

AnT 4.669

Release 2a

Demos

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1 Introduction

This document describes the pre-implemented demos, which show some of the features of the **AnT** package.

2 System requirements

For starting the demos please make sure, that **AnT** is installed on your system. If **AnT** is not installed, please do it according to the Installation Manual. Additionally, the demos require the visualization tool **gnuplot**. This tool is available on most UNIX platforms. In order to compile the system function, you need the **GNU Make** utility and the **GNU C++** compiler (**g++**). The **Make** utility will be also used for starting the demos.

3 How to start the demos

By unpacking the tar-archive, the directory **AnT-demos** will be created. This contains two subdirectories, **systems** and **scripts**. Please go into the subdirectory **systems**. You will find here a lot of subdirectories (like **logistic**, **roessler**, **pll**, etc.), containing demos for several dynamical systems. Please choose a dynamical system (for instance, **logistic**) and go into the corresponding subdirectory. Here you will find a **.cpp** file containing the implementation of the system and a **Makefile**. Concerning the implementation, please see the Reference Manual, Part II. Now you have to call the **Make** utility (typing **make** or **gmake** depending on your UNIX platform) and the **.cpp** file will be compiled using the provided **Makefile**. As a result, a library (say, **logistic.so**) containing the system function will be created.

After the system function is compiled, you can go into the subdirectories containing the demos (like **demo01**, **demo02**, etc.). Here you can start the corresponding demo by calling the **Make** utility again. This will start the **AnT** simulator using the system function library from the parent directory (say, **../logistic.so**) and the initialization file from the current directory (say, **./logistic.ini**). Subsequently, **gnuplot** will be started with the script file **demo.plt** in order to visualize the data files produced by **AnT**. The resulting diagrams will be shown on screen and additionally saved in two formats: **.png** (Portable Network Graphics) and **.ps** (Postscript). You will find these files in the subdirectories (**./ps** and **./png**).

Finally, you can remove the generated files by calling the **Make** utility with the **clean** target (typing `make clean` or `gmake clean`). Note, that the diagrams will be removed also. The same instruction called in the parent directory will remove the system function library.

4 Demos overview

Following demos are available:

4.1 Logistic map

- **demo01**
Calculation of the trajectory of the logistic map for a fixed parameter value $\alpha = 3.9$. The invariant measure of the attractor is shown. Lyapunov exponent and some other measures of the attractor are calculated. Run of this demo take a few minutes.
- **demo02**
Investigation of the logistic map for the parameter interval $2.9 < \alpha < 4$. Bifurcation diagrams, period diagrams, parameter intervals leading to attractors with some given periods, Lyapunov exponent, fractal dimension, wave number diagram, etc. will be calculated. Note, that this demo may take some time.

4.2 Henon map

- **demo01**
Calculation of trajectories of the Henon system for three parameter values $a = 1.308$, $a = 1.309$ and $a = 1.33$ (with $b = 0.3$). For all these parameter values the system shows a chaotic dynamics. In the first case the attractor consists of seven chaotic bands, another two attractors are one-band attractors. The attractors and their invariant measures are visualized.
- **demo02**
Investigation of the Henon map for the parameter interval $0 < a < 1.4$. Bifurcation diagrams, period diagrams, parameter intervals leading to attractors with some given periods, Lyapunov exponent, fractal dimension, wave number diagram, etc. will be calculated. Note, that this demo may take some time.

4.3 Duffing map

- demo01

Calculation of trajectories of the Duffing map for two parameter values $a = 2.7$ and $a = 2.75$ (with $b = 0.2$). For $a = 2.7$ the coexistence of two attractors is shown. For $a = 2.75$ (after a global bifurcation, where the coexisting attractors merge with each other) a single attractor exists. Time series, phase portraits and invariant measure of the attractors are presented.

4.4 Rössler system

- demo01 Calculation of trajectories of the Rössler system. Time series are shown.
- demo02 Calculation of trajectories of the Rössler system. Different kinds of phase portraits are shown.

4.5 Phase locked loop

- demo01 ... demo11

Calculation of trajectories of the phase locked loop system. Shown are the phase portraits for several parameter values. Dependent on the parameter value the coexisting attractors, a period doubling cascade, chaotic one-band and three-band attractors are shown.