Shane Hoversten
Diana S. Dabby: Musical variations

A chaotic process is, generally speaking, a deterministic process in which variation in the initial conditions lead to unpredictable variation as the process evolves. Some sorts of chaotic processes, such as the Lorenz attractors described in this paper, have attractive properties: while the variations, based on initial conditions, are unpredictable, they are nonetheless constrained to certain regions. This means that the outputs of two chaotic attractive processes will have the same general shape. For the Lorenz, this is the well-known butterfly shape.

Dabby uses this chaotic property to good effect. The idea is to take a piece of music and use it as source material to make a new piece of music that is similar to, but different from, the original. There are, of course, a huge number of ways this could potentially be done, and in fact other techniques are better known for doing the same thing. Analyzing a corpus of music using a stochastic model, like an HMM, and then using that model in generative fashion also produces music that is similar to the source model. The major difference between the two, probably, is that the music produced by the chaotic generator (at least the one described in this paper) is a much closer approximation than the music an HMM would produce. This is because the chaotic model uses the original songs as a base and then departs from them in incremental fashion while continually being "attracted" back to the original. The HMM, on the other hand, produces chunks of music from pure statistics harvested with only a limited sense of history, and generally over a corpus larger than one single song. Still, this is a simple characterization; it would be interesting to compare the two methods more directly.

Coming back to the idea of "similar, but different" we find ourselves faced with the same problem we've encountered every time we explore a new music generation technique, which is: how exactly is the problem domain to be constrained to produce the best results? A piece of music could potentially be similar in pacing, in theme, in pitch, in pattern, in instrumentation, etc. Moreover, one could reasonably invent a variety of similarity metrics for each of these circumstances. Enumerating the full range of possibilities consequently drops us in a very high dimensional space.

Dabby's solution to this problem is both simple and elegant: she takes the pitches of the original piece and maps them onto a scale of values produced by the chaotic process begun at some initial point. Then, starting from another initial point, she takes the output of the process, and selects from the original scale the pitch corresponding to the first value the new value exceeds. Since the two chaotic processes will differ slightly at unpredictable points, yet remain quite close to each other generally, the music produced by this technique will be different in parts (but not too different) yet similar in the whole.

The domain of the derivative work Dabby chooses is pitch variation. This has two very nice implications. The first is that the particular form (the type of notes used: quarter, sixteenth, etc.) of the original piece is preserved; since weird constructions in this aspect of music can be especially discordant (at least to my ears) Dabby ensures that the derived

works will be reasonable. Further, since the pitch selection of the derived work comes exclusively from the pitch catalog of the original work, the general "mood" of the derived work will likely be compatible. This is precisely what one hopes for in a derivative work: something new, but still recognizably the original.

Dabby describes her results on a number of original pieces; I lack the expertise to evaluate these, but judging from the samples we heard in class the technique seems an especially powerful one, especially when viewed from the perspective Dabby describes. She suggests that while the method is capable of producing complete works, it is probably better used by a human composer as a resource for creative ideas, a point of departure. As she says: "Though the method will not flatter fools, it can lead explorers into landscapes where, amidst the familiar, variations and mutation allow wild things to grow."

I found this paper incredibly inspiring, and the chaotic attractors a powerful idea with broad potential for application for making derived works. This is important, since all of art is derivative. It's difficult even to imagine music that lacks the accrued historical weight of the last five hundred years. Of course, such music exists, but even that music comes out of its own tradition, a tradition without which it's impossible to make sense of the modern piece. But it's not just music – every sort of art is just one sample point in a much longer conversation leading back and disappearing into the haze of prehistory.

Viewed this way, a system for thinking about similarity and variation is an incredibly powerful thing. Dabby's formulation would seem to hold promise for any sort of art that can be rigorously and concretely described. Music, with its discrete catalog of notes and pitches, lends itself especially well to this process, but one could imagine using a similar technique for fiction: come up with a catalog of fictional atoms, or fictional chunks, and a base-story described as an atomic sequence of this kind. Plug it into the chaotic attractor, and bam! A new spin on an old process. One gets the feeling that certain authors have internalized Dabby's technique without knowing it, considering the dizzying number of cat books, crappy detective novels, and dime-store horror that lines the shelves. In the wild these works are usually maligned, as I am now maligning them, and rightly so: their thousand variations on the same theme offer little insight to the reader. But that doesn't mean it need be so; the best and the worst are not any less derivative of some original prototype, they're just differently derived.

Actually, I'm not sure I totally believe that. But I mostly believe it, and Dabby's paper is an inspiring invitation to figure out exactly how much.