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from PIL import Image
import numpy as np

a = np.asarray(Image.open('./beijing.jpg').convert('L')).astype('float')

depth = 10. # (0-100)
grad = np.gradient(a) #取图像灰度的梯度值
grad_x, grad_y = grad #分别取横纵图像梯度值
grad_x = grad_x*depth/100.
grad_y = grad_y*depth/100.
A = np.sqrt(grad_x**2 + grad_y**2 + 1.)
uni_x = grad_x/A
uni_y = grad_y/A
uni_z = 1./A

vec_el = np.pi/2.2 # 光源的俯视角度，弧度值
vec_az = np.pi/4. # 光源的方位角度，弧度值
dx = np.cos(vec_el)*np.cos(vec_az) #光源对x 轴的影响
dy = np.cos(vec_el)*np.sin(vec_az) #光源对y 轴的影响
dz = np.sin(vec_el) #光源对z 轴的影响

b = 255*(dx*uni_x + dy*uni_y + dz*uni_z) #光源归一化
b = b.clip(0,255)

im = Image.fromarray(b.astype('uint8')) #重构图像
im.save('./beijingHD.jpg')

```