**数据结构实验报告8**

**学号：117060400225 姓名**：池艳 **班级：应用统计学二班**

**指导老师：林卫中**

**实验名称**：科学计算和可视化

**实验要求：** （1）利用numpy对矩阵进行运算处理

（2）运用数据绘图库matplotlib进行坐标系绘制

（3）图像的手绘效果处理

**实验题目：科学计算和可视化**

**算法实现：**

**1. 方波绘制**

**import numpy as np**

**import matplotlib.pyplot as plt**

**def squareWave(x,n):**

**f = np.zeros((x.shape[0].))**

**k = 1**

**while k <= n:**

**f =  f + (8\*np.sin((2\*k-1)\*x)/((2\*k-1)\*np.pi))**

**k = k +1**

**return f**

**x = np.linspace(0.0,2\*np.pi,100)**

**y = squareWave(x,8)**

**plt.plot(x,y)**

**plt.show()**

**2. numpy库的使用（解方程Ax=b）**

**import numpy as np**

**from numpy.linalg import inv**

**A = np.array([[1,0.5,5],[2.3,2,3],[4,1,1.7]])**

**b = np.array([[1,2,3]])**

**c = np.transpose(b)**

**x = np.matmul(inv(A),np.transpose(b))**

**print(x)**

**3.绘制一幅人物肖像的手绘效果图**

**from PIL import Image**

**import numpy as np**

**vec\_el = np.pi/2.2**

**vec\_az = np.pi/4.**

**depth = 100.**

**im = Image.open("C:\\吴世勋.jpg").convert('L')**

**a = np.asarray(im).astype('float')**

**grad = np.gradient(a)**

**grad\_x,grad\_y = grad**

**grad\_x = grad\_x\*depth/100.**

**grad\_y = grad\_y\*depth/100.**

**dx = np.cos(vec\_el)\*np.cos(vec\_az)**

**dy = np.cos(vec\_el)\*np.cos(vec\_az)**

**dz = np.sin(vec\_el)**

**A = np.sqrt(grad\_x\*\*2 + grad\_y\*\*2 + 1.)**

**uni\_x = grad\_x/A**

**uni\_y = grad\_y/A**

**uni\_z = 1./A**

**a2 = 255\*(dx\*uni\_x + dy\*uni\_y + dz\*uni\_z)**

**a2 = a2.clip(0,255)**

**im2 = Image.fromarray(a2.astype('uint8'))**

**im2.save('吴世勋HandDraw,jpg')**

**4. matplotlib.pyplot库绘制相关函数**

**import matplotlib**

**import numpy as np**

**import matplotlib.pyplot as plt**

**np.random.seed(19680801)**

**mu = 100**

**sigma = 15**

**x = mu + sigma \* np.random.randn(437)**

**num\_bins = 50**

**fig, ax = plt.subplots()**

**n, bins, patches = ax.hist(x, num\_bins, density=1)**

**y = ((1 / (np.sqrt(2 \* np.pi) \* sigma)) \***

**np.exp(-0.5 \* (1 / sigma \* (bins - mu))\*\*2))**

**ax.plot(bins, y, '--')**

**ax.set\_xlabel('Smarts')**

**ax.set\_ylabel('Probability density')**

**ax.set\_title(r'Histogram of IQ: $\mu=100$, $\sigma=15$')**

**fig.tight\_layout()**

**plt.show()**

**实验结果：**





