FACULTY OF COMPUTING
UTM Johor Bahru

FACULTY OF COMPUTING

SEMESTER 1/2223

SECV3213- FUNDAMENTAL OF IMAGE PROCESSING

SECTION 1

Assignment 1: Image Enhancement in Spatial Domain

Lecturer: Dr Md Sah Hj Salam

Group 3

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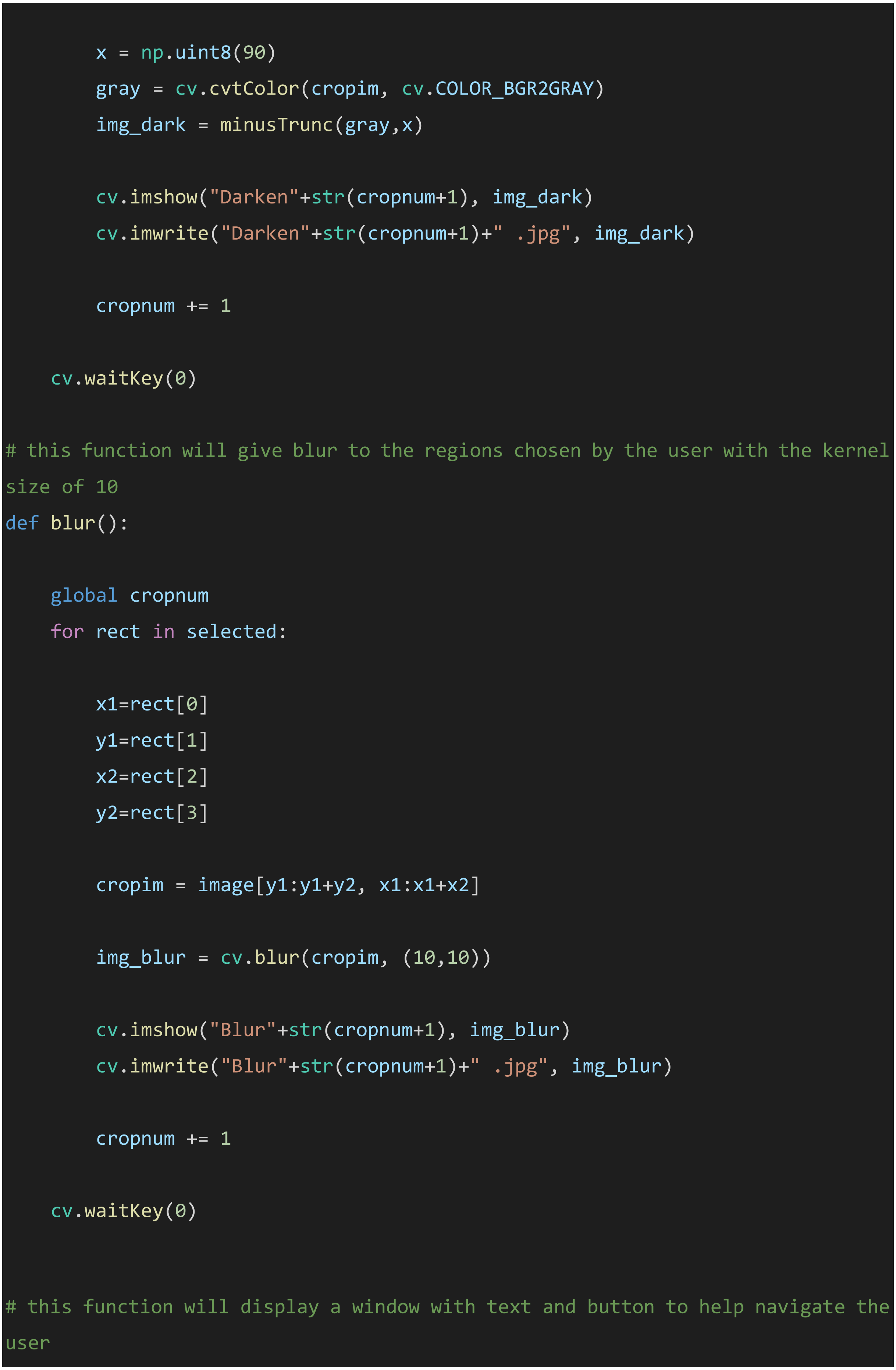
Contents

Code and Documentation

```
# --------------------------------------------------- #
# Assignment 1 - SECV3213 FIP - Section 1 - Group 3    #
# 1. Bilkis Musa A20EC0233                             #
# 2. Fatin Aimi Ayuni Binti Affindy A20EC0190          #
# ----------------------------------------------------#

import cv2 as cv
import numpy as np
from tkinter import *

# this function will minus the values of the image to darken the image
def  minusTrunc(img,num):
    img1=img
    (x,y) = img1.shape
    for i in range(0,x):
           for j in range(0,y):
               if (img[i,j]< num):
                img1[i,j]=0;
               else:
                 img1[i,j] = img[i,j]-int(num);
    return img1

# this function will display a text box to give instruction to the user on how
to
# navigate the interface
top = Tk()
top.title('Instruction')
top.geometry('600x170')
text = Text(top, height=200, width=300)
text.insert(INSERT, '! ! ! PLEASE READ BEFORE START ! ! !\n\n')
text.insert(INSERT, '1. Select a ROI and then press SPACE or ENTER button!\n\n')
text.insert(INSERT, '2. Repeat step 1 to select multiple region\n\n')
text.insert(INSERT,  '3.  Finish  the  selection  of  region(s)  by  pressing  ECS
button!\n\n')
```

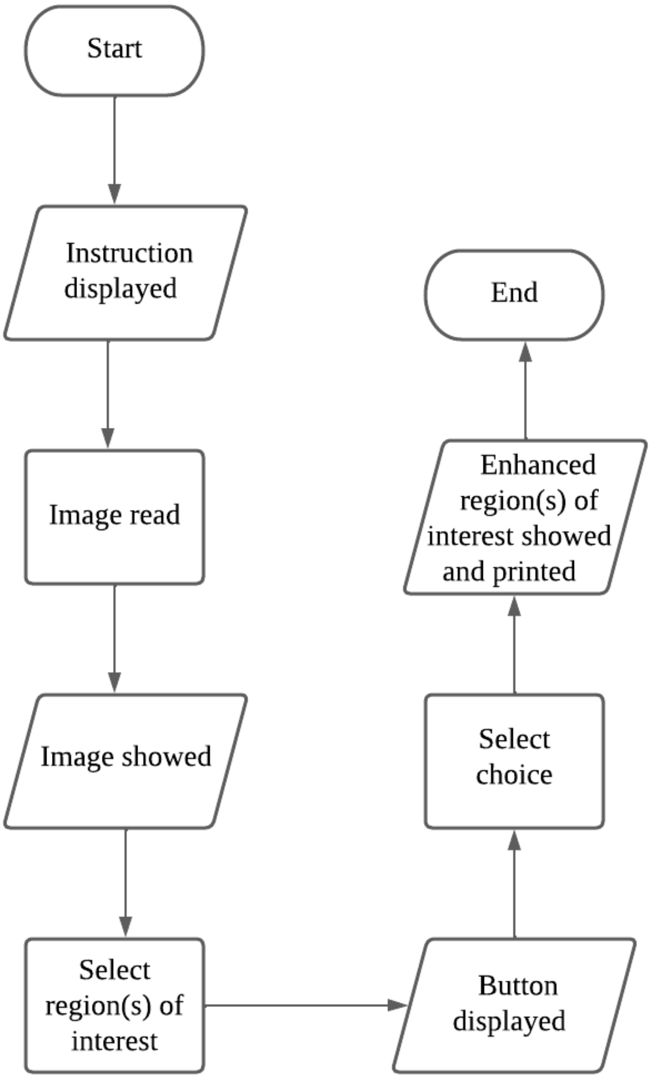
```
text.insert(INSERT, '4. Please close this window to begin cropping image\n\n')
text.pack()
top.mainloop()

# this line will create a blank window named 'Image'
cv.namedWindow('Image')

# this line will read the image cat.jpg from the same folder and convert it to
grayscale
image = cv.imread('cat.jpg')
gray = cv.cvtColor(image, cv.COLOR_BGR2GRAY)

# this line will take the dimension of the image
size = image.shape
x = size[0]
y = size[1]

# this line will enable the user to select multiple part of image to be
manipulated
# depending on the choice chosen by the user
selected = cv.selectROIs('Image', image, showCrosshair=False)

# these are to initialize the values
cropnum = 0
cropim = image.copy()

# this function will darken the regions chosen by the user
def darken():

    global cropnum
    for rect in selected:

        x1=rect[0]
        y1=rect[1]
        x2=rect[2]
        y2=rect[3]

        cropim = image[y1:y1+y2, x1:x1+x2]
```



```
        x = np.uint8(90)
        gray = cv.cvtColor(cropim, cv.COLOR_BGR2GRAY)
        img_dark = minusTrunc(gray,x)

        cv.imshow("Darken"+str(cropnum+1), img_dark)
        cv.imwrite("Darken"+str(cropnum+1)+" .jpg", img_dark)

        cropnum += 1

    cv.waitKey(0)

# this function will give blur to the regions chosen by the user with the kernel size of 10
def blur():

    global cropnum
    for rect in selected:

        x1=rect[0]
        y1=rect[1]
        x2=rect[2]
        y2=rect[3]

        cropim = image[y1:y1+y2, x1:x1+x2]

        img_blur = cv.blur(cropim, (10,10))

        cv.imshow("Blur"+str(cropnum+1), img_blur)
        cv.imwrite("Blur"+str(cropnum+1)+" .jpg", img_blur)

        cropnum += 1

    cv.waitKey(0)


# this function will display a window with text and button to help navigate the user
```

```
top = Tk()
top.title('Action')
top.geometry('670x230')
text = Text(top, height=200, width=300)
text.insert(INSERT, '1. Click the button to view the cropped image in chosen condition(darken/blur)\n\n')
text.insert(INSERT, '2. Press SPACE to reset the button\n\n')
text.insert(INSERT, '3. Repeat step 1 and 2 if you want to view the cropped image in both condition\n\n')
text.insert(INSERT, '4. Cropped image with changed condition will be saved automatically\n\n')

# this line will display a clickable button
darken = Button(top, text = "Darken",activeforeground = "black",activebackground = '#ed92b6', pady=10, padx=10,command = darken)
blur = Button(top, text = "Blur",activeforeground = "black",activebackground = '#a4d3eb', pady=10, padx=15, command = blur)

darken.pack(side = BOTTOM)
blur.pack(side = BOTTOM)

text.pack()
top.mainloop()

cv.waitKey(0)
```

Process Chart



1. **Start**

   The program should be able to run successfully without any runtime error.

2. **Instruction displayed**

   The first window that will be displayed on the screen is the text window. This text window will display the instruction that the user need to follow to get the output as how it is supposed to be. In order to proceed with the next step, the user should close the text window as how it has been told in the instruction window.

3. **Image read**

   The program should read the image that has been declared in the code which is an image with file name ‘cat.jpg’.

4. **Image showed**

   The program will display the image read onto the screen.

5. **Select region(s) of interest**

   After the image showed onto the screen, the user should choose the part of image that they are interested to enhance. The instruction for the selection process is provided in the first window which is the instruction window where it popped up first as the program is run.

6. **Button displayed**

   After selecting region(s) of interest, another window will pop-up. The window consists of two clickable buttons which are ‘Darken’ and ‘Blur’ and an instruction on how to enhance the image by clicking the button.

7. **Select choice**

   The user should click one of the buttons to see the action.

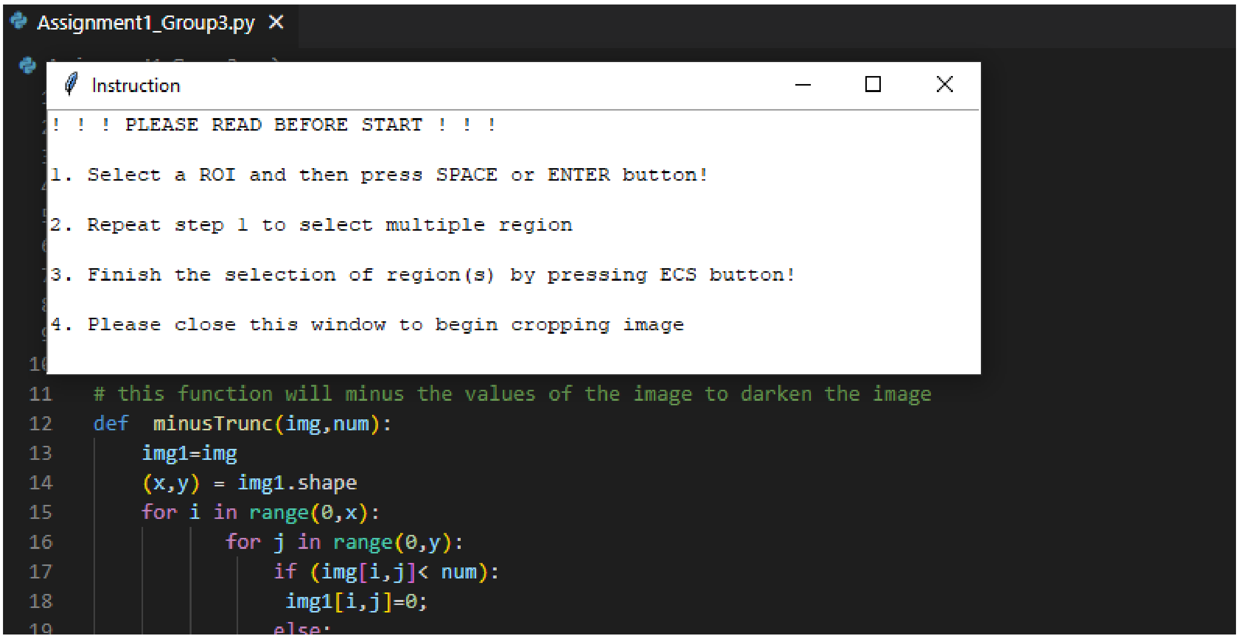
8. **Enhanced region(s) of interest showed and printed**

   After the button has been clicked, enhanced region(s) will be displayed. If there are three regions selected, there will be three new windows that will display the three regions separately. As the process happens, the three enhanced regions will be saved automatically into the same folder.

9. **End**

   The system will terminate if the user closes all the windows.

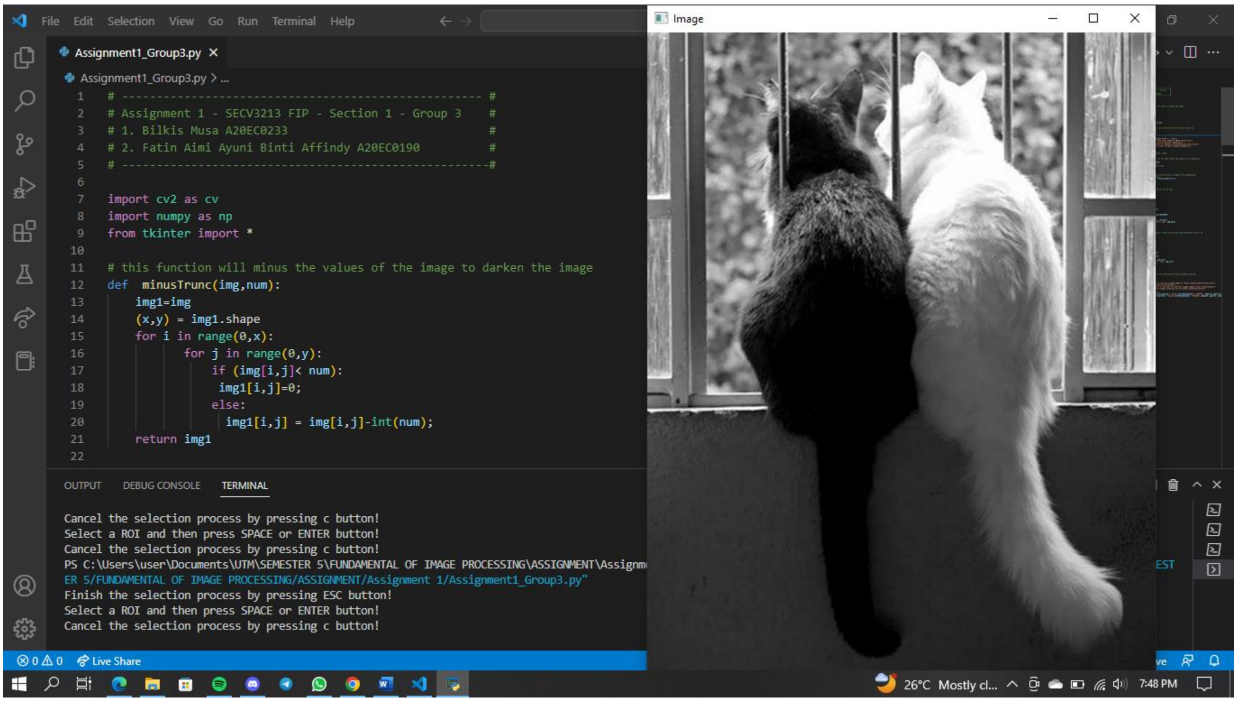
Example of Image & Expected Output



```
! ! ! PLEASE READ BEFORE START ! ! !

1. Select a ROI and then press SPACE or ENTER button!

2. Repeat step 1 to select multiple region

3. Finish the selection of region(s) by pressing ECS button!

4. Please close this window to begin cropping image
```

```python
# this function will minus the values of the image to darken the image
def  minusTrunc(img,num):
    img1=img
    (x,y) = img1.shape
    for i in range(0,x):
          for j in range(0,y):
                if (img[i,j]< num):
                 img1[i,j]=0;
                else:
```

This will be the first window that will be displayed when the code is run.



```python
# ---------------------------------------------------- #
# Assignment 1 - SECV3213 FIP - Section 1 - Group 3    #
# 1. Bilkis Musa A20EC0233                             #
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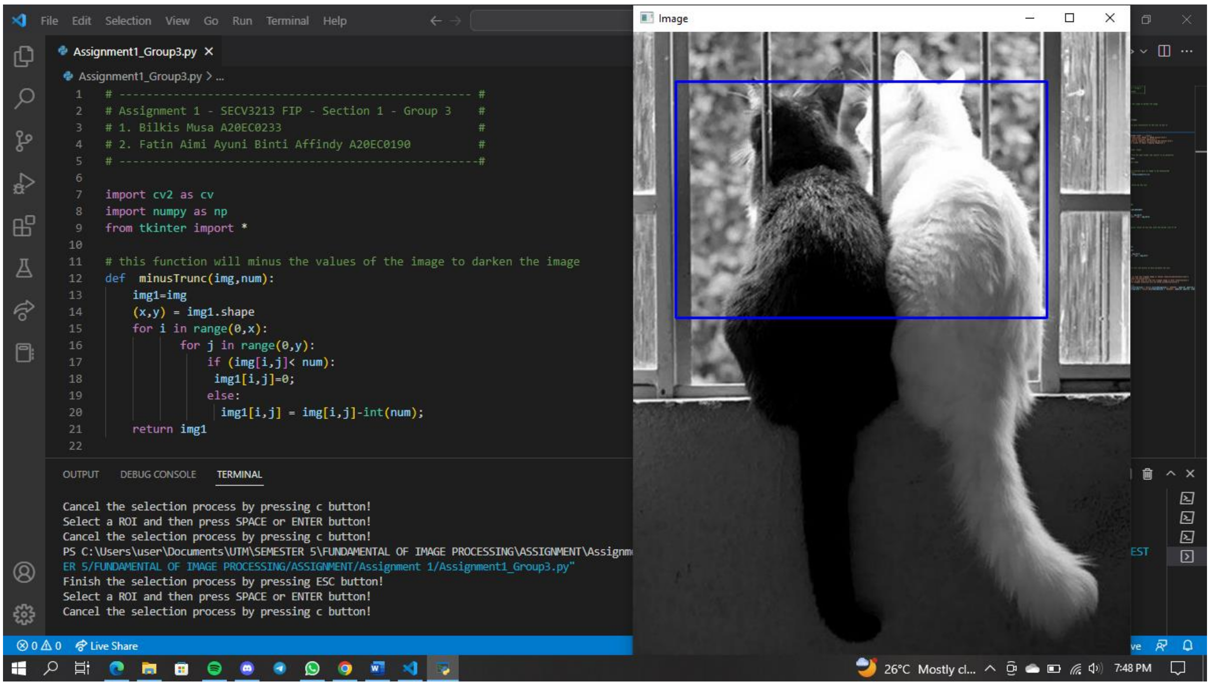
    for i in range(0,x):
          for j in range(0,y):
                if (img[i,j]< num):
                 img1[i,j]=0;
                else:
                  img1[i,j] = img[i,j]-int(num);
    return img1
```

```
Cancel the selection process by pressing c button!
Select a ROI and then press SPACE or ENTER button!
Cancel the selection process by pressing c button!
PS C:\Users\user\Documents\UTM\SEMESTER 5\FUNDAMENTAL OF IMAGE PROCESSING\ASSIGNMENT\Assignm
ER 5/FUNDAMENTAL OF IMAGE PROCESSING/ASSIGNMENT/Assignment 1/Assignment1_Group3.py"
Finish the selection process by pressing ESC button!
Select a ROI and then press SPACE or ENTER button!
Cancel the selection process by pressing c button!
```

When the instruction window is closed, the image window will be displayed.


File Edit Selection View Go Run Terminal Help
Assignment1_Group3.py
Image
OUTPUT DEBUG CONSOLE TERMINAL
Live Share
26°C Mostly cl...
7:48 PM

```
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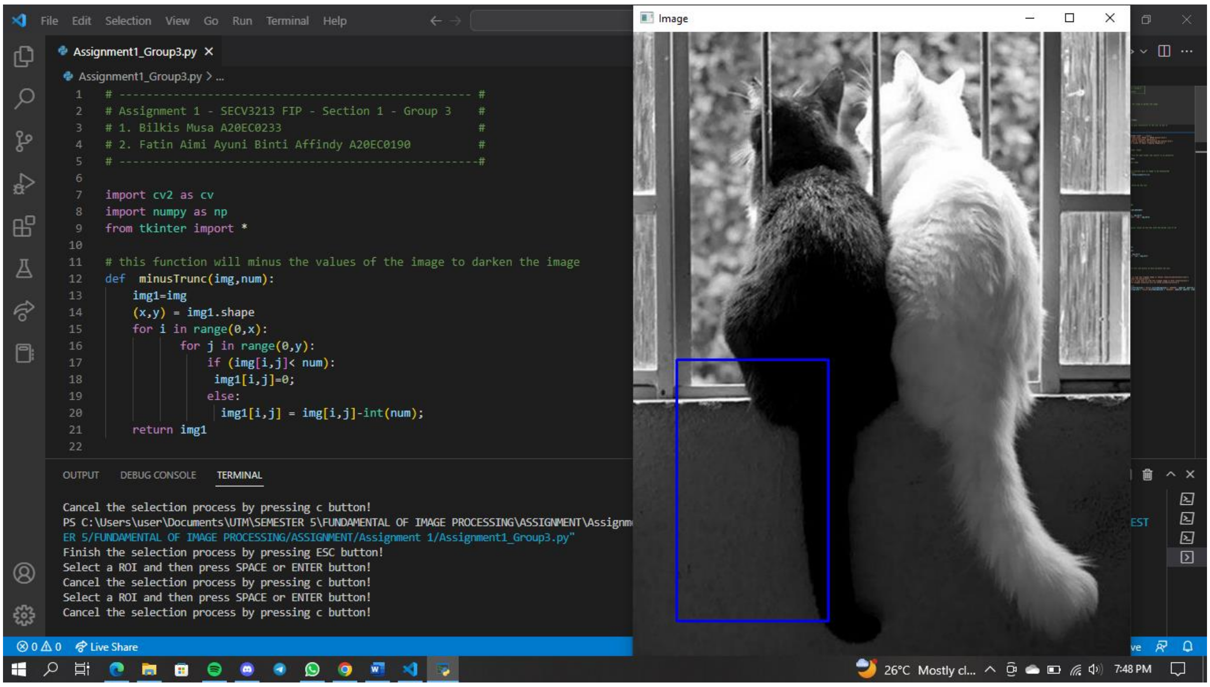
    for i in range(0,x):
           for j in range(0,y):
               if (img[i,j]< num):
                img1[i,j]=0;
               else:
                 img1[i,j] = img[i,j]-int(num);
    return img1

```

```
Cancel the selection process by pressing c button!
Select a ROI and then press SPACE or ENTER button!
Cancel the selection process by pressing c button!
PS C:\Users\user\Documents\UTM\SEMESTER 5\FUNDAMENTAL OF IMAGE PROCESSING\ASSIGNMENT\Assignm
ER 5/FUNDAMENTAL OF IMAGE PROCESSING/ASSIGNMENT/Assignment 1/Assignment1_Group3.py"
Finish the selection process by pressing ESC button!
Select a ROI and then press SPACE or ENTER button!
Cancel the selection process by pressing c button!
```

Then, the user can choose the part of the image they want to enhance. They can choose one or more parts to be enhanced.


File Edit Selection View Go Run Terminal Help
Assignment1_Group3.py
Image
OUTPUT DEBUG CONSOLE TERMINAL
Live Share
26°C Mostly cl...
7:48 PM

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# ---------------------------------------------------- #
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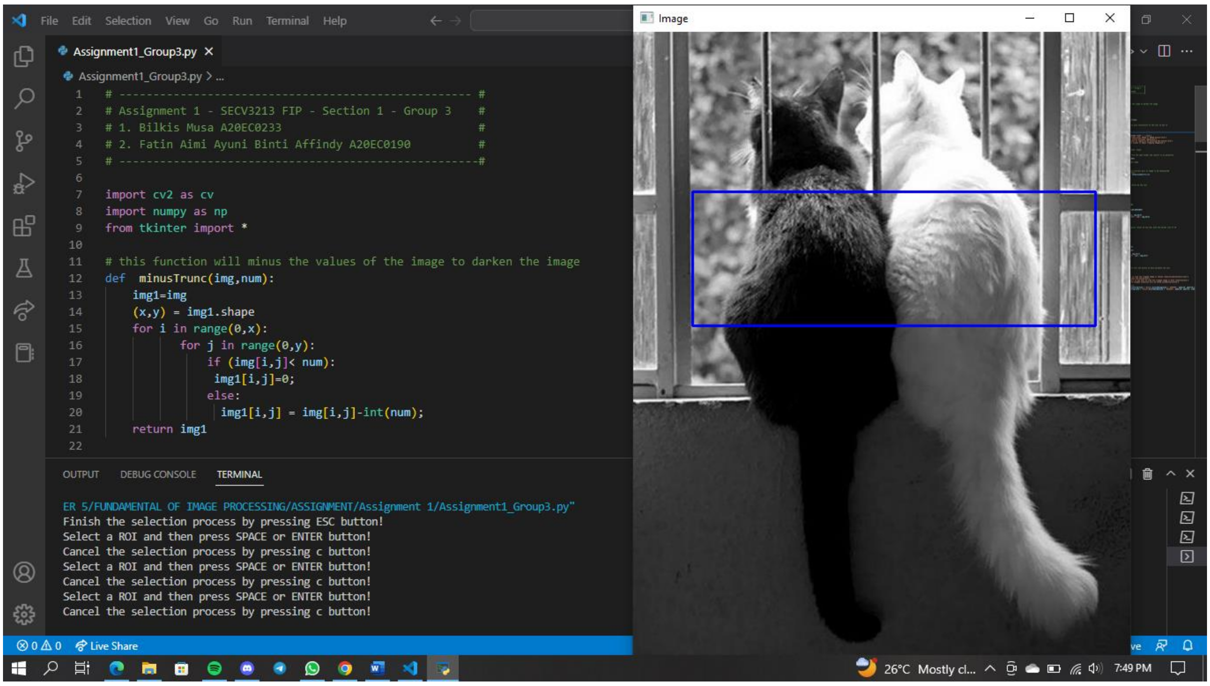
    img1=img
    (x,y) = img1.shape
    for i in range(0,x):
           for j in range(0,y):
               if (img[i,j]< num):
                img1[i,j]=0;
               else:
                 img1[i,j] = img[i,j]-int(num);
    return img1

```

```
Cancel the selection process by pressing c button!
PS C:\Users\user\Documents\UTM\SEMESTER 5\FUNDAMENTAL OF IMAGE PROCESSING\ASSIGNMENT\Assignm
ER 5/FUNDAMENTAL OF IMAGE PROCESSING/ASSIGNMENT/Assignment 1/Assignment1_Group3.py"
Finish the selection process by pressing ESC button!
Select a ROI and then press SPACE or ENTER button!
Cancel the selection process by pressing c button!
Select a ROI and then press SPACE or ENTER button!
Cancel the selection process by pressing c button!
```

This is the user choosing the second part.


File Edit Selection View Go Run Terminal Help
Assignment1_Group3.py
Image
OUTPUT DEBUG CONSOLE TERMINAL
Live Share
26°C Mostly cl...
7:49 PM

```
# -------------------------------------------------- #
# Assignment 1 - SECV3213 FIP - Section 1 - Group 3    #
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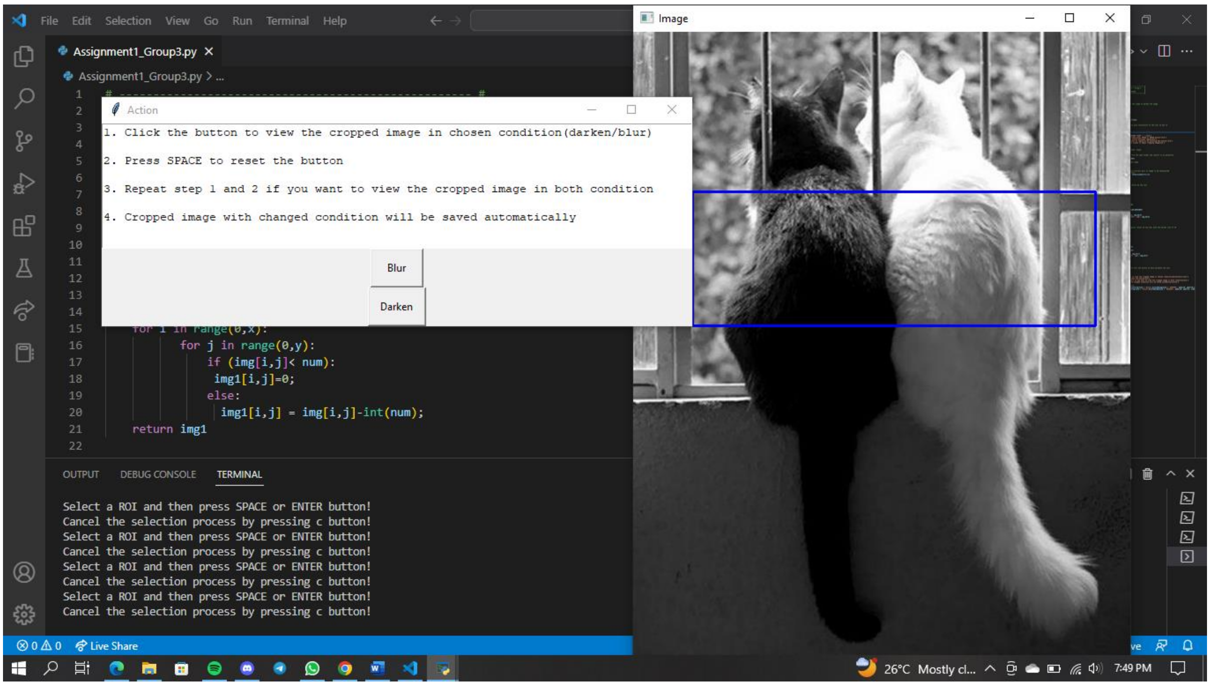
from tkinter import *

# this function will minus the values of the image to darken the image
def  minusTrunc(img,num):
    img1=img
    (x,y) = img1.shape
    for i in range(0,x):
          for j in range(0,y):
              if (img[i,j]< num):
               img1[i,j]=0;
              else:
                img1[i,j] = img[i,j]-int(num);
    return img1
```

```
ER 5/FUNDAMENTAL OF IMAGE PROCESSING/ASSIGNMENT/Assignment 1/Assignment1_Group3.py"
Finish the selection process by pressing ESC button!
Select a ROI and then press SPACE or ENTER button!
Cancel the selection process by pressing c button!
Select a ROI and then press SPACE or ENTER button!
Cancel the selection process by pressing c button!
Select a ROI and then press SPACE or ENTER button!
Cancel the selection process by pressing c button!
```

This is the user choosing the third part.



1. Click the button to view the cropped image in chosen condition(darken/blur)

2. Press SPACE to reset the button

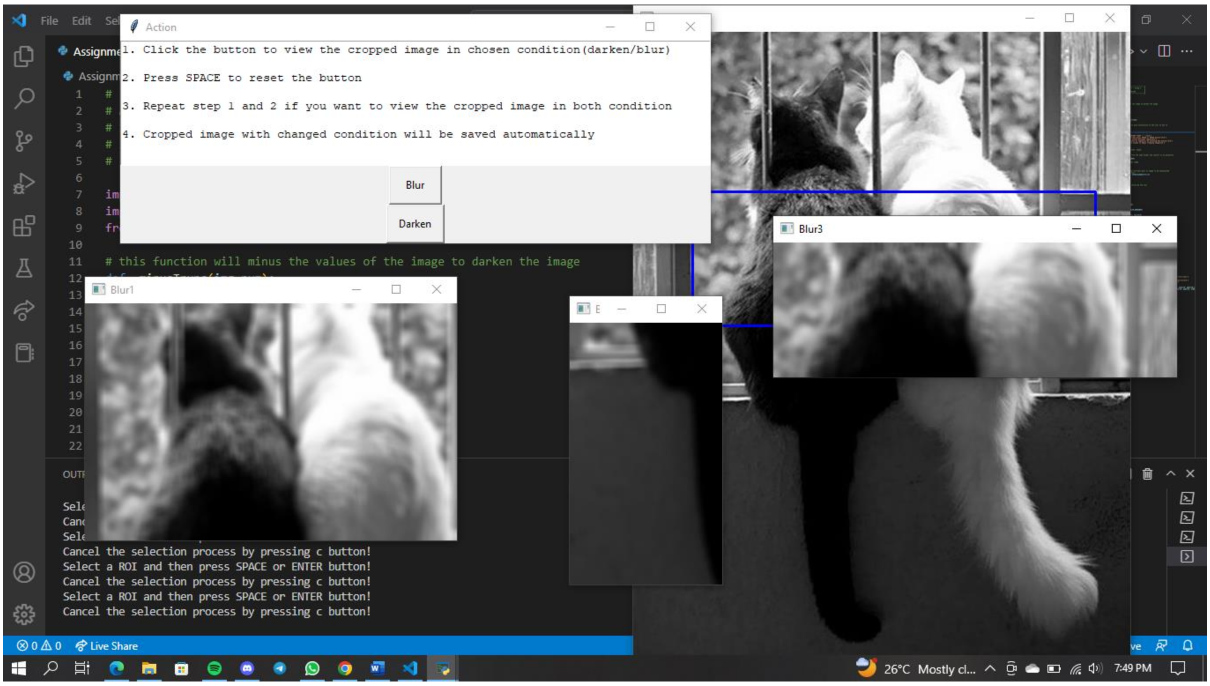
3. Repeat step 1 and 2 if you want to view the cropped image in both condition

4. Cropped image with changed condition will be saved automatically

```
          for j in range(0,y):
              if (img[i,j]< num):
               img1[i,j]=0;
              else:
                img1[i,j] = img[i,j]-int(num);
    return img1
```

```
Select a ROI and then press SPACE or ENTER button!
Cancel the selection process by pressing c button!
Select a ROI and then press SPACE or ENTER button!
Cancel the selection process by pressing c button!
Select a ROI and then press SPACE or ENTER button!
Cancel the selection process by pressing c button!
Select a ROI and then press SPACE or ENTER button!
Cancel the selection process by pressing c button!
```

After following the instruction to proceed with the image enhancement, there will be another window pop up, displaying button and the instruction to use the button.



```
1. Click the button to view the cropped image in chosen condition(darken/blur)

2. Press SPACE to reset the button

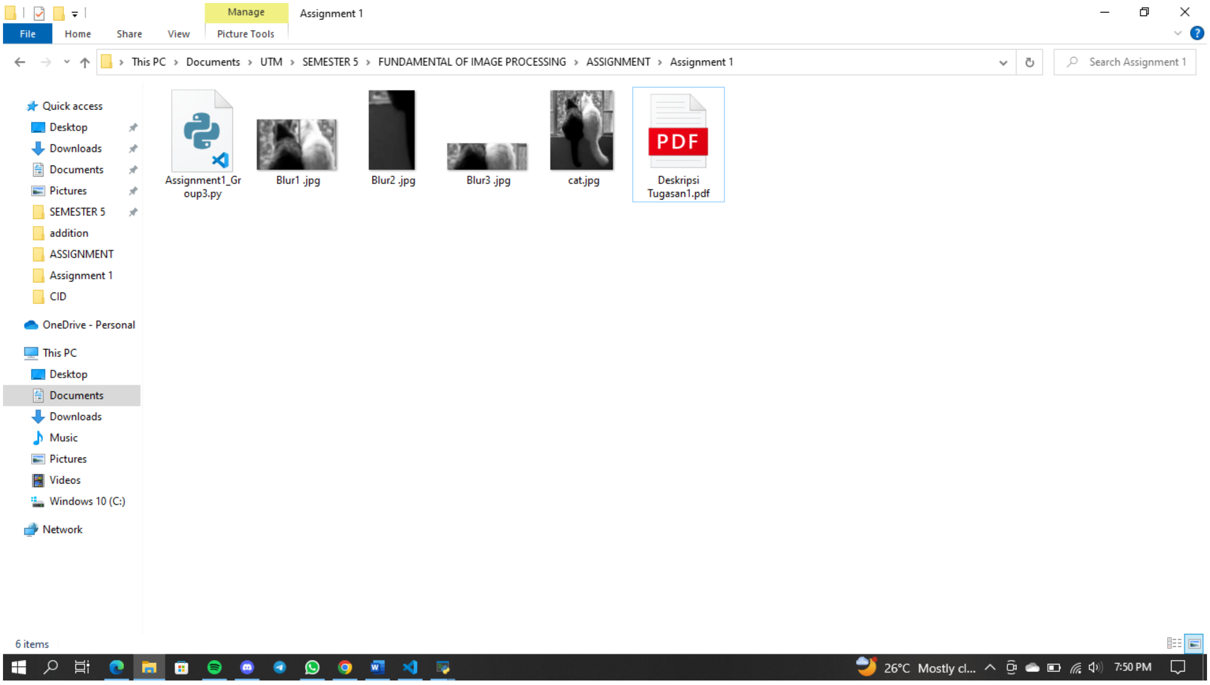
3. Repeat step 1 and 2 if you want to view the cropped image in both condition

4. Cropped image with changed condition will be saved automatically
```

```
# this function will minus the values of the image to darken the image
```

```
Sele
Canc
Sele
Cancel the selection process by pressing c button!
Select a ROI and then press SPACE or ENTER button!
Cancel the selection process by pressing c button!
Select a ROI and then press SPACE or ENTER button!
Cancel the selection process by pressing c button!
```

This is an example of the user choosing Blur, there will be three new windows displaying the three parts getting blur.



The three blurry image will be saved automatically as the three windows are being displayed.

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