)
%Average is taken out by dividing the elements of I1 by
the total no of frames (i.e. 1059)
Iavg1 = I1.*(1/1059);
%improfile() function plots out the values of pixels along
the line segment
improfile(Iavg1, x, y)
```



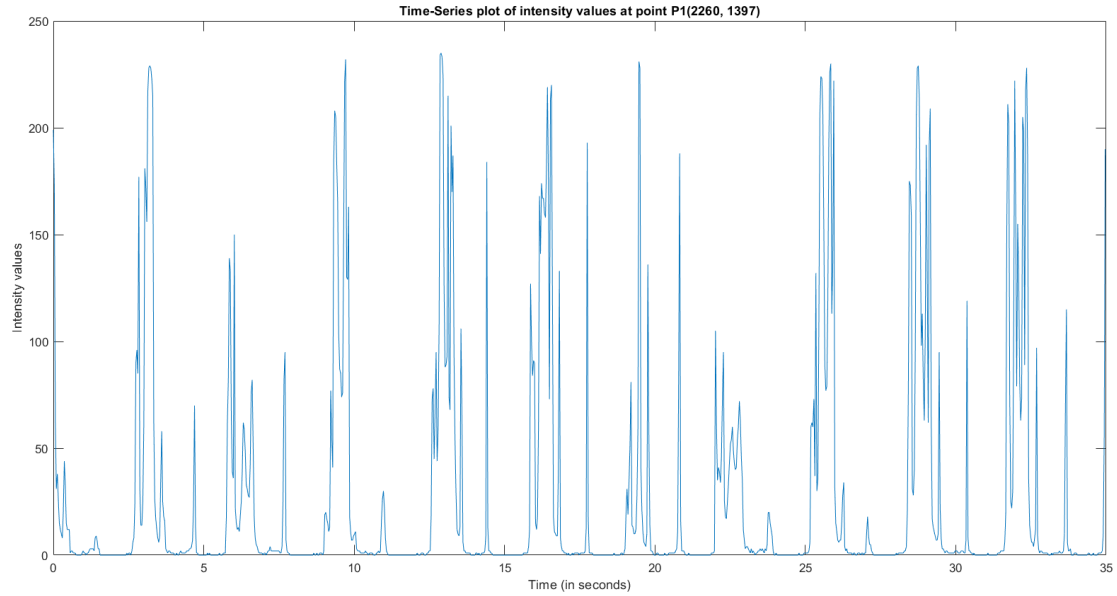

```
%%MATLAB Code to plot the RMS (Root Mean Squared)
Intensity along the vertical line (middle of the image)
clc
clear
%Creation of an empty array of values '0'
I1 = zeros(2160, 3840, 'double');
i=1;
%While loop reads each and every frame (i.e. an image) of
the video saved in the directory (images are saved in the
form of img_1.png, img_2.png ..... upto img_1059.png)
while i<=1059
```

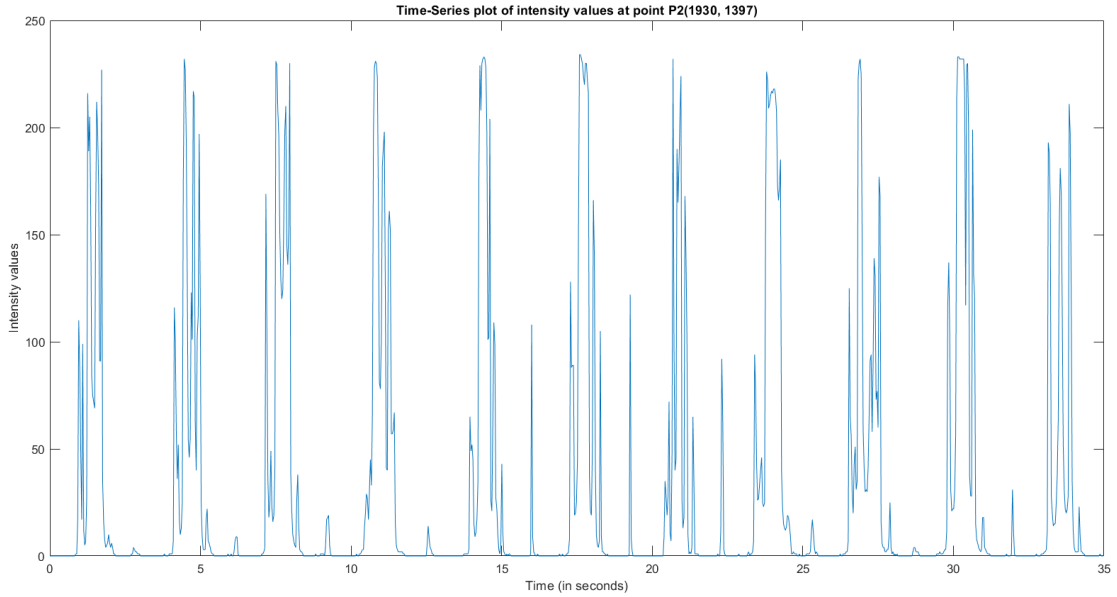
```
    I = imread(strcat('img_', num2str(i), '.png'));
    Id = double(I);
     %In each iteration the elements of the array are
squared (multiplied by itself) & added up in the I1 array.
    I1 = I1 + Id.*Id;
    i = i+1;
end
% x and y vectors contains the x & y coordinates of the
endpoints of the line segment.
x = [size(I,2)/2 size(I,2)/2];
y = [0 size(I,1)];
%The rms values can be found by taking the average of the
elements of matrix I1 and then taking square root of the
values.
Iavg1 = sqrt(I1.*(1/1059));
figure(1)
improfile(Iavg1, x, y)
```

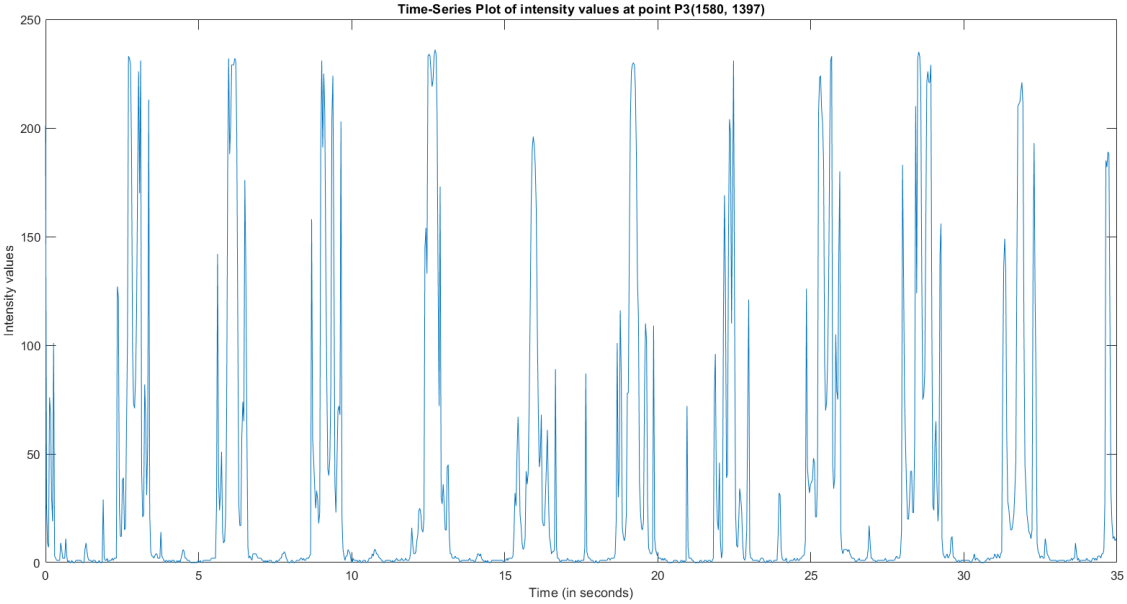


(3)

```
%% Plotting the time series of Intensity at specific
points for all the frames.
clear
clc
%Enter the x & y coordinate of the pixel.
x = input('Enter the x-coordinate of the pixel: ');
y = input('Enter the y-coordinate of the pixel: ');
%Creation of an empty array
m = [ ];
i = 1;
%While loop reads each and every frame (i.e. an image) of
the video saved in the directory (images are saved in the
form of img_1.png, img_2.png ..... upto img_1059.png)
while i<=1059
    I = imread(strcat('img_', num2str(i), '.png'));
    %impixel() reads the value of the pixel at the
specified location in the image.
    c = impixel(I, x, y);
    %It adds up the pixel values as elements in the column
in empty array 'm'
    m(end+1, 1) = c(1,1);
    i = i+1;
end
%Generation of a time series for the extracted intensity
data using the appropriate time steps.
TT = timetable(m, 'TimeStep', seconds(35/1059));
%Conversion to a table
TT2Table = timetable2table(TT);
%Extractiing the absolute time value in seconds.
TT2Table.Time = seconds(TT2Table.Time);
%Plotting-up the intensity vs time values.
plot(TT2Table.Time, TT2Table.m)
xlabel('Time (in seconds)');
ylabel('Intensity values');
```


Time-Series plot of intensity values at point P1(2260, 1397)
Intensity values
Time (in seconds)
0
50
100
150
200
250
0
5
10
15
20
25
30
35


Time-Series plot of intensity values at point P2(1930, 1397)
Intensity values
Time (in seconds)
0
50
100
150
200
250
0
5
10
15
20
25
30
35


Time-Series Plot of intensity values at point P3(1580, 1397)
Intensity values
Time (in seconds)
0
50
100
150
200
250
0
5
10
15
20
25
30
35