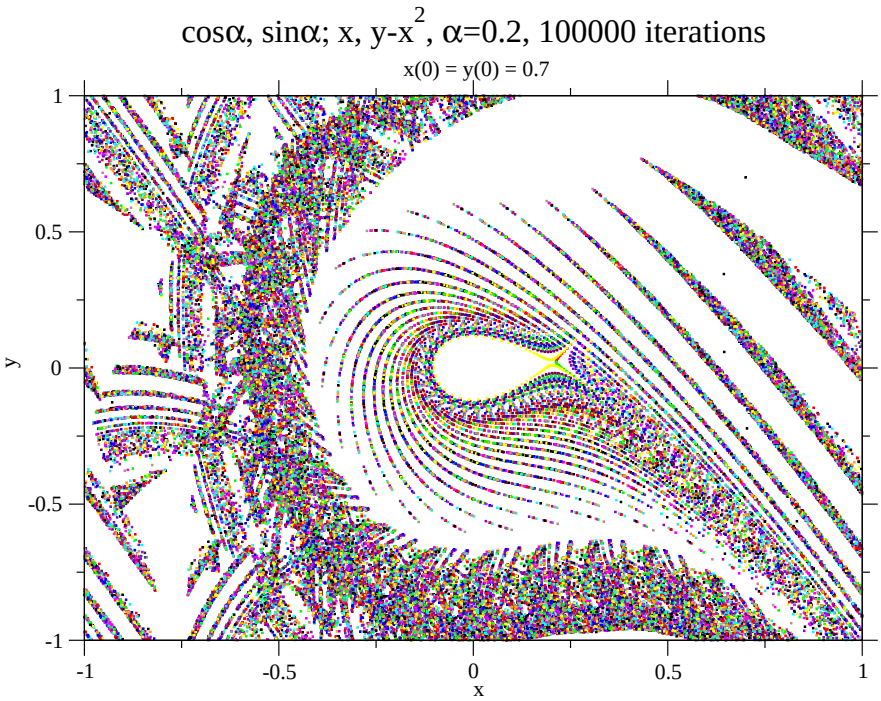
SUGGESTED PROJECTS IN THE CHAOS COURSE SPRING 2013

The project is a compulsory part of the course and corresponds to 1.5 hp. You are suggested to work in groups of two persons, but in special cases you can work alone. The project shall be presented in a written report - there is no oral presentation. Only two kinds of marks are given on the project part: passed or not passed.

You are welcome to suggest your own project or choose one from the list below. The responsible person is identified as: S (Sven Åberg), G (Gunnar Ohlén) and I (Ingemar Ragnarsson).

Sign up with Gunnar for a project as soon as possible - a project can in general be performed by one group only.

1. Set up and solve a simple model for propagation of fire in a forest (S)
2. How is crystal growth changed under a strong voltage? (S)
3. Compose fractal music! (S)
4. What is the time to cross Mårtenstorget on a Saturday? (S)
5. Study basin of attractors for zeroths of the complex function, $z^n - 1 = 0$, solved by Newton-Raphson method. (S)
6. Study the onset of chaos on a pool table. Assume point-like balls. (S)
7. Study the onset of chaos and diffusive behavior of the "kicked rotor". (S)
8. Simulate earth quakes. (G)
9. Calculate bifurcations and compare with Feigenbaum numbers. (G)
10. Study basin of attraction for an oscillating system in a double well. (G)
11. Chaotic behavior of the weather - study of literature and internet. (G)
12. Multifractals. (S)
13. Analyze one of the models in the 'kompendium' by making a more detailed simulation combined with literature study. (I)
14. When the map of Eq. (6.47) in the kompendium is iterated, the standard structure is that new stable islands show up when parts of the phase portrait is enlarged. For some initial values, howevr, structures like that on the next page show up. Try to analyze how such a structure is formed, for which vales of the input parameters, periodicity etc. Will you find some other unusual structures?


cosα, sinα; x, y-x^2, α=0.2, 100000 iterations
x(0) = y(0) = 0.7
1
0.5
0
-0.5
-1
y
-1
-0.5
0
0.5
1
x

Figur 1: