GENERATIVE ART
Politecnico di Milano 12- 14 Dic. 2007

ARTISTIC PERIODS (UNTIL CHAOS)

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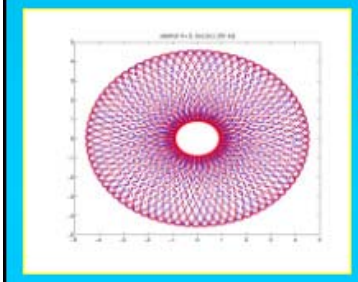
Periodicity has always enchanted mankind. For example, this medieval picture represents an ancient cyclic idea of time, originated by observation of natural phenomena. Afterwards, time was supposed to have had a starting point (linear and progressive concept), but periodic phenomena survived in this view as well.
One of the basic results of our science is still that we can superimpose linear periodic motions (Fourier series).
At the present, periodicity of nonlinear motions (in particular their mysterious composition, definitely different from superimposition) is a subject of deep research efforts from several scientific points of view. Here, our point of view is that of Mathematicians, who use computer programs to compute non continuous approximations of continuous motions, i.e. **numerical discrete approximations.**

However, the realm of discrete world is much **more complex and richer** than the one of continuous world and small perturbations (such as those due to numerical rounding approximations) can cause spectacular variations.
But we hold the trump card too, in order to reduce complexity: we can make the discrete approximation tend to the continuous motion. Unfortunately, from an aesthetic point of view, this process turns out to be often awful and even blameworthy. Indeed, figures, which we want to smooth , exhibit sometimes uncommon beauty. We look as if we commit an aesthetic crime, when we make such figures more regular and so close to the continuous phenomenon.

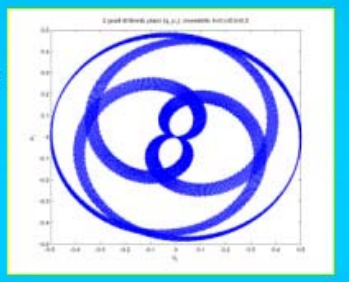


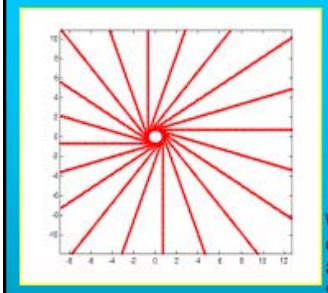
On the left: **crystal plate or crochet doily?**

Actually, the composition of just two rotations, where nobody would recognize the original problem, which is the motion of an electron in a magnetic field.

On the right: **post- modern knots?**

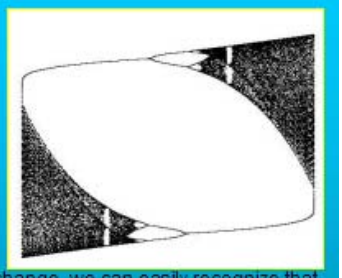
Actually projections on the velocity plane of a discrete Planetary orbits (Kepler motion).



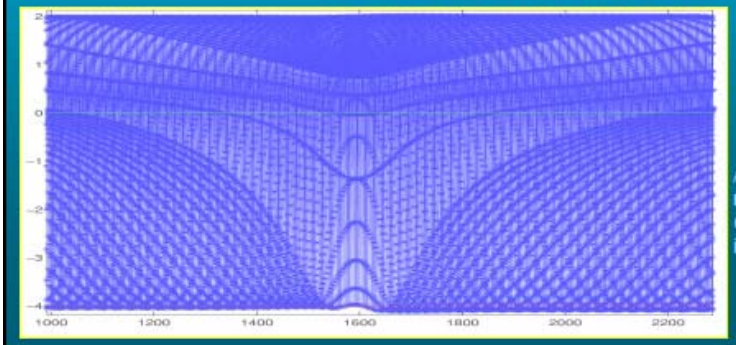


On the left: **oriental sunbeams?**

On the right: **too much is too much indeed**



When an infinite number of periods coexist, their nonlinear composition entails chaos. But it generates figures too, which are appreciated for their complex beauty. In this numerical simulation of the last century behavior of Wall Street Stock Exchange, we can easily recognize that the two areas (representing bifurcations in Bull period and Bear period, respectively), where such behavior is unpredictable, are connected by simple lines, where such behavior is easily predictable. Less periods would be preferable from stockjobber point of view, not from the aesthetical one.



On the left:**sinuous forms?**
(Honni soit qui mal y pense)

Actually, the figure shows orbits of a **quasi-periodic motion** with many energy levels very close together. Going from one level to the closest one, orbits combine in such a way to build a figure with 3-D effects.