CS512 Assignment 2: Report

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Abstract

This Assignment dealt with Programming of image processing involving basic functions like read,write,converting an image to grayscale,smoothing, Convolution,using filters, downsampling ,plotting of gradient vectors and rotating the image using OpenCV and Python with libraries like numpy,scipy,matplotlib and sys

1 Problem statement

- Smoothing and its importance

The filter used here the most simplest one called homogeneous smoothing or box filter.
It does smoothing by sliding a kernel (filter) across the image. Each pixel value will be calculated based on the value of the kernel and the overlapping pixel's value of the original image. Mathematically speaking, we do convolution operation on an image with a kernel. What kernel we're applying to an image makes difference to the the result of the smoothing. What we do for this filter is assigning an average values of a pixel's neighbors.We need to choose right size of the kernel. If it's too large, it may blur and remove small features of the image. But if it is too small, we may not be able to eliminate noises of the image.

- Rotating

There is *nothing* wrong with the cv2.getRotationMatrix2D and cv2.warpAffine functions that are used to rotate images inside OpenCV.In reality, these functions give us more freedom than perhaps we are comfortable with The cv2.getRotationMatrix2D function *doesn't care* if we would like the entire rotated image to kept.It *doesn't care* if the image is cut off. By using imutils.rotate_bound , we can ensure that no part of the image is cut off when using OpenCV

2 Proposed solution

- The program consistes of loops, def blocks and OpenCV functions to implement most of the requirements.
- Filters like below are used in my program -
- Average Filtering
- Own Convolution method
- Sobel filters
- Imutils.rotate_bound for rotation since cv2.getRotationMatrix2D and cv2.warpAffine cuts off the image

3 Implementation details

- Problems of trackbar implementation on rotate where both image and rotation function was not working
- Trackbar on smoothing and it is successfully resolved by using sliderHandler def block
- X and y derivative where I imported ndimage from scipy
- Color channel cycle where I used a loop algorithm to cycle the color channels

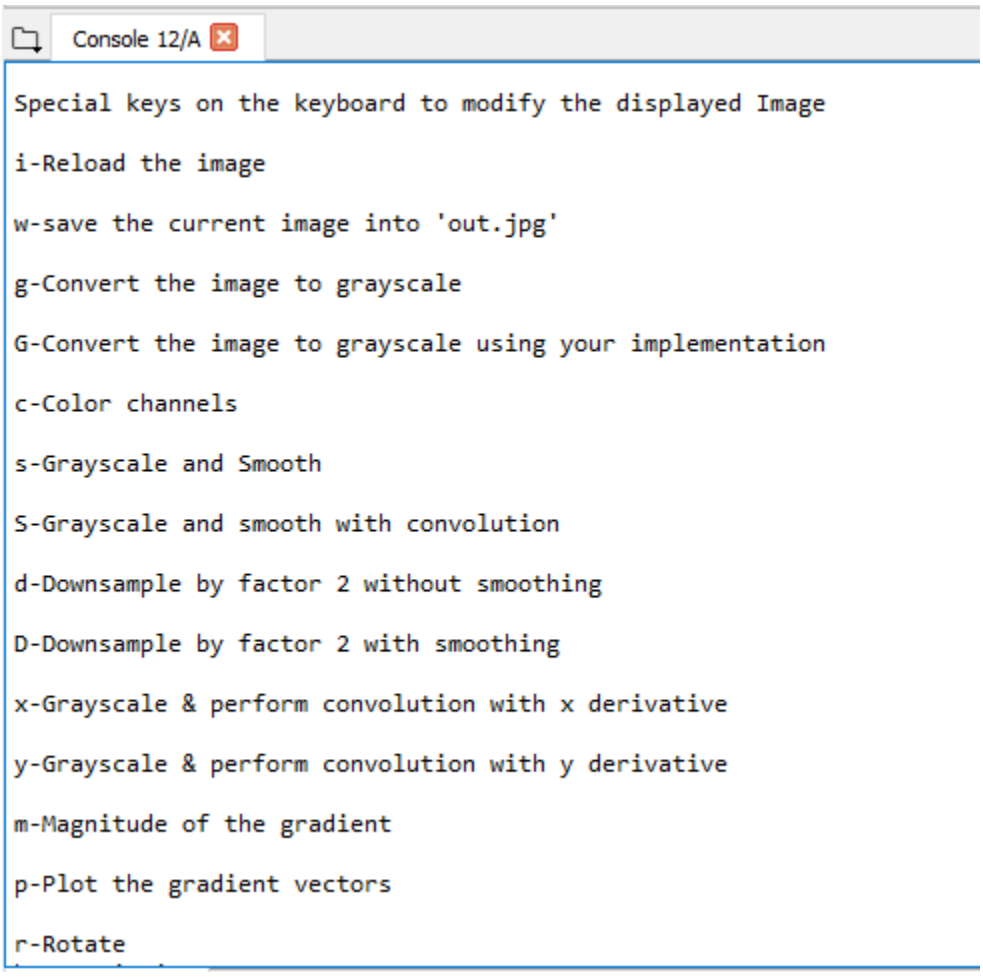
4 Results and discussion

- Manual
    - Save the Python file and the image I've used in one folder
    - Open the python file HW2.py with Spyder
    - Run the file
    - The command line asks you to enter a path
    - If the path of the image in the folder is provided, the program run for static image else live video capture mode is on
    - There are special keys on the keyboard to modify the displayed image
    - Press 'h' for description of the special keys

CommandLine -> File name

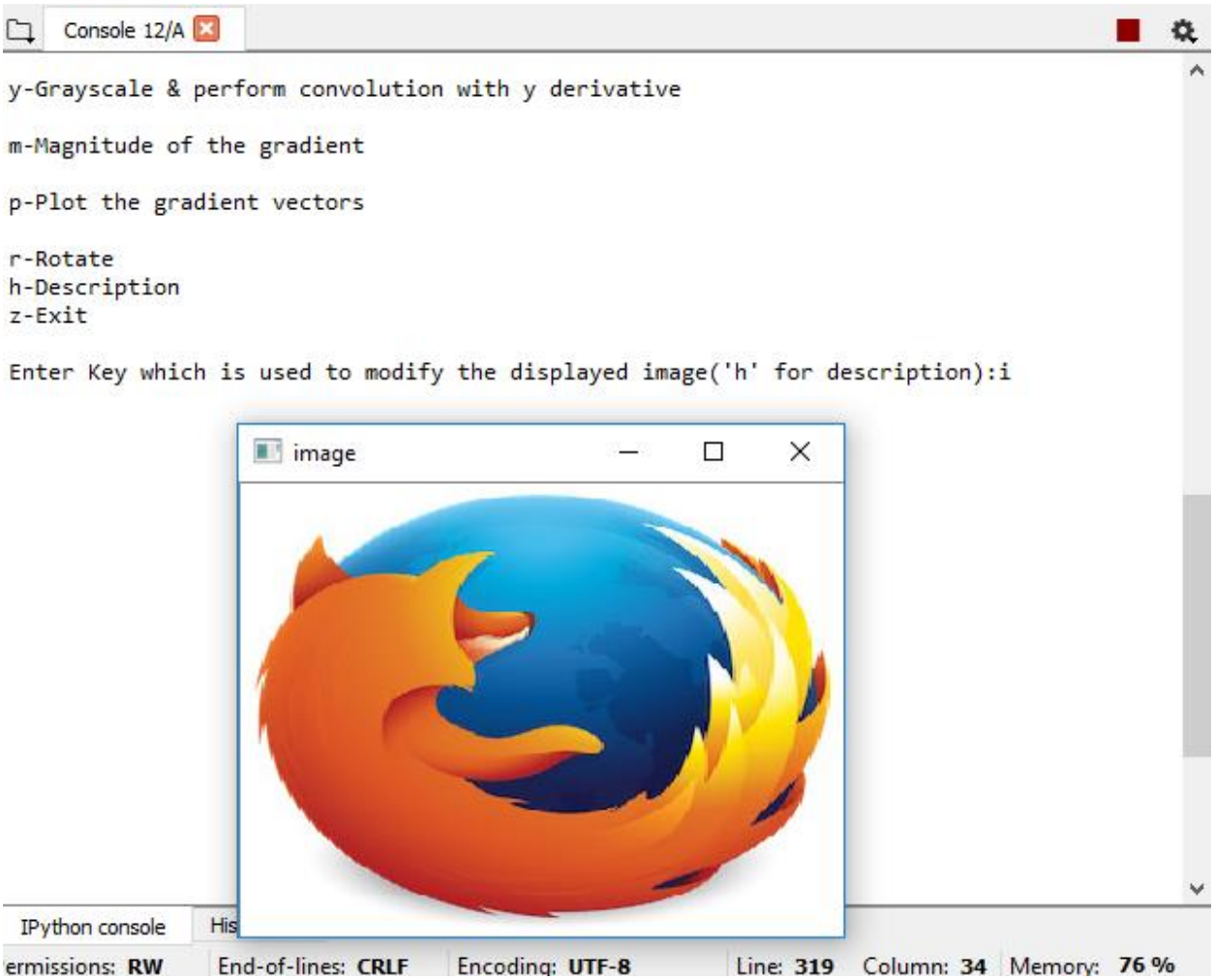
```
In [1]: runfile('C:/Users/Alisha/HW2.py', wdir='C:/Users/Alisha')
<built-in function getcwd>

Type the Path of your file:C://Users//Alisha//Desktop//CS512-CV//AS2//firefox.jpg
C://Users//Alisha//Desktop//CS512-CV//AS2//firefox.jpg
True

Enter Key which is used to modify the displayed image('h' for description):
```

Description on ‘h’ key:

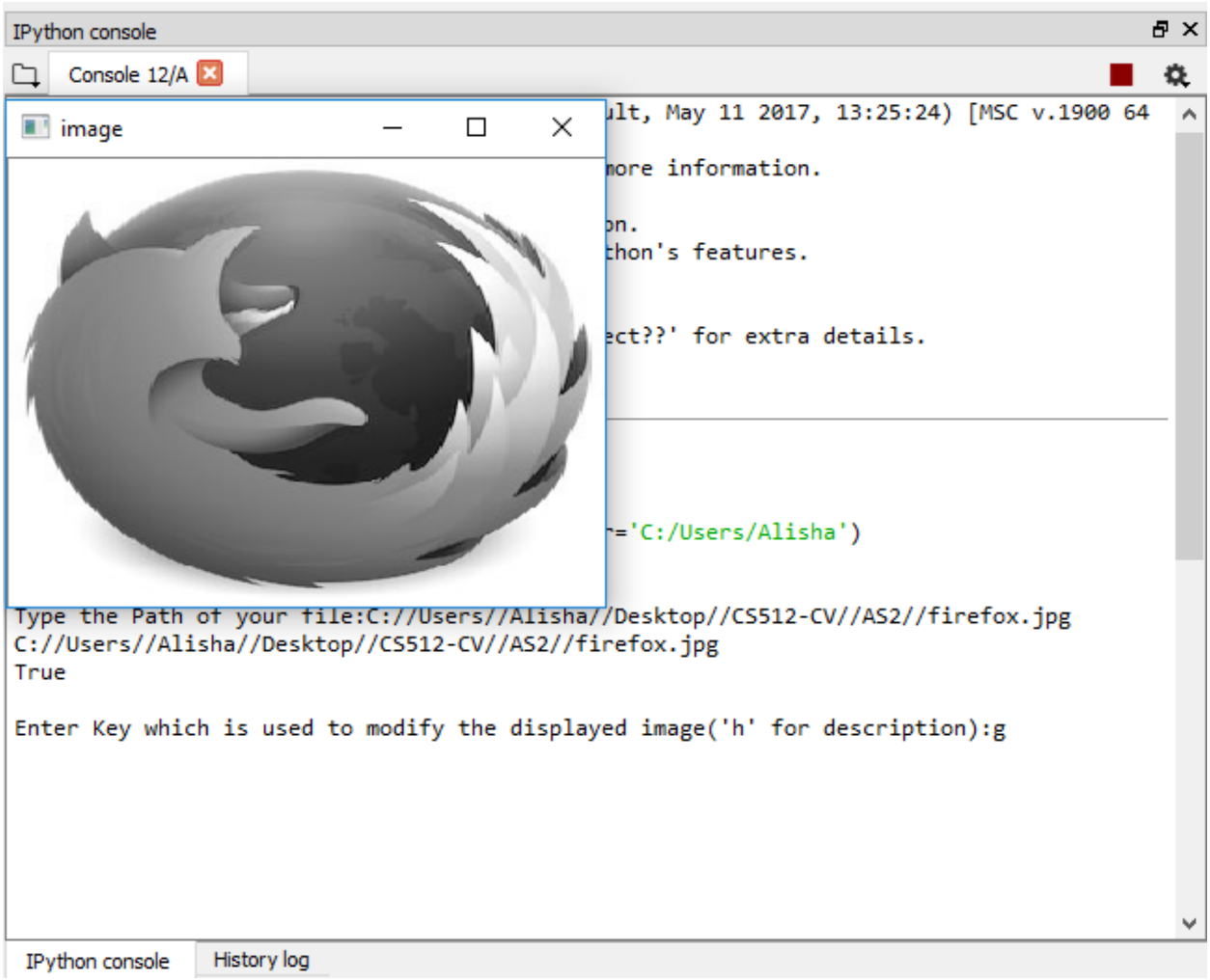


Special Keys on the keyboard

i-Reload the original image



g-Grayscale


IPython console
Console 12/A
image
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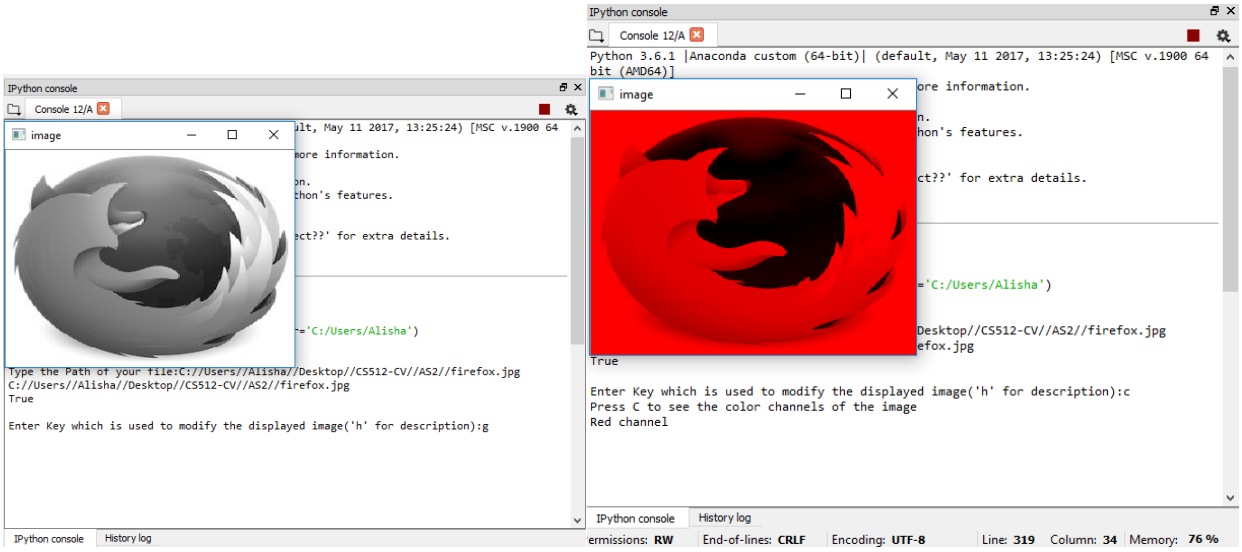
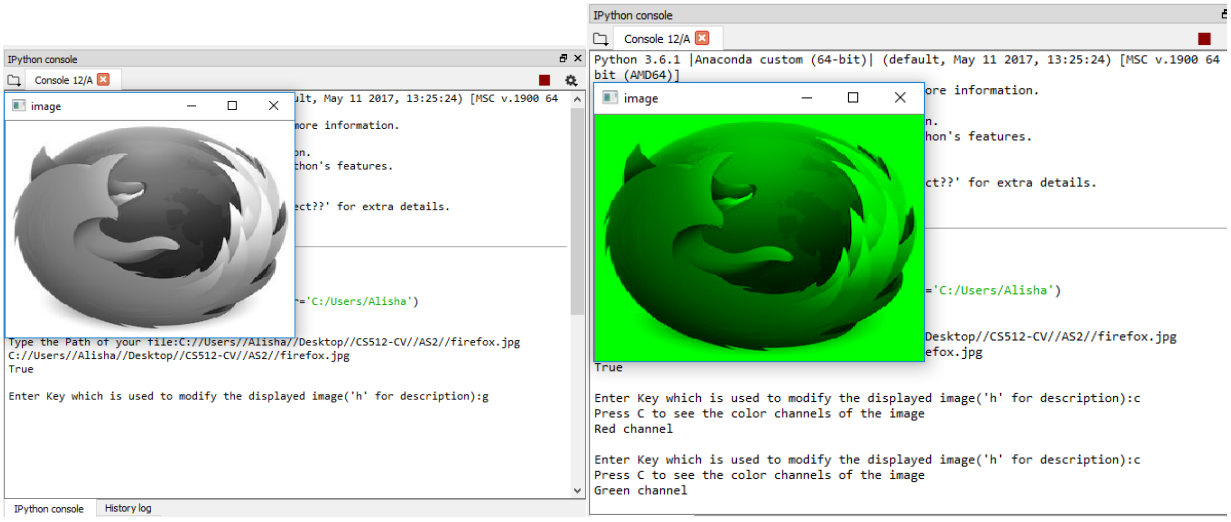
ect??' for extra details.
r='C:/Users/Alisha')
Type the Path of your file:C://Users//Alisha//Desktop//CS512-CV//AS2//firefox.jpg
C://Users//Alisha//Desktop//CS512-CV//AS2//firefox.jpg
True
Enter Key which is used to modify the displayed image('h' for description):g
IPython console
History log

c-Color Channels

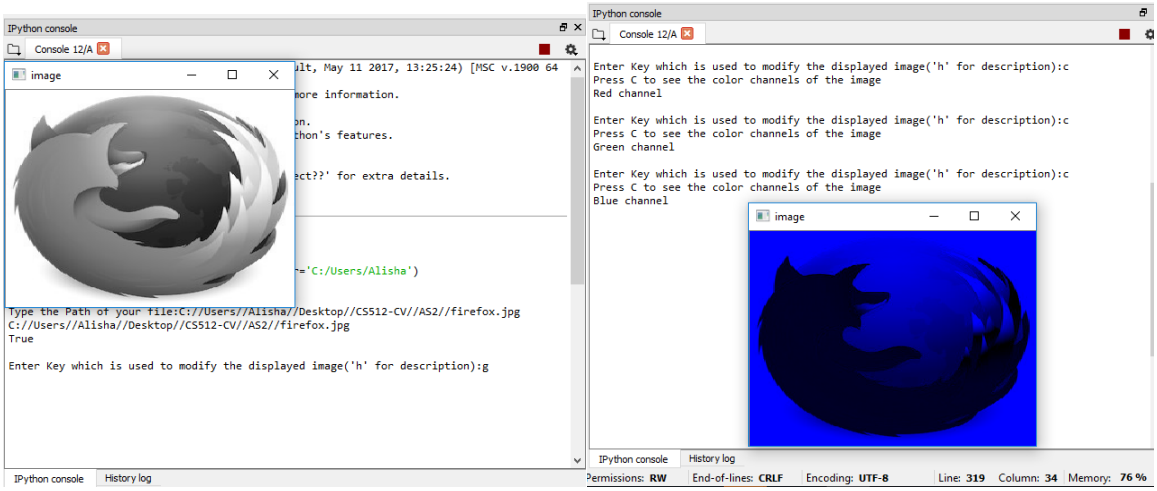
Red Channel



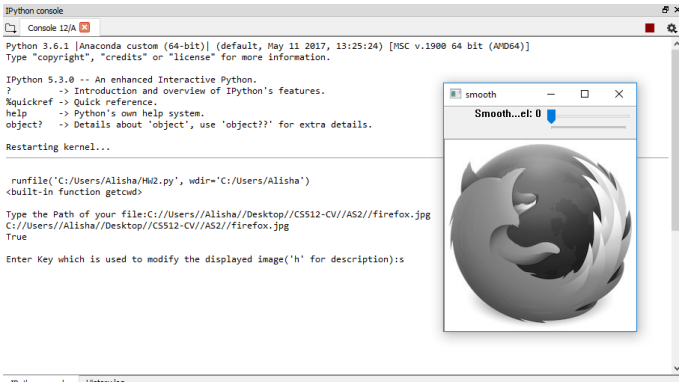
Green Channel

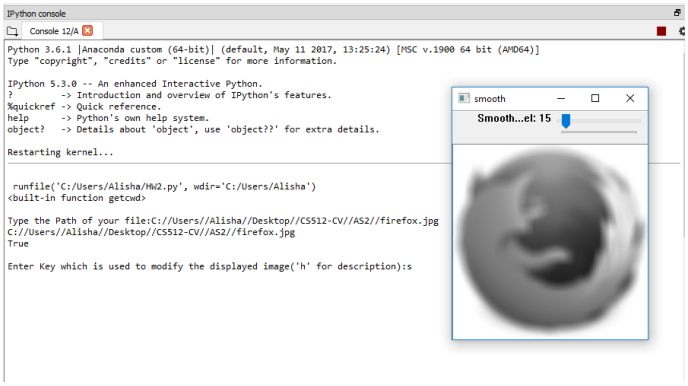


Blue Channel

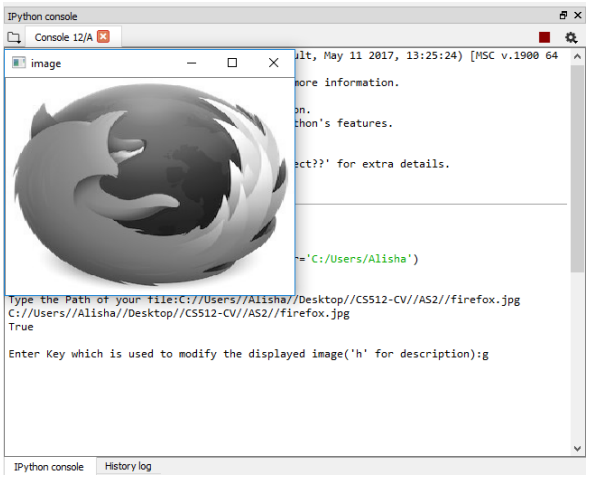


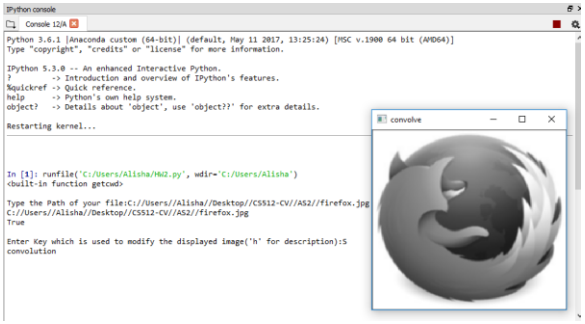
s-smoothing



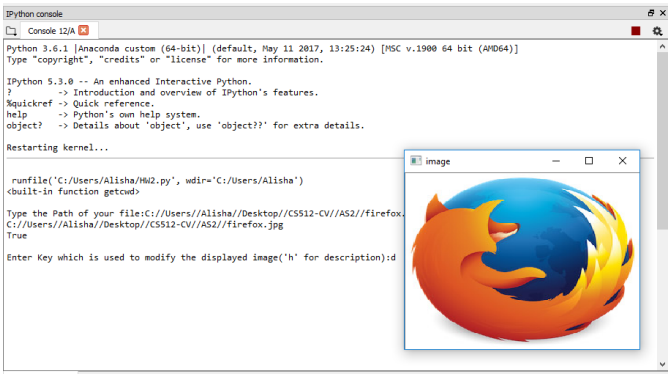


S-convolution

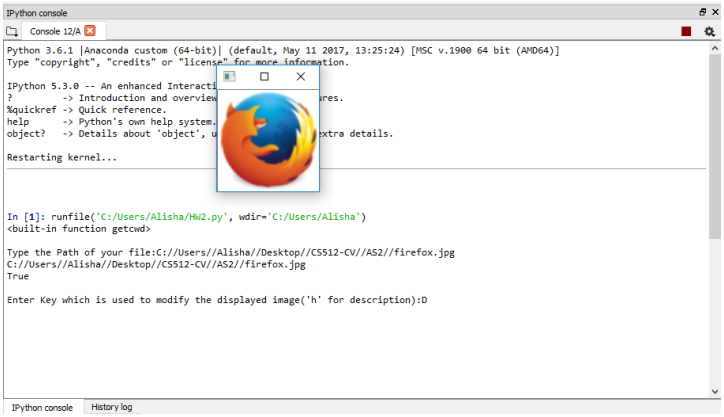




d-without smoothing



D-with Smoothing



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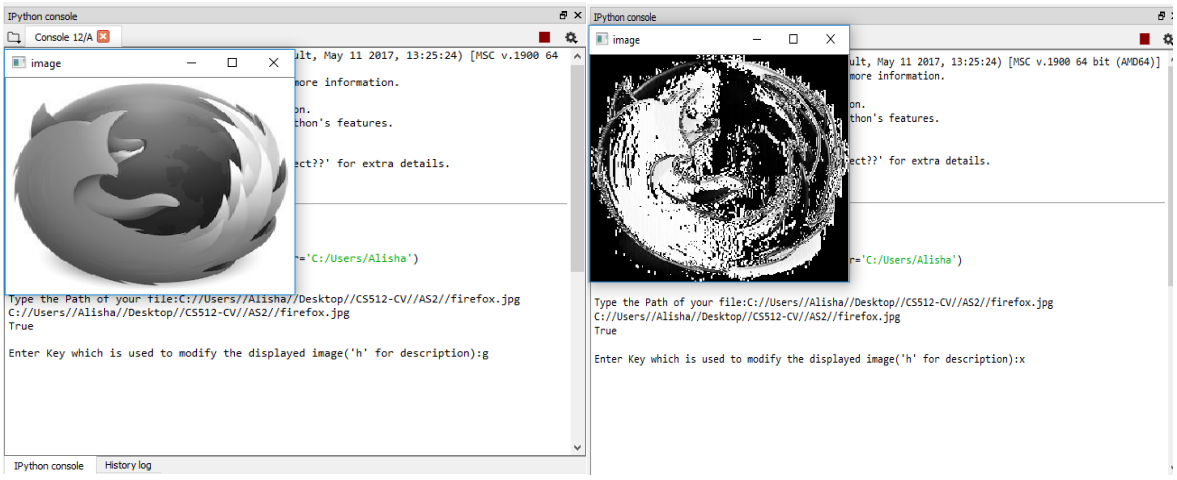

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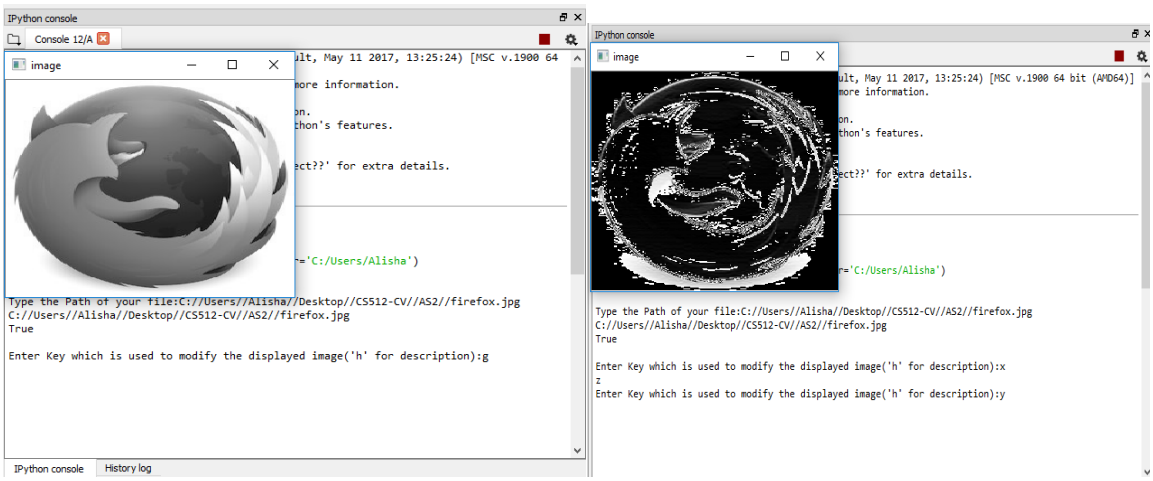

m-magnitude of the vector

p- Plot Gradient Vector

```
Type the Path of your file:C://Users//Alisha//Desktop//CS512-CV//AS2//firefox.jpg
C://Users//Alisha//Desktop//CS512-CV//AS2//firefox.jpg
True

Enter Key which is used to modify the displayed image('h' for description):p
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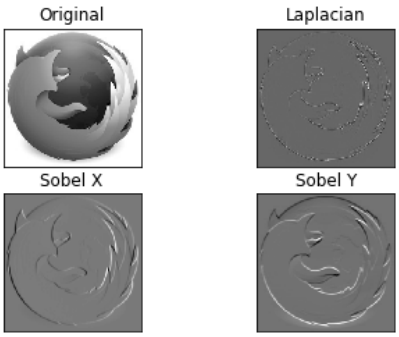


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Enter Key which is used to modify the displayed image('h' for description):
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Live Capture

```
Python 3.6.1 |Anaconda custom (64-bit)| (default, May 11 2017, 13:25:24) [MSC v.1900 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.

IPython 5.3.0 -- An enhanced Interactive Python.
?         -> Introduction and overview of IPython's features.
%quickref -> Quick reference.
help      -> Python's own help system.
object?   -> Details about 'object', use 'object??' for extra details.

Restarting kernel...


In [1]: runfile('C:/Users/Alisha/HW2.py', wdir='C:/Users/Alisha')
<built-in function getcwd>

Type the Path of your file:
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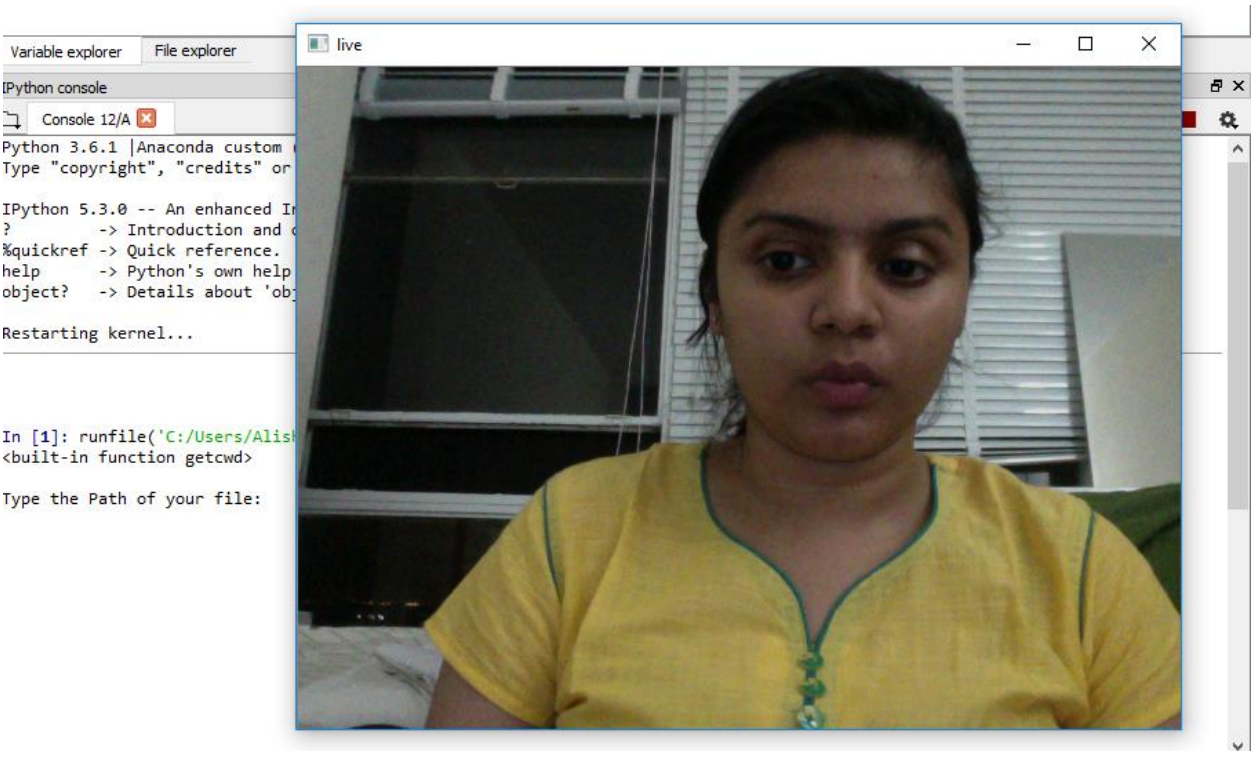
Variable explorer
File explorer
IPython console
Console 12/A
Python 3.6.1 |Anaconda custom
Type "copyright", "credits" or
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%quickref -> Quick reference.
help -> Python's own help
object? -> Details about 'obj
Restarting kernel...
In [1]: runfile('C:/Users/Alis
<built-in function getcwd>
Type the Path of your file:
live

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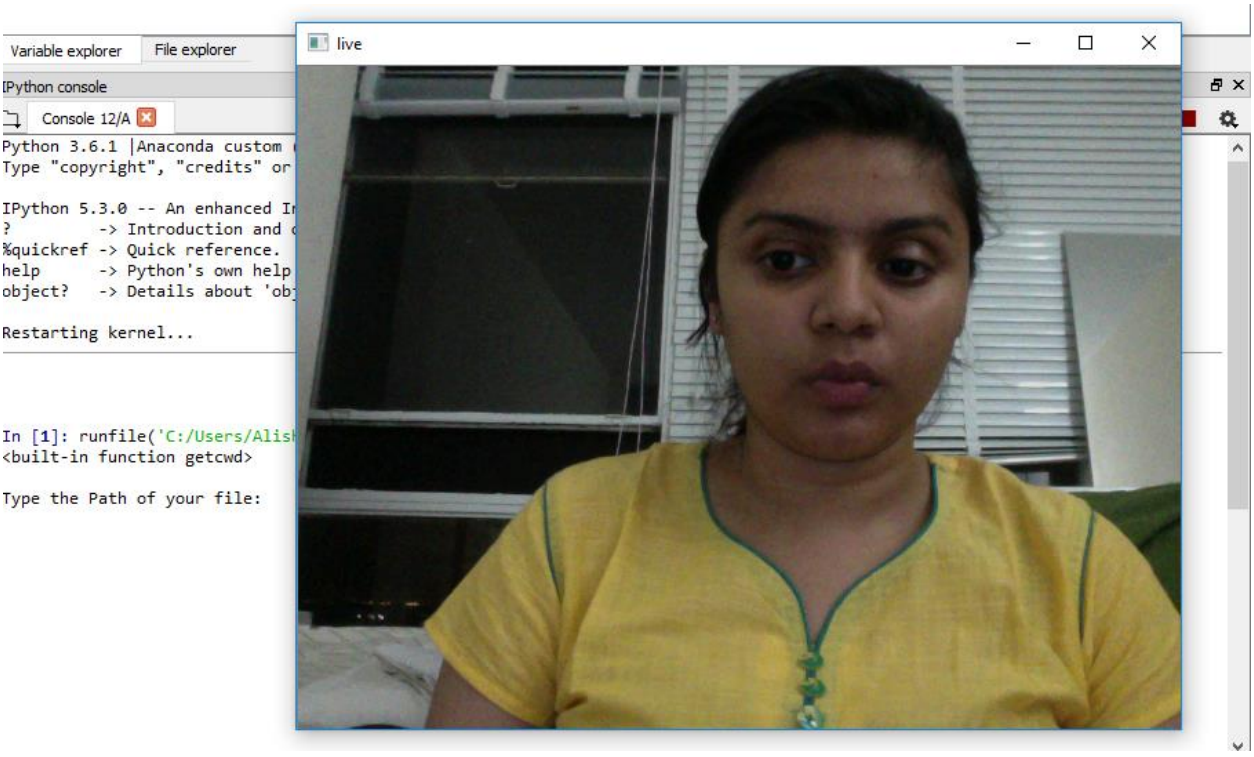
Variable explorer
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In [1]: runfile('C:/Users/Alis
<built-in function getcwd>
Type the Path of your file:
live

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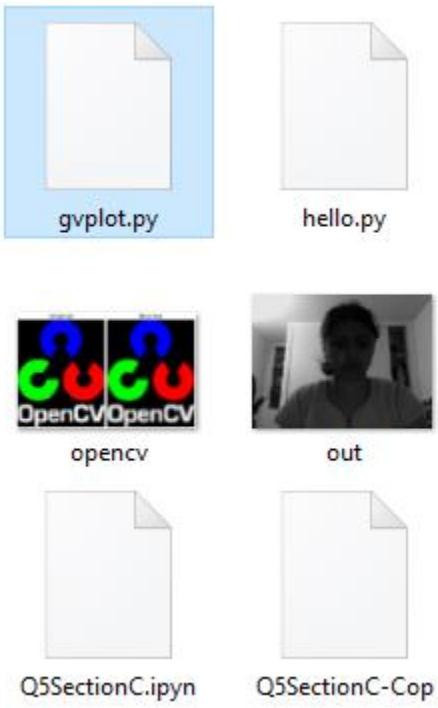
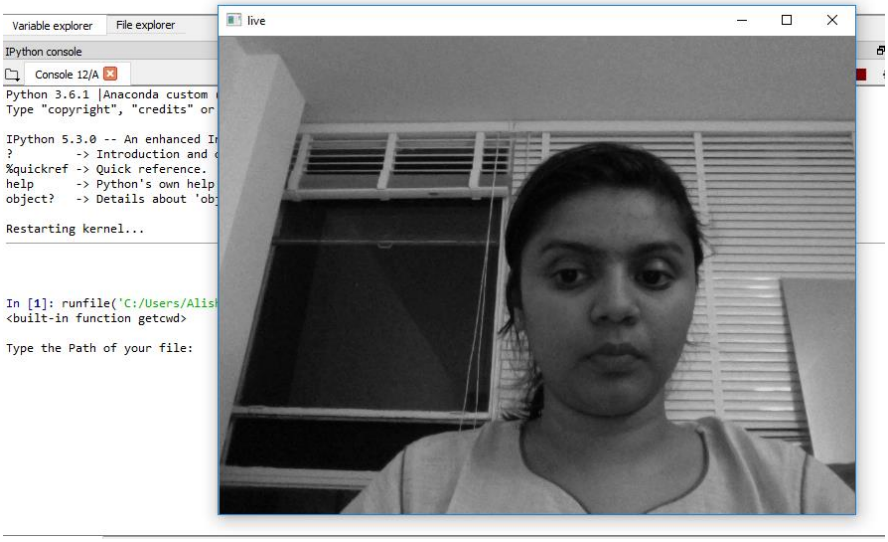
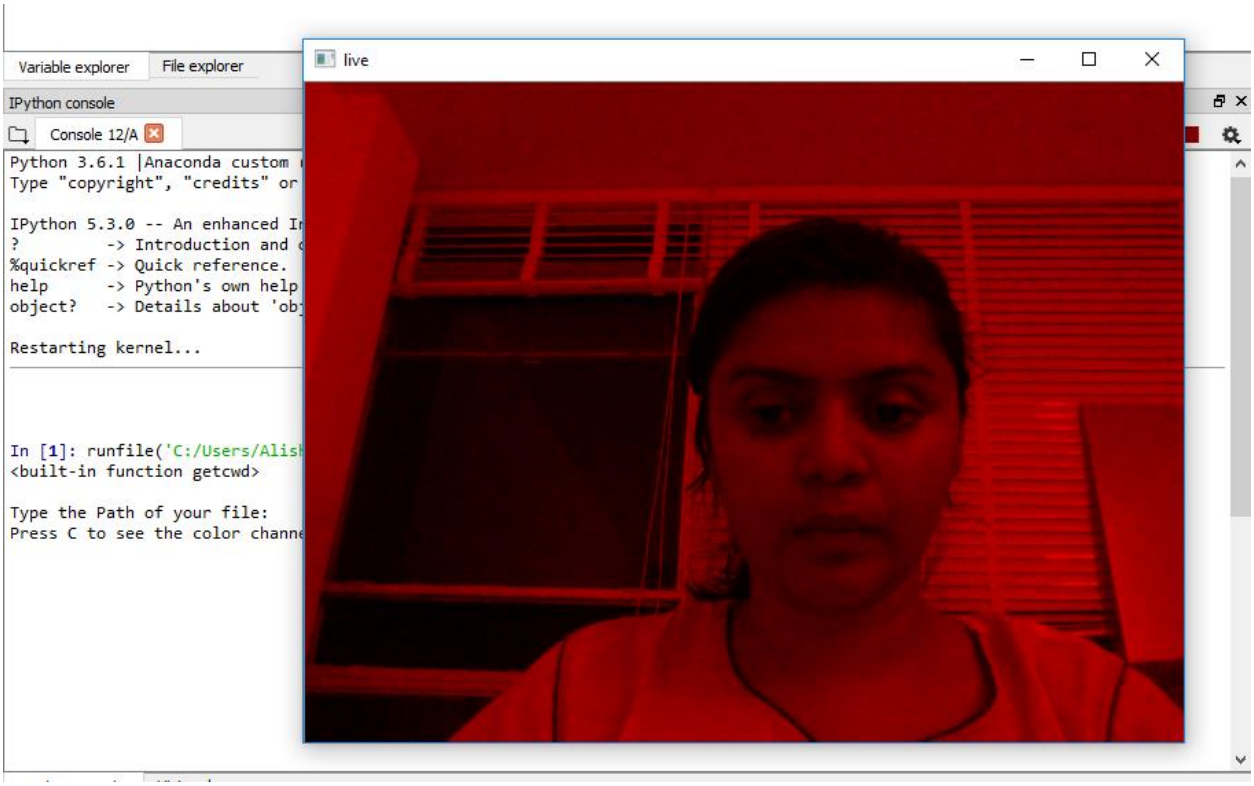


g-grayscale

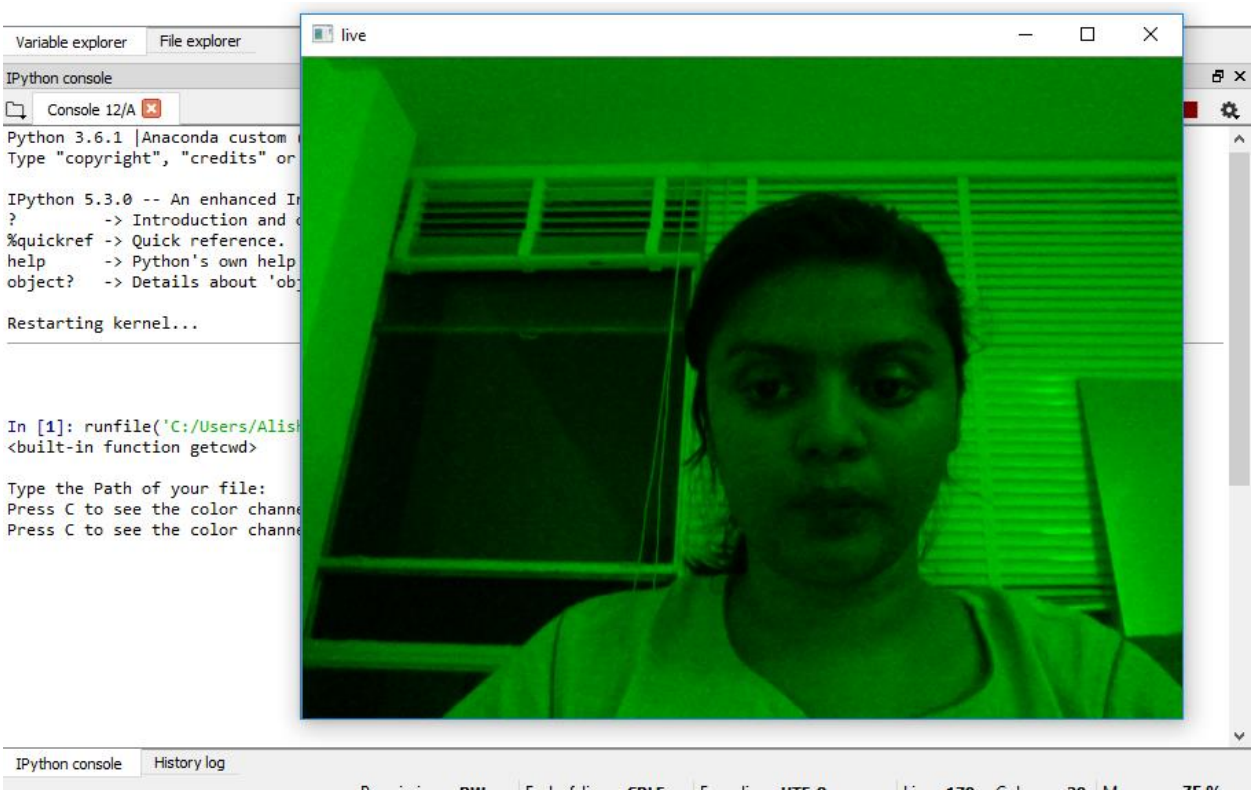


c-Color Channels

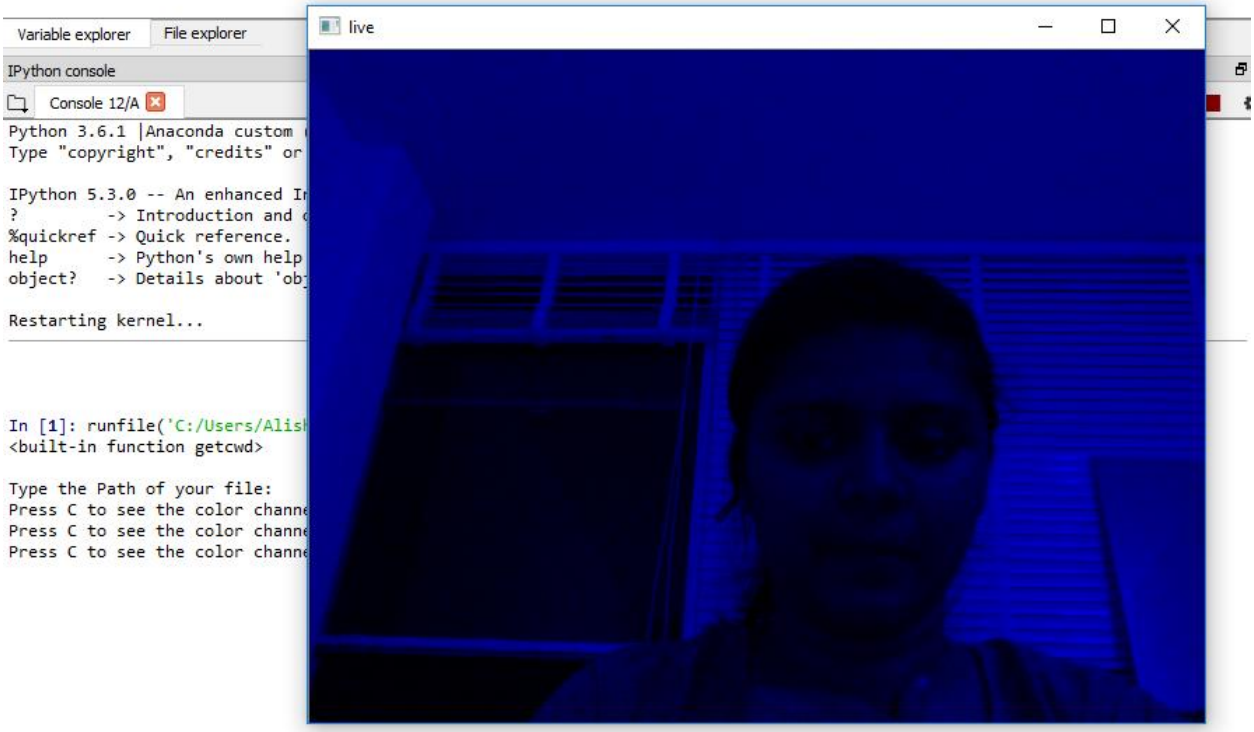
Red Channel



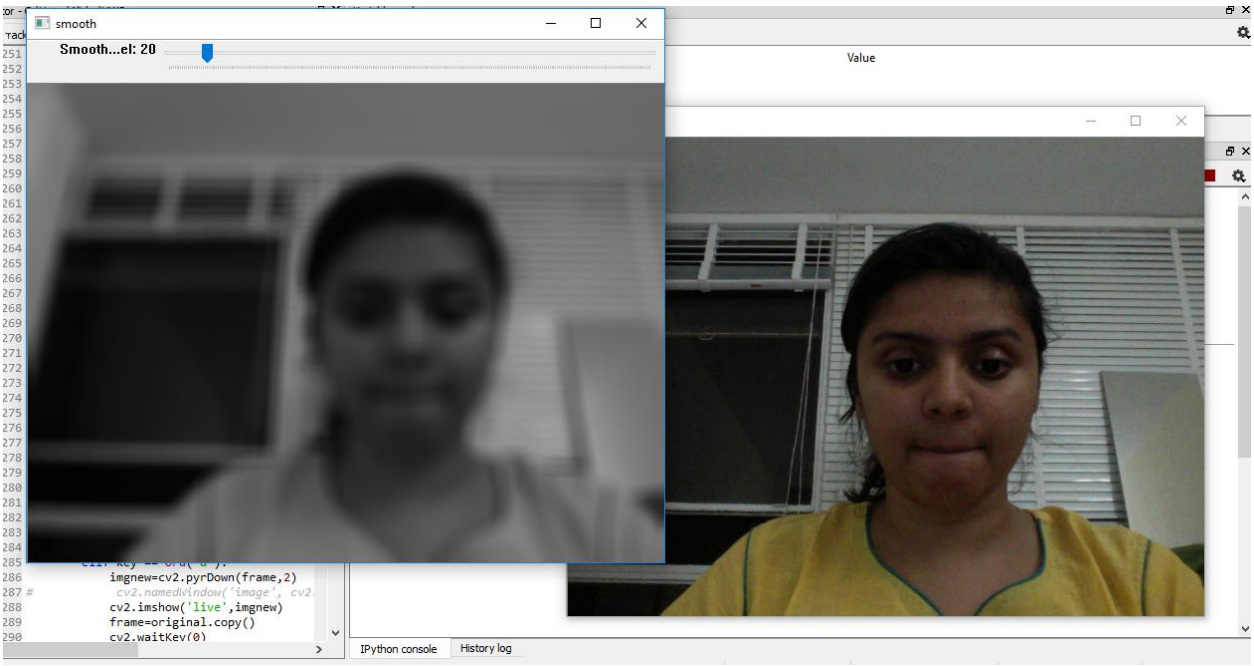
Green Channel



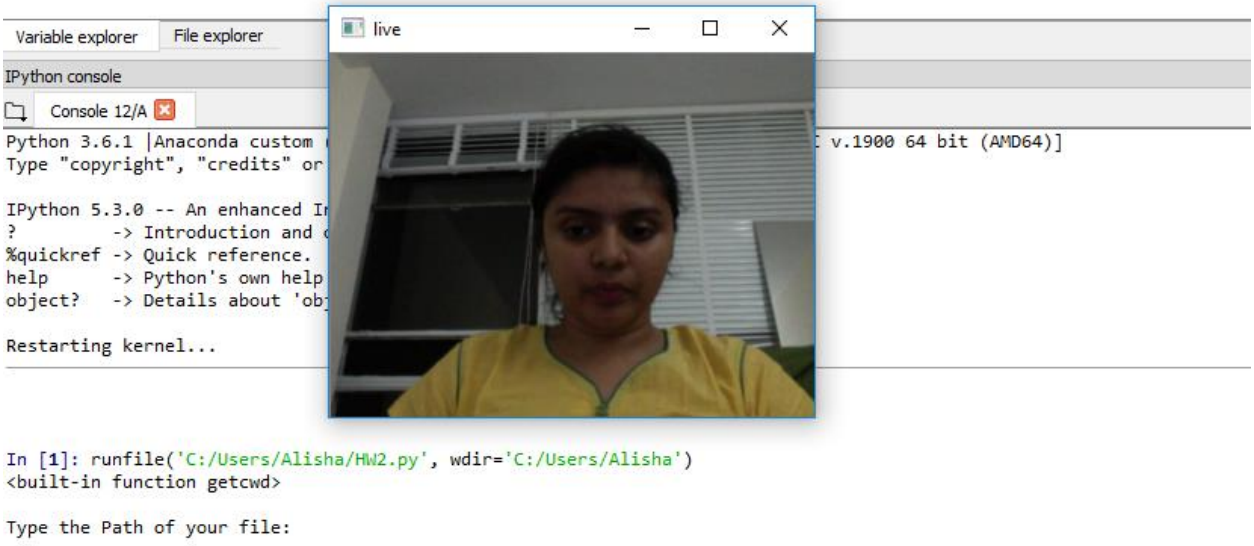
Blue Channel



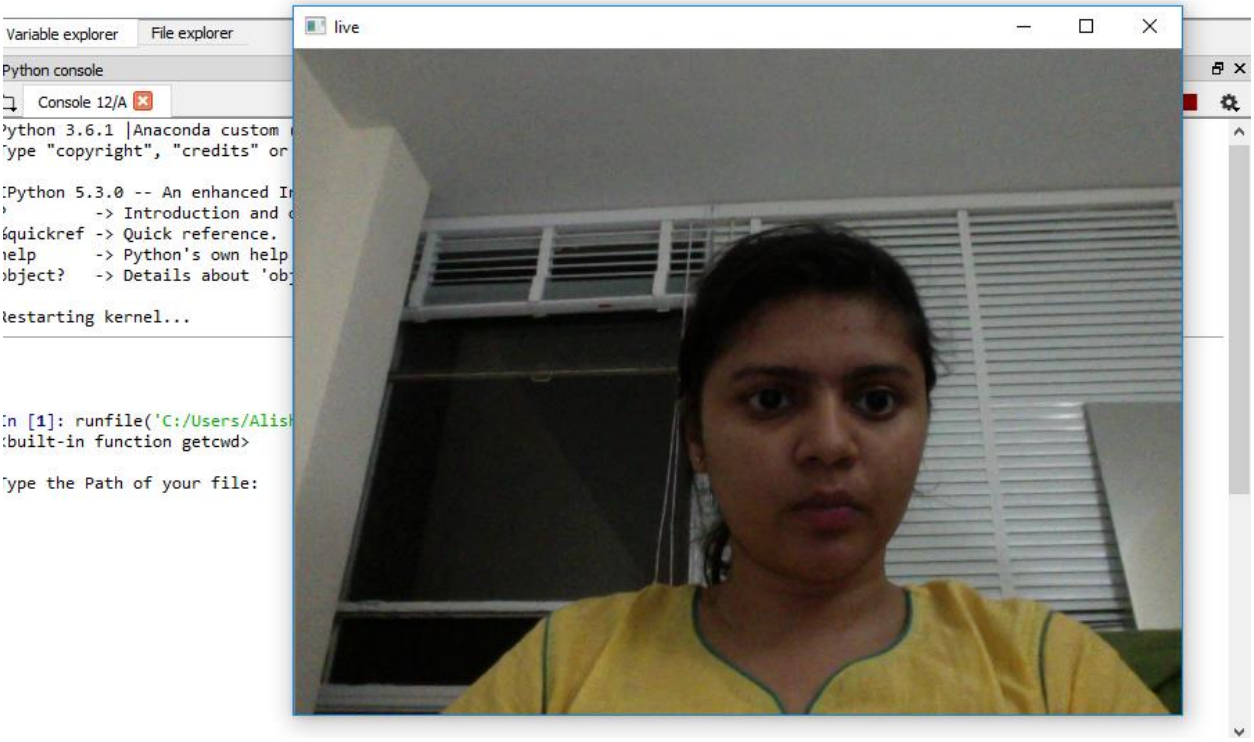
s-smoothing



d-downsample without smoothing



D-Downsample with smoothing


Variable explorer
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Python console
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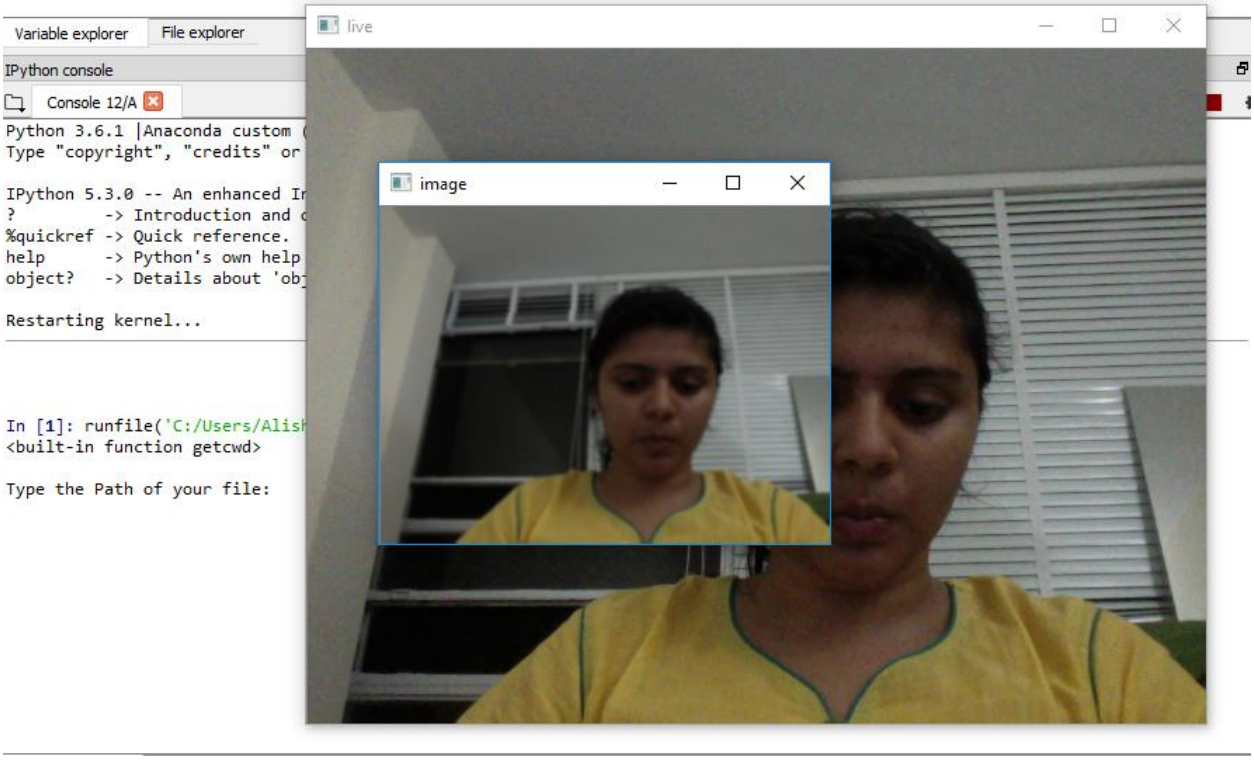
Variable explorer
File explorer
IPython console
Console 12/A
live
image
Restarting kernel...
Type the Path of your file:

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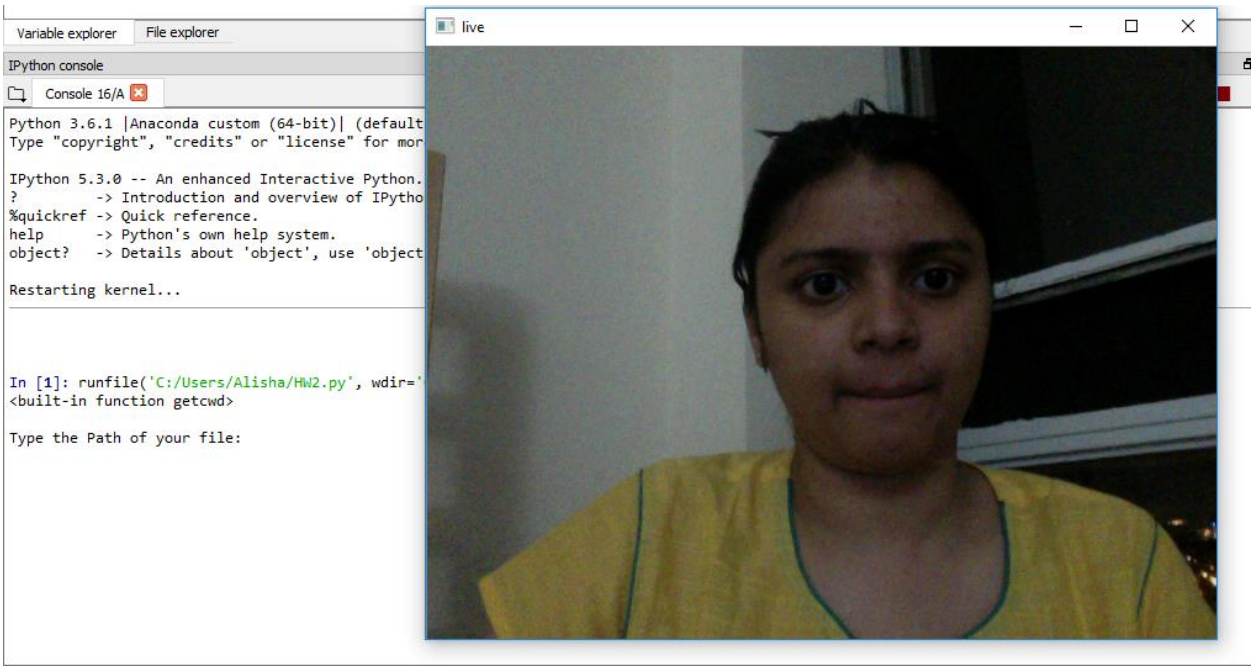
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Console 16/A
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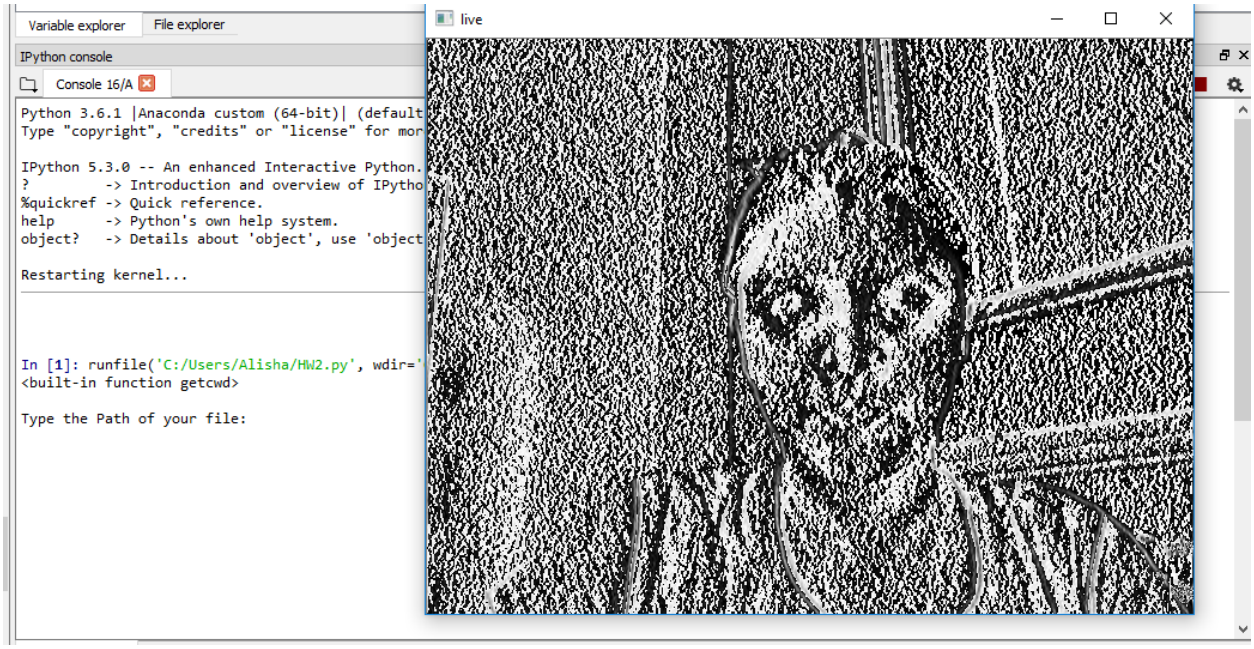
live


Variable explorer
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Python 3.6.1 |Anaconda custom (64-bit)| (default
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Type the Path of your file:
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Variable explorer | File explorer

IPython console

Console 16/A

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Restarting kernel...


In [1]: runfile('C:/Users/Alisha/HW2.py', wdir='
<built-in function getcwd>

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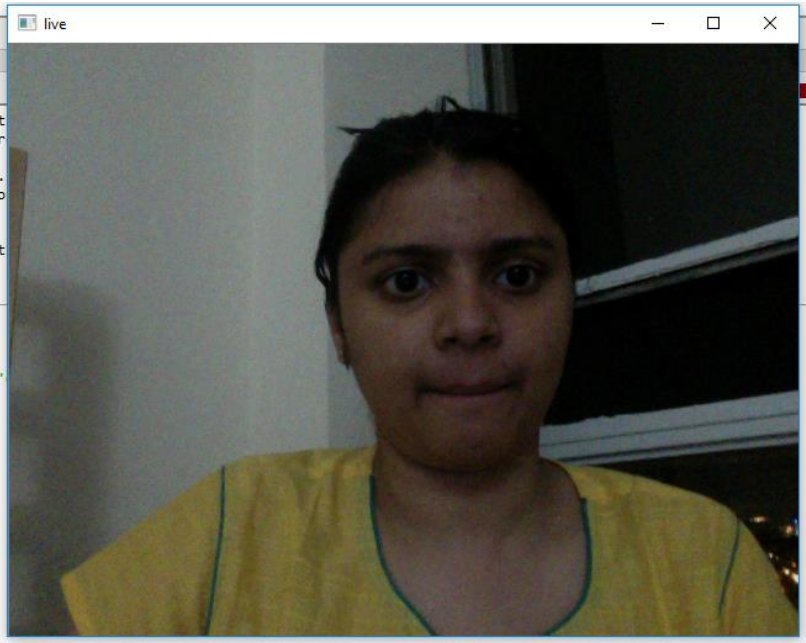

Variable explorer | File explorer

IPython console

Console 16/A

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Python 3.6.1 |Anaconda custom (64-bit)| (default
Type "copyright", "credits" or "license" for mor

IPython 5.3.0 -- An enhanced Interactive Python.
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%quickref -> Quick reference.
help      -> Python's own help system.
object?   -> Details about 'object', use 'object

Restarting kernel...


 runfile('C:/Users/Alisha/HW2.py', wdir='C:/User
<built-in function getcwd>

Type the Path of your file:
```

p-plot the gradient

IPython console

Console 12/A

```
Restarting kernel...

 runfile('C:/Users/Alisha/HW2.py', wdir='C:/Users/Alisha')
<built-in function getcwd>

Type the Path of your file:
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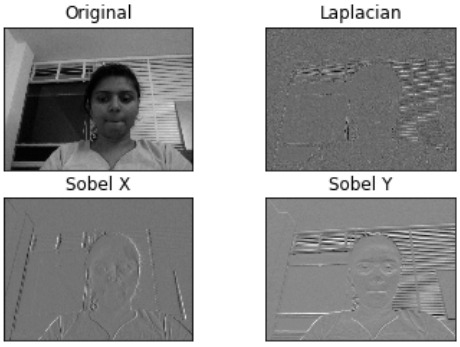
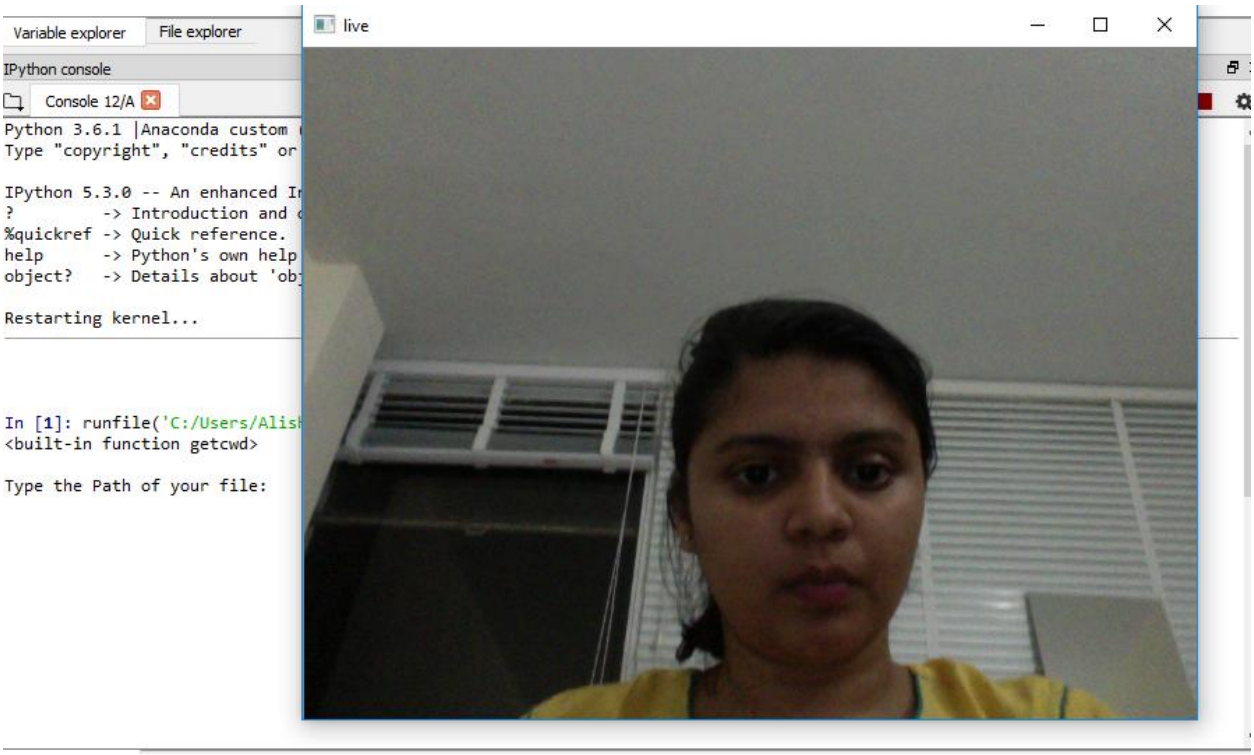


r-Rotate


Variable explorer
File explorer
IPython console
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Python 3.6.1 |Anaconda custom
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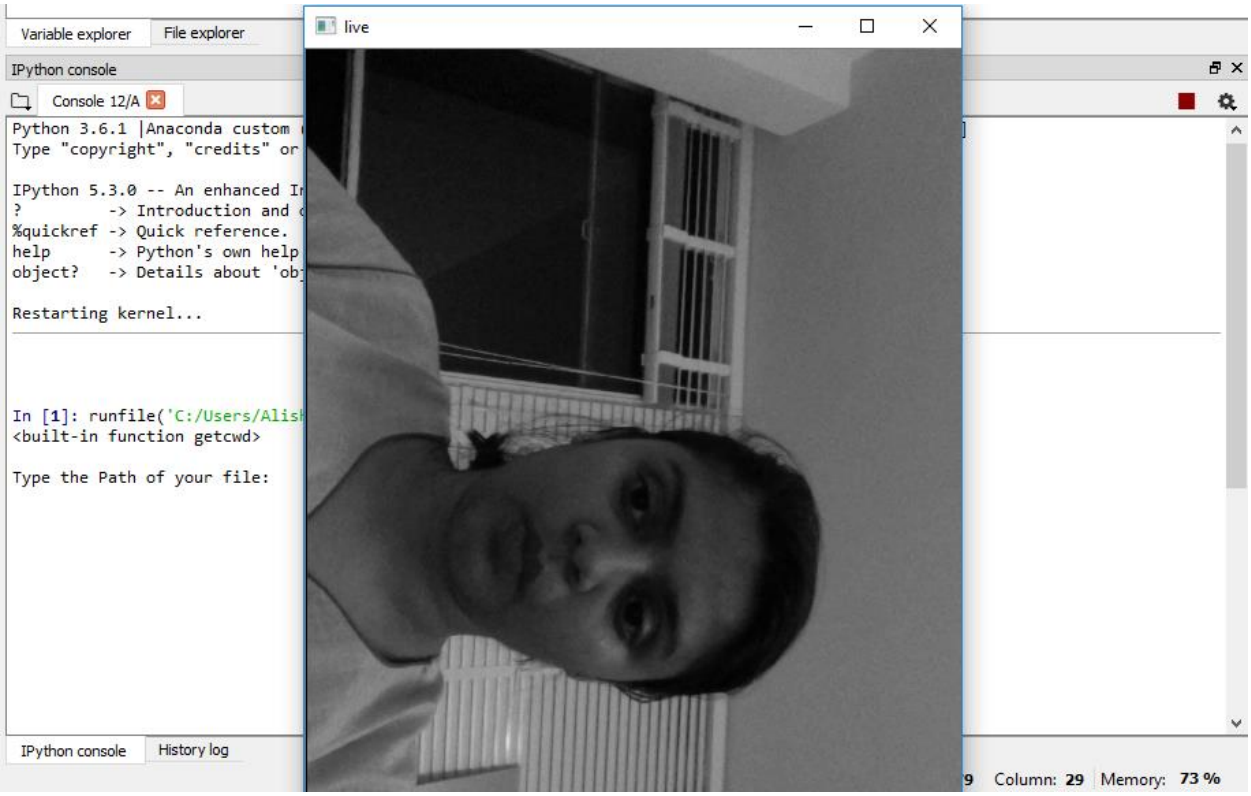
In [1]: runfile('C:/Users/Alis
<built-in function getcwd>
Type the Path of your file:
live



5 References

- https://stackoverflow.com/
- https://docs.opencv.org/3.0-beta/doc/py_tutorials/py_tutorials.html
- https://www.pyimagesearch.com/2017/01/02/rotate-images-correctly-with-opencv-and-python/
- http://docs.opencv.org/3.0-beta/doc/py_tutorials/py_tutorials.html