exercise1

December 4, 2016

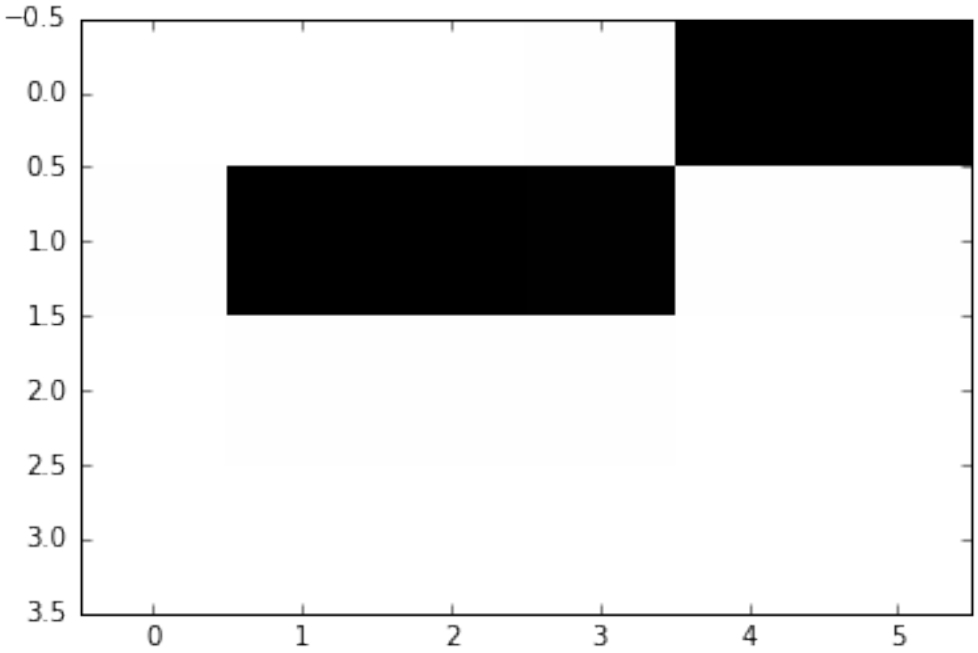
In [73]:
```
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
```

In [98]:
```
def F(x, y, x0, y0, x1, y1):
    return y*(x1-x0)+x*(y0-y1)+y1*x0-y0*x1

def Bresenham(x0, y0, x1, y1):
    image = np.ones((y1+1,x1+1))
    mirror = False
    if (y1-y0)>(x1-x0):
        mirror = True
        x0, x1, y0, y1 = y0, y1, x0, x1
        print("slope greater 1. So mirroring at diagonal.")

    y = y0
    d = F(x0+1, y0+0.5, x0, y0, x1, y1)

    for x in range(x0, x1+1):
        if mirror == True:
            print("Please set pixel", y, x)
            image[x,y]=0
        else:
            print("Please set pixel", x, y)
            image[y,x]=0
        print("d is", d)
        if d<0:
            y += 1
            d += x1-x0 + y0-y1
        else:
            d += y0-y1
    return image
```

For the first line that has $(x_0, y_0) = (1, 2)$ and $(x_1, y_1) = (5, 3)$

In [149]:
```
image = Bresenham(1,2,5,3)
plt.imshow(np.flipud(image), interpolation='none', cmap='gray');
print(np.flipud(image))
```

```
Please set pixel 1 2
d is 1.0
Please set pixel 2 2
d is 0.0
Please set pixel 3 2
d is -1.0
Please set pixel 4 3
d is 2.0
Please set pixel 5 3
d is 1.0
[[ 1.  1.  1.  1.  0.  0.]
 [ 1.  0.  0.  0.  1.  1.]
 [ 1.  1.  1.  1.  1.  1.]
 [ 1.  1.  1.  1.  1.  1.]]
```

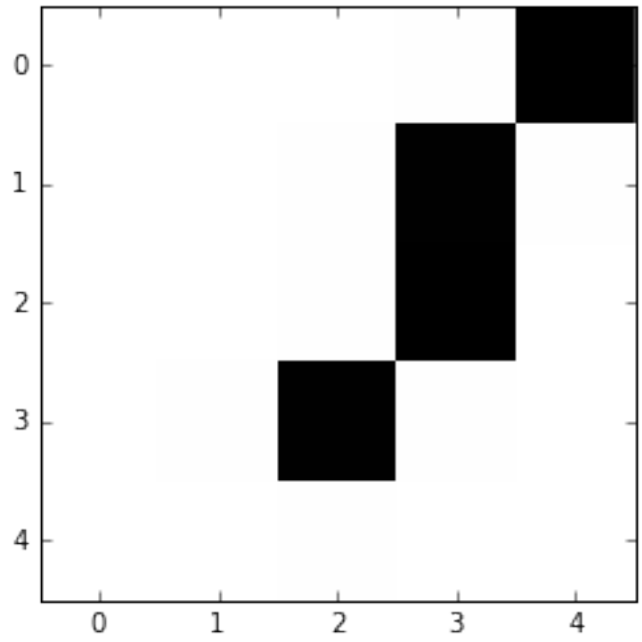


For the second that has $(x_0, y_0) = (2, 1)$ and $(x_1, y_1) = (4, 4)$

```
In [104]: image = Bresenham(2,1,4,4)
          plt.imshow(np.flipud(image), interpolation='none', cmap='gray');
          print(np.flipud(image))
```

```
slope greater 1. So mirroring at diagonal.
Please set pixel 2 1
d is -0.5
Please set pixel 3 2
d is 0.5
```

```
Please set pixel 3 3
d is -1.5
Please set pixel 4 4
d is -0.5
[[ 1.  1.  1.  1.  0.]
 [ 1.  1.  1.  0.  1.]
 [ 1.  1.  1.  0.  1.]
 [ 1.  1.  0.  1.  1.]
 [ 1.  1.  1.  1.  1.]]
```



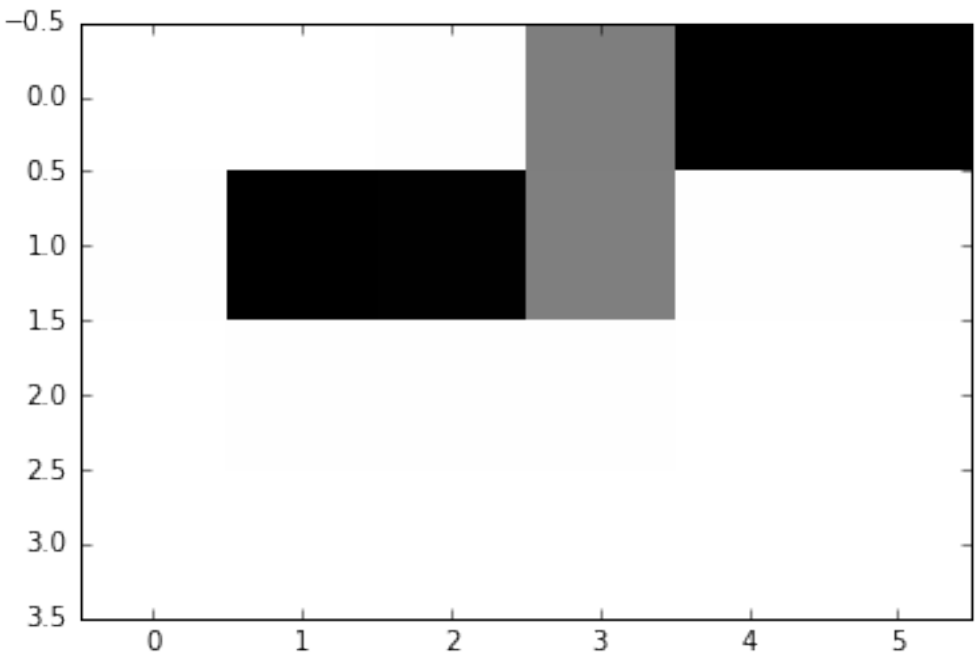

```
In [168]: def Bresenham_antialias(x0, y0, x1, y1):
              image = np.zeros((y1+1,x1+1))
              mirror = False
              if (y1-y0)>(x1-x0):
                  mirror = True
                  x0, x1, y0, y1 = y0, y1, x0, x1
                  print("slope greater 1. So mirroring at diagonal.")

              y = y0
              d = F(x0+1, y0+0.5, x0, y0, x1, y1)

              for x in range(x0, x1+1):
                  a = d/2
                  if x==x0 and y==y0:
                      if mirror == False:
```

```
            print("Please set {},{}".format(x,y))
            image[y,x]=1
        else:
            print("Please set {},{}".format(y,x))
            image[x,y]=1
    if x==x1:
        if mirror == False:
            print("Please set {},{}".format(x,y))
            image[y,x]=1
            image[y-1,x]=0
        else:
            print("Please set {},{}".format(y,x))
            image[x,y]=1
            image[x,y-1]=0
        break
    if d<0:
        if a >= -0.5:
            if mirror == True:
                print("Please set pixel1 {}, {} with {}".format(y,x+1
                image[x+1,y]=0.5+a
                print("Please set pixel2 {}, {} with {}".format(y+1,
                image[x+1,y+1]= 0.5-a
            else:
                print("Please set pixel1 {}, {} with {}".format(x+1,y
                image[y,x+1]=0.5+a
                print("Please set pixel2 {}, {} with {}".format(x+1,y
                image[y+1,x+1]= 0.5-a
        else:
            if a >= -0.5:
                if mirror == True:
                    print("Please set pixel1 {}, {} with {}".format(y
                    image[x+1,y+1]=1.5+a
                    print("Please set pixel2 {}, {} with {}".format(y
                    image[x+1,y+2]=-0.5-a
                else:
                    print("Please set pixel1 {}, {} with {}".format(x
                    image[y+1,x+1]=1.5+a
                    print("Please set pixel2 {}, {} with {}".format(x
                    image[y+2,x+1]=-0.5-a
        y += 1
        d += x1-x0 + y0-y1
    else:
        if a <= 0.5:
            if mirror == True:
                print("Please set pixel1 {}, {} with {}".format(y,x+1
                image[x+1,y]=0.5+a
                print("Please set pixel2 {}, {} with {}".format(y+1,
                image[x+1,y+1]=0.5-a
```

```
                    else:
                        print("Please set pixel1 {}, {} with {}".format(x+1,y
                        image[y,x+1]=0.5+a
                        print("Please set pixel2 {}, {} with {}".format(x+1,y
                        image[y+1,x+1]=0.5-a
                else:
                    if a >= -0.5:
                        if mirror == True:
                            print("Please set pixel1 {}, {} with {}".format(y
                            image[x+1,y]=1.5-a
                            print("Please set pixel2 {}, {} with {}".format(y
                            image[x+1,y-1]=-0.5+a
                        else:
                            print("Please set pixel1 {}, {} with {}".format(x
                            image[y,x+1]=1.5-a
                            print("Please set pixel2 {}, {} with {}".format(x
                            image[y-1,x+1]=-0.5+a
                    d += y0-y1
        return image
```

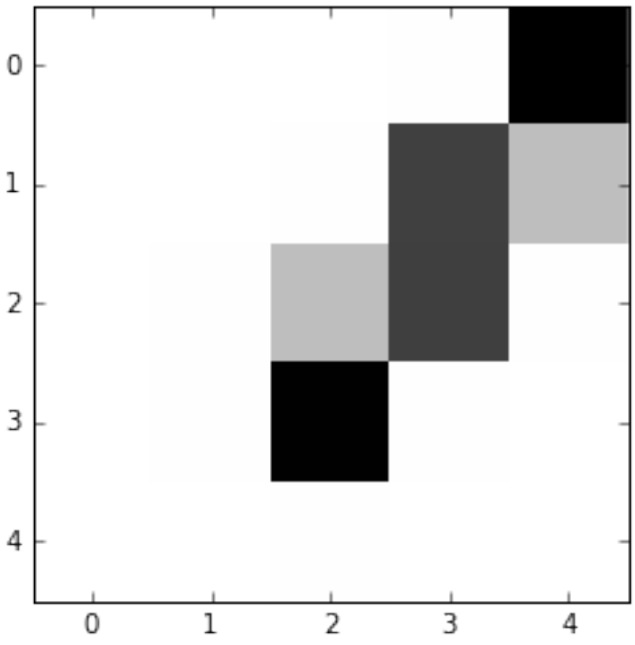
```
In [169]: image = Bresenham_antialias(1,2,5,3)
          plt.imshow(np.flipud(image), interpolation='none', cmap='gray_r');
          print(np.flipud(image))
```

```
Please set 1,2
Please set pixel1 2, 2 with 1.0
Please set pixel2 2, 3 with 0.0
Please set pixel1 3, 2 with 0.5
Please set pixel2 3, 3 with 0.5
Please set pixel1 4, 2 with 0.0
Please set pixel2 4, 3 with 1.0
Please set pixel1 5, 3 with 0.5
Please set pixel2 5, 2 with 0.5
Please set 5,3
[[ 0.   0.   0.   0.5  1.   1. ]
 [ 0.   1.   1.   0.5  0.   0. ]
 [ 0.   0.   0.   0.   0.   0. ]
 [ 0.   0.   0.   0.   0.   0. ]]
```




```
In [170]: image = Bresenham_antialias(2,1,4,4)
          plt.imshow(np.flipud(image), interpolation='none', cmap='gray_r');
          print(np.flipud(image))
```

```
slope greater 1. So mirroring at diagonal.
Please set 2,1
Please set pixel1 2, 2 with 0.25
Please set pixel2 3, 2 with 0.75
Please set pixel1 3, 3 with 0.75
Please set pixel2 4, 3 with 0.25
Please set 4,4
[[ 0.    0.    0.    0.    1.  ]
 [ 0.    0.    0.    0.75  0.25]
 [ 0.    0.    0.25  0.75  0.  ]
 [ 0.    0.    1.    0.    0.  ]
 [ 0.    0.    0.    0.    0.  ]]
```


0
1
2
3
4
0
1
2
3
4