Mohanty_R_HW1_Prob3

February 20, 2020

1 Math 521 HW1

1.1 Computing Question 3

[1]:
```
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
from  imageio import imread
```

[3]:
```
image = imread('cameraman.png')
```

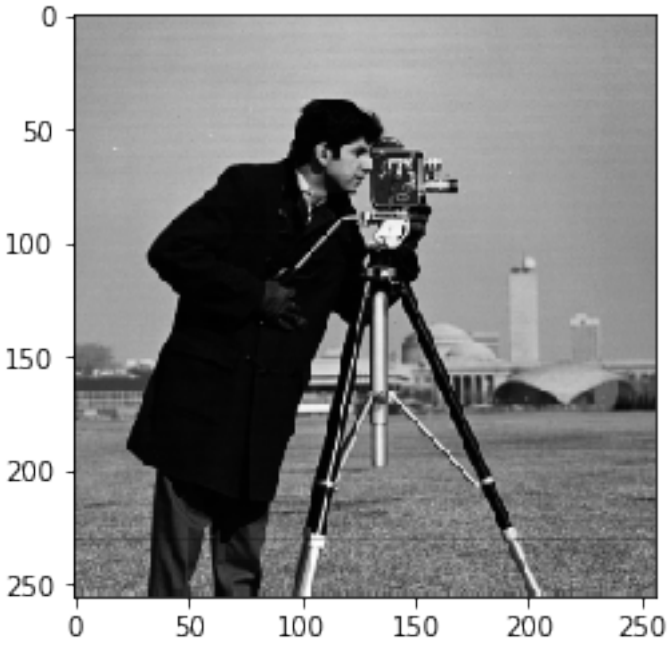
[4]:
```
image.shape
```

[4]:
```
(256, 256)
```

Original Image

[177]:
```
plt.imshow(image,cmap='gray')
```

[177]:
```
<matplotlib.image.AxesImage at 0xb20a33048>
```



Defining a function to scale back sx and sy

[150]:
```
def process_alpha(alpha):
    if alpha[0]>1:
        alpha[0]=1/alpha[0]
    if alpha[1]>1:
        alpha[1]=1/alpha[1]
    return alpha
```

Main function that enlarges and shrinks image

[178]:
```
def enlarge_shrink(image,P,alpha):
    B=np.zeros((image.shape[0],image.shape[1]))
    sx=alpha[0];sy=alpha[1];
    alpha=process_alpha(alpha)
    for i in range(image.shape[0]):
        for j in range(image.shape[0]):
            ind=alpha*(np.array([i,j,1]) - P)+P
            ind=ind.astype('int')
            if sx>=1 and sy>=1:
                B[(i,j)]=image[(ind[0],ind[1])]
            elif sx<=1 and sy<=1:
                B[(ind[0],ind[1])]=image[i,j]
            elif sx>=1 and sy<=1:
                B[(i,ind[1])]=image[ind[0],j]
            elif sx<=1 and sy>=1:
```

```
                B[(ind[0],j)]=image[i,ind[1]]
    return B
```

User input: Define reference point P on the image

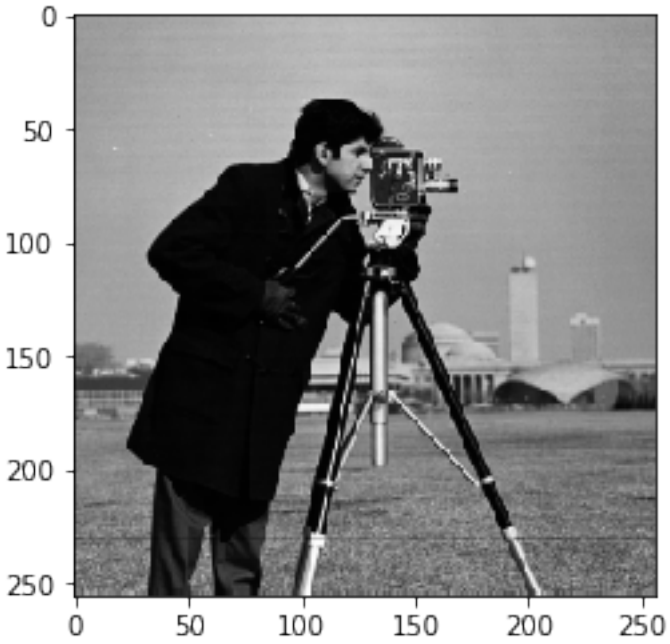
[157]:
```
tx=image.shape[0]/2
ty=image.shape[1]/2
P=np.array([tx,ty,1])
P
```

[157]:
```
array([128., 128.,   1.])
```

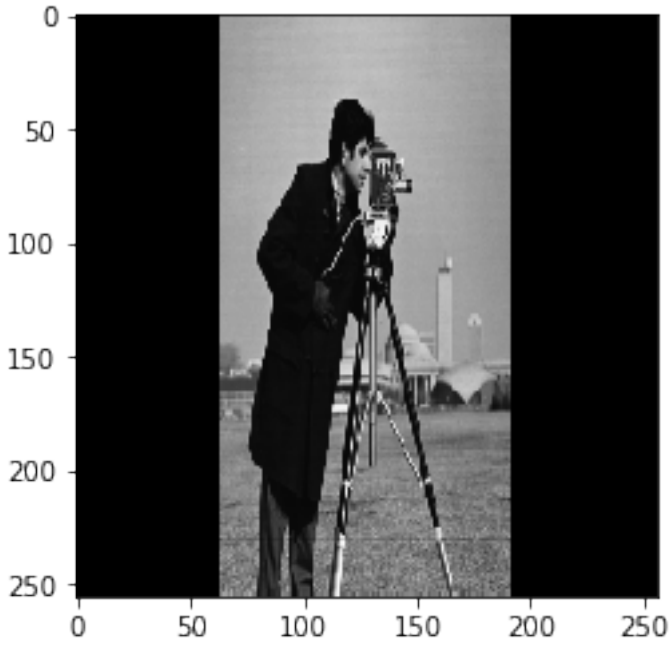
Try different enlargement and shrinking alpha values

[179]:
```
print(".....Image zoom in and zoom out at the center of the image (P)....")
for sx in [1.0,0.5,2.0]:
    for sy in [1.0,0.5,2.0]:
        alpha=np.array([sx,sy,1])
        print("alpha = ",alpha)
        plt.imshow(enlarge_shrink(image,P,alpha),cmap='gray')
        plt.show()
```

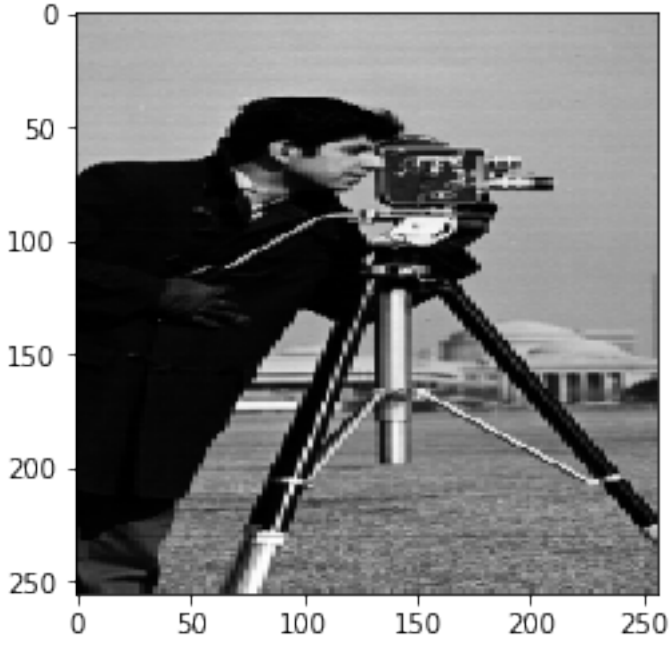
```
...Image zoom in and zoom out at the center of the image (P)...
alpha =  [1. 1. 1.]
```



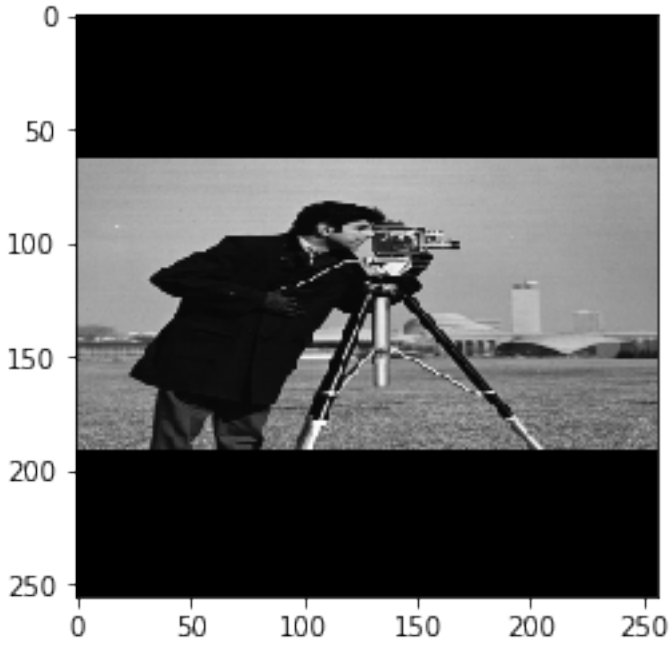

```
alpha =  [1.  0.5 1. ]
```



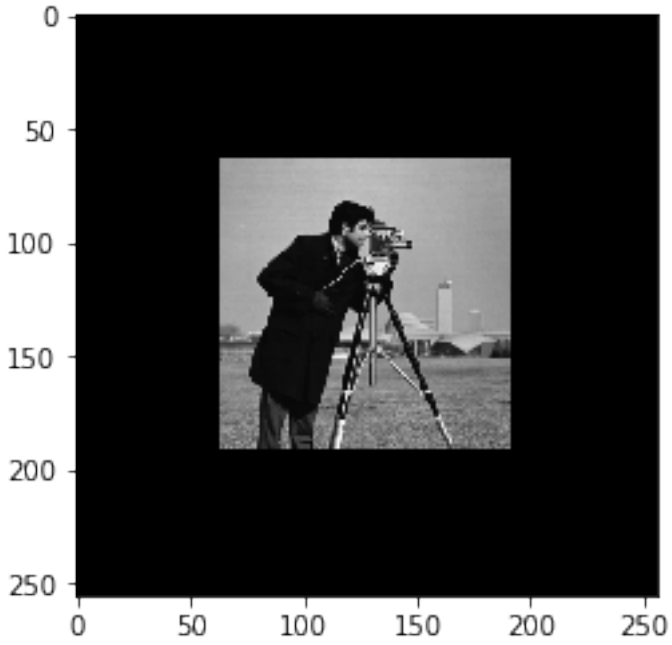

```
alpha =  [1. 2. 1.]
```



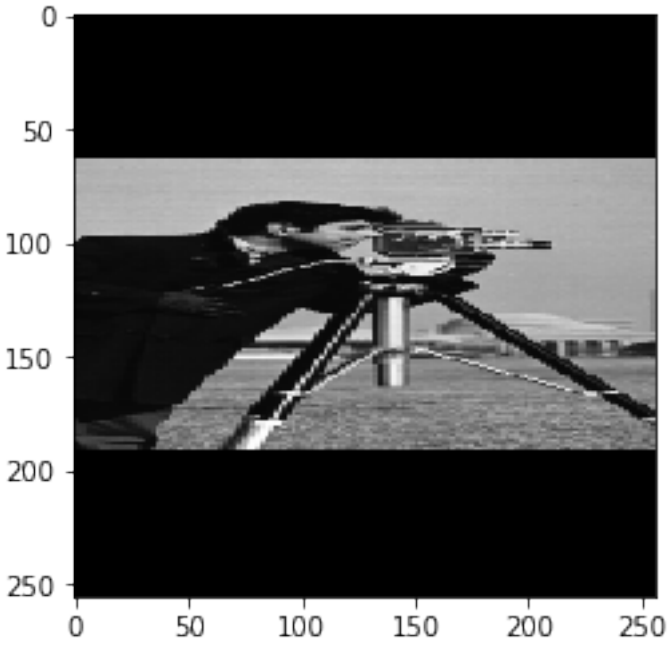

```
alpha =  [0.5 1.  1. ]
```



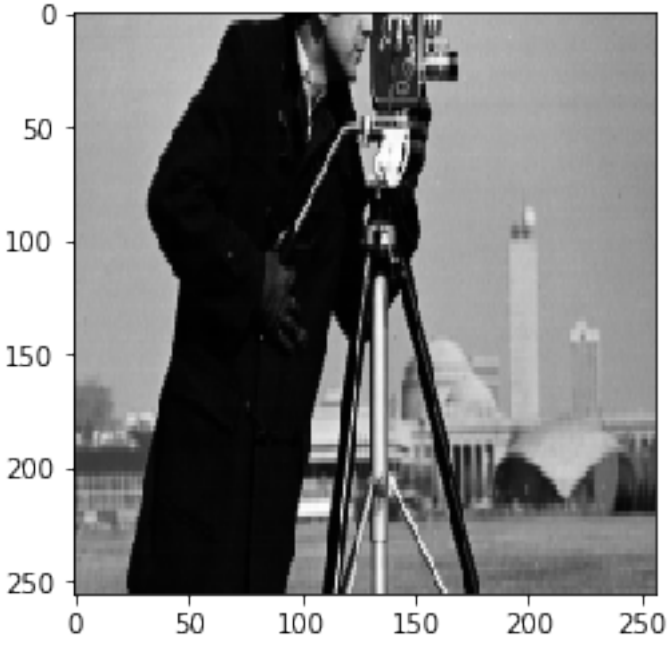

```
alpha =  [0.5 0.5 1. ]
```



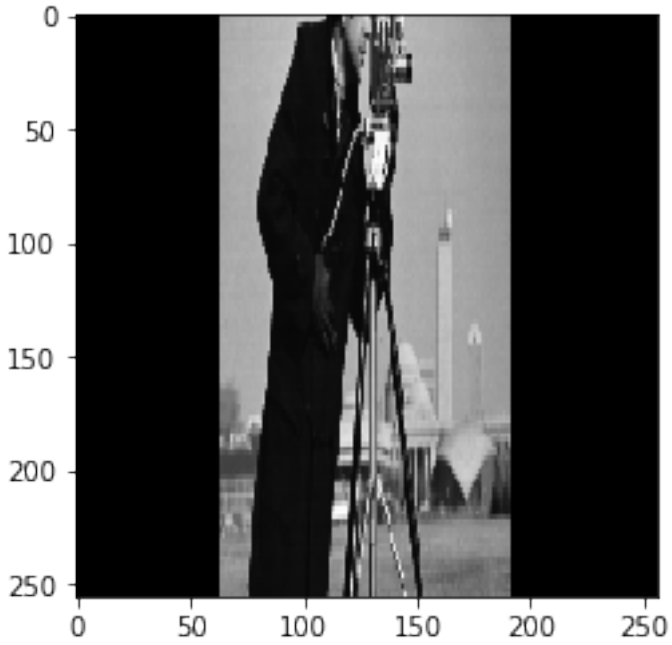

```
alpha =  [0.5 2.  1. ]
```



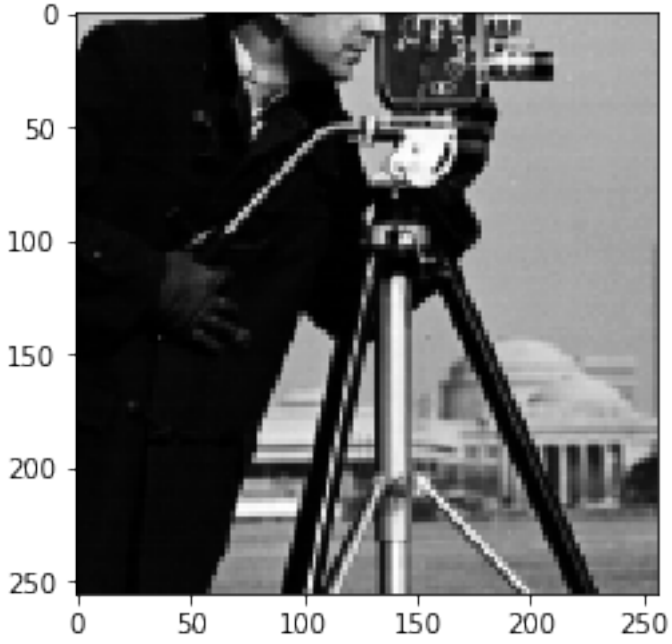

```
alpha =  [2. 1. 1.]
```




```
alpha =  [2.  0.5 1. ]
```


0
50
100
150
200
250
0
50
100
150
200
250

```
alpha =  [2. 2. 1.]
```


0
50
100
150
200
250
0
50
100
150
200
250

[ ]: