midterm_hough_transform

September 26, 2019

```
In [1]: import numpy as np
        import pandas as pd
        import matplotlib.pyplot as plt
```

0.1 Problem Setup

```
In [2]: angles = np.arange(-90, 91, 15, dtype=np.float32) # * np.pi / 180

        intercepts = np.arange(-1, 8)

        points = [(0,0), (1,6), (2,4), (3,6), (4,8)]

        print "angles: ", angles
        print "intercepts: ", intercepts
        print "points: ", points
```

```
angles:  [-90. -75. -60. -45. -30. -15.   0.  15.  30.  45.  60.  75.  90.]
intercepts:  [-1  0  1  2  3  4  5  6  7]
points:  [(0, 0), (1, 6), (2, 4), (3, 6), (4, 8)]
```

0.2 Question b

```
In [3]: vote_table = np.zeros((len(angles), len(intercepts)), dtype=int)
        eps = 0.5
        angles_pi = angles * np.pi / 180

        # hough transform
        for i in xrange(len(angles_pi)):
            ang = angles_pi[i]
            for j in xrange(len(intercepts)):
                intercept = intercepts[j]
                for pt in points:
                    if abs(pt[0] * np.tan(ang) + intercept - pt[1]) < eps:
                        vote_table[i,j] = vote_table[i,j] + 1

        vote_table_df = pd.DataFrame(vote_table, index=angles, columns=intercepts)
        display(vote_table_df)
```

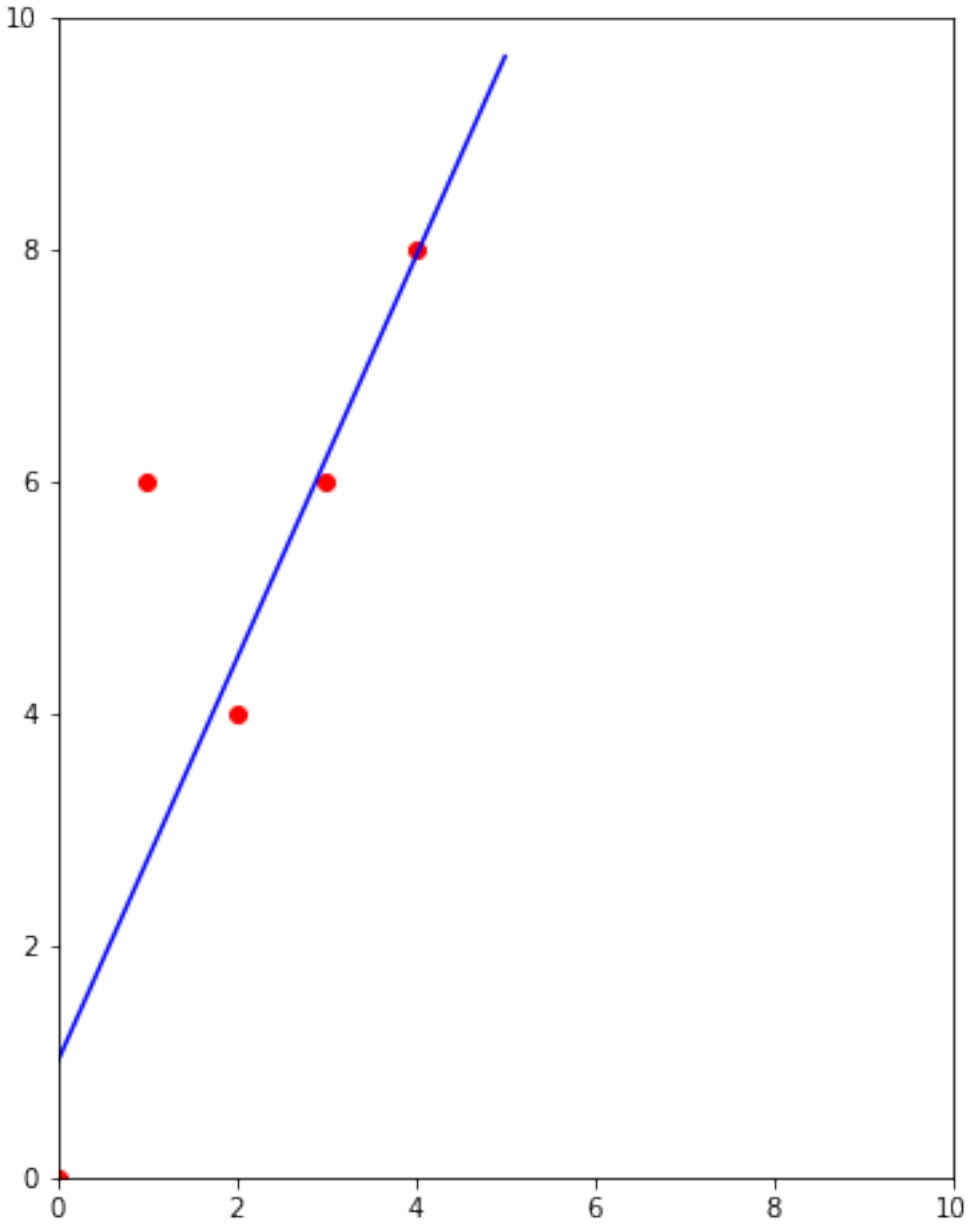
	-1	0	1	2	3	4	5	6	7
-90.0	0	1	0	0	0	0	0	0	0
-75.0	0	1	0	0	0	0	0	0	0
-60.0	0	1	0	0	0	0	0	0	1
-45.0	0	1	0	0	0	0	0	1	1
-30.0	0	1	0	0	0	0	1	0	1
-15.0	0	1	0	0	0	0	1	1	1
0.0	0	1	0	0	0	1	0	2	0
15.0	0	1	0	0	1	0	1	1	1
30.0	0	1	0	0	1	1	1	1	0
45.0	0	1	0	1	1	1	1	0	0
60.0	0	1	3	0	0	1	0	0	0
75.0	0	1	0	1	0	0	0	0	0
90.0	0	1	0	0	0	0	0	0	0

0.3 Question c

In [4]:
```
# draw points
plt.figure(figsize=(6,8))
points = np.array(points)
x = points[:,0]
y = points[:,1]
plt.plot(x, y, 'ro')
plt.axis([0, 10, 0, 10])

# draw Hough line
row = vote_table.argmax() / vote_table.shape[1]
col = vote_table.argmax() % vote_table.shape[1]
slope = np.tan(angles_pi[row])
intercept = intercepts[col]

x = np.arange(6)
y = slope * x + intercept
plt.plot(x, y, 'b')
plt.show()
```


10
8
6
4
2
0
0
2
4
6
8
10