

# circleRW

July 27, 2020

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[18]: import math as mt
import numpy as np
import matplotlib.pyplot as plt
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[24]: #circle perimeter and radius
n=10
r=n/2/mt.pi

#length of step
l=n/100

#number of step
num=100

#probability of walking clockwise
p=0.8

#orginal position
o=0
```

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[25]: #one step RW function, return the updated position(float)
def SimpleRW(o,p,l,n):
    step=np.random.choice(np.array([-1,1]),p=[1-p,p])
    return (step+o)%n
```

```
[26]: #plot Circle
def Circle(r):
    c1=np.linspace(-r,r,1000)
    c2=np.sqrt(r**2-c1**2)
    plt.plot(c1,c2,c1,-c2,c='b')

#Save pic function
def SavePlot(i):
    txt='{}.png'.format(i)
    plt.savefig(txt)
    return txt
```

```

#Get x and y
def GetXY(o,n,r):
    x=-r*mt.cos(o/n*2*mt.pi)
    y=r*mt.sin(o/n*2*mt.pi)
    return x,y

#plot position
def Position(x,y,r,i):
    Circle(r)
    plt.plot(x,y,marker='o',markerfacecolor='r')
    plt.title('Random Walk in a Circle\n (P(Walking clockwise)={})'.format(p))
    filename=SavePlot(i+1)
    plt.clf()
    return filename

```

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[27]: filenames=[]
      position=[]

      for i in range(num):
          o=SimpleRW(o,p,l,n)
          position.append(o)
          x,y=GetXY(o,n,r)
          filename=Position(x,y,r,i)
          filenames.append(filename)

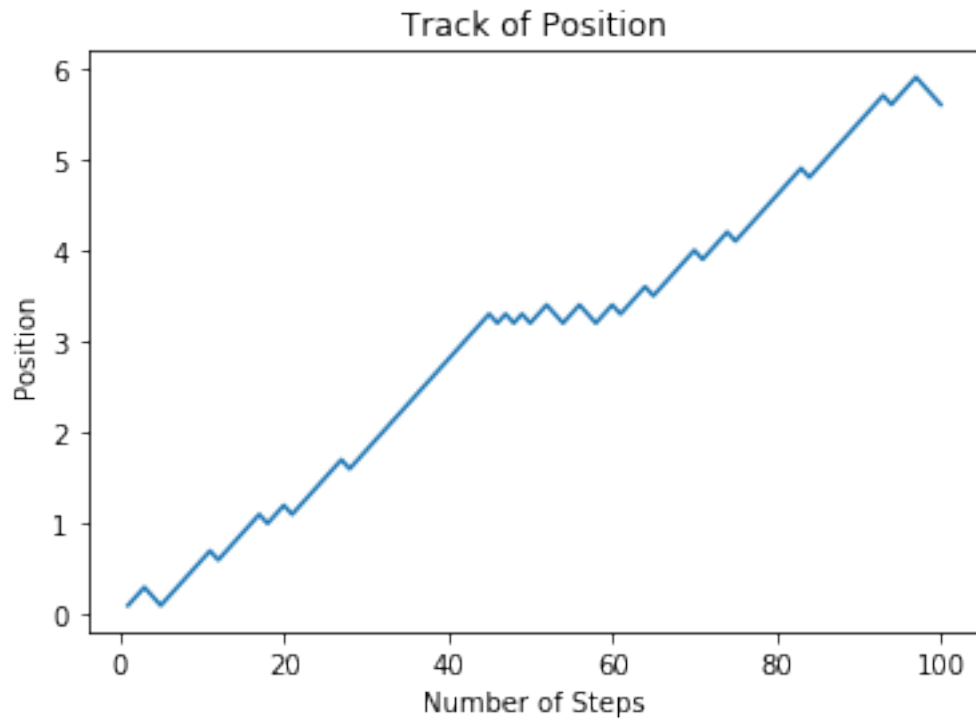
      plt.plot(np.linspace(1,num,num),position)
      plt.xlabel('Number of Steps')
      plt.ylabel('Position')
      plt.title('Track of Position')
      SavePlot('Track of Position')

```

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[27]: 'Track of Position.png'

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[28]: import imageio
      images=[]
      for filename in filenames:
          images.append(imageio.imread(filename))
      imageio.mimsave('final.gif',images)
```

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