Dynamical Systems
Homework Ten
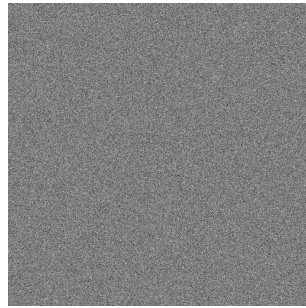**Due February ♡, 2013**

Figure 1: Otto A gray-scale image made from Gaussian Noise. Figure source: `http://en.` `wikipedia.org/wiki/File:Image_gaussian_noise_example.png`.

There are some programming subtleties that we'll encounter as we do these, and possibly some conceptual subtleties as well. I would recommend starting with the logistic equation problem before going on to the

1. Let's see what happens when we add a tiny bit of noise to the logistic equation. There are several ways to implement this, but one would be to add a small amount of Gaussian noise to x at each timestep. The noise should have a zero mean and a standard deviation of σ, where is something you can experiment with. A larger σ means a noisier noise. What happens to the bifurcation diagram?

2. Another way to add noise the logistic equation would be to have r be fluctuating. What happens to the bifurcation diagram? Is it similar to what happens when you add noise directly to x?

3. Add noise to the Lorenz equations. The variables and/or the parameters could be noisy. It is not clear to me what the most sensible way is to implement this. So let's experiment. I will experiment some and will post additional suggestions.