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import numpy as np

def noise(noise_typ, image):
    if noise_typ == "gauss":
        row, col = image.shape
        mean = 0
        var = 0.002
        sigma = var ** 0.5
        gauss = np.random.normal(mean, sigma, (row, col))
        gauss = gauss.reshape(row, col)
        noisy = image + gauss
        return noisy
    elif noise_typ == "s&p":
        row, col = image.shape
        s_vs_p = 0.5
        amount = 0.01
        out = np.copy(image)
        # Salt mode
        num_salt = np.ceil(amount * image.size * s_vs_p)
        coords = [np.random.randint(0, i - 1, int(num_salt))
                   for i in image.shape]
        out[tuple(coords)] = 1

        # Pepper mode
        num_pepper = np.ceil(amount * image.size * (1. - s_vs_p))
        coords = [np.random.randint(0, i - 1, int(num_pepper))
                   for i in image.shape]
        out[tuple(coords)] = 0
        return out
    elif noise_typ == "poisson":
        vals = len(np.unique(image))
        vals = 2 ** np.ceil(np.log2(vals))
        noisy = np.random.poisson(image * vals) / float(vals)
        return noisy

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