Dynamical and creative Mathematics using ICT

Poster prepared by Vladimir Georgiev and based on the Comenius project with site

http://www.dynamathmat.eu/

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In the last few decades the nature of mathematics and its evolution over time are influenced by the new technologies. Future and in-service teachers need some concrete examples, hints and good practices how to apply dynamical ICT and in the same time to develop effectively the dynamical thinking, reasoning and creativity of their pupils.

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We follow two approaches:

a) show how the use of ICT can develop the visualization process,

b) show how to make visual reasoning an acceptable practice in math education in combination with algebraic reasoning.

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Example 1: GPS-geometry in the landscape. More and more cars are equipped with GPS, and sometimes it seems that the good old map-reading is on the recline. But you can do something else with your GPS device.

In Copenhagen you find the fortress Kastellet

There is public access to the fortress and the pathways around and it is a popular place for jogging. On the trips one can track the route with Garmin etrex VISTA HCx GPS(for example) and after uploading to Google Earth this star shaped geometrical object appeared as follows

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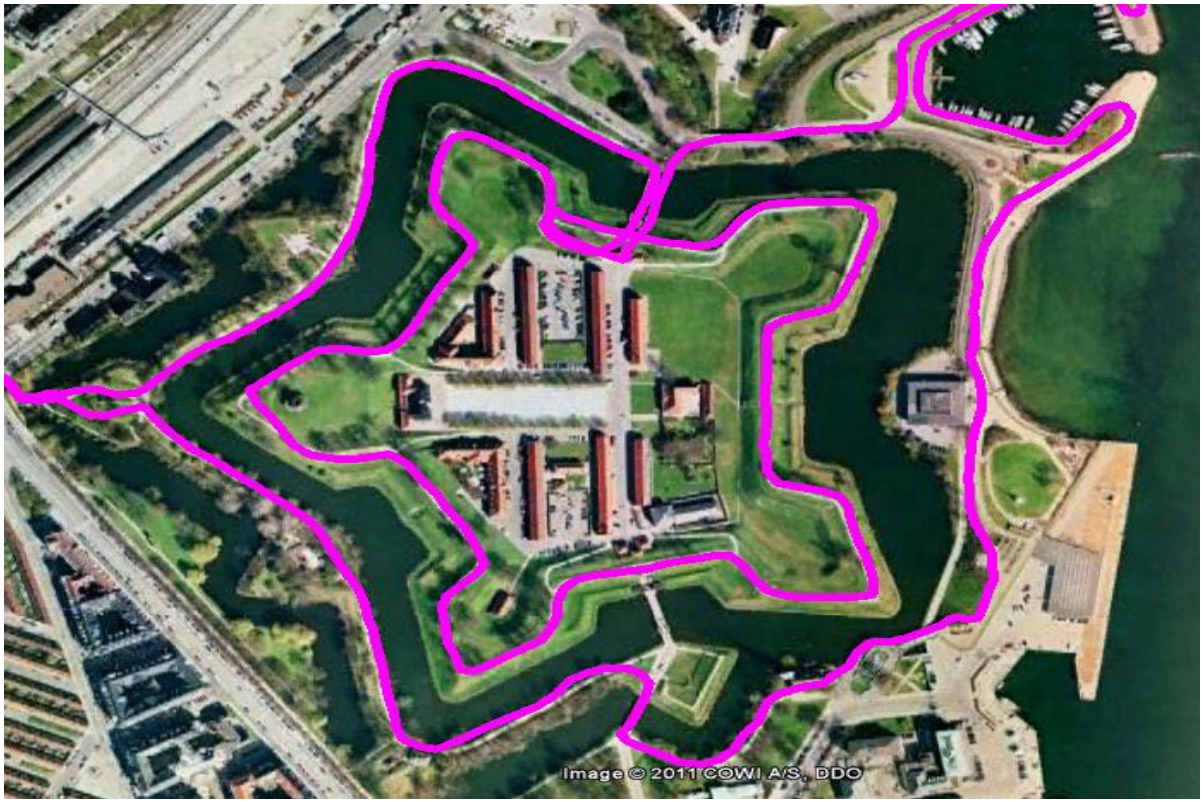

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You can follow already made pathways in the landscape and track them with GPS and study the shapes. But what about the other way round: You start with some geometrical shape and then you plan a trip that will produce this shape on your GPS-device and on Google Earth.

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Example 2: Can Equations Be Exciting?

Nowadays computer generated fractal patterns can be seen everywhere, from squiggly designs on computer art posters to illustrations in serious scientific journals. Interest continues to grow among scientists and, rather surprisingly, artists and designers.

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Consider a two-species predator-prey discrete model in which one species preys on another. Examples in the nature include sharks and fish, lynx and snow-shoe hares, ladybirds and aphids, wolves and rabbits.

The equations have the form

$$x_{n+1} = a + b\,x_n + B_1(x_n, y_n)$$

$$y_{n+1} = c + d\,y_n + B_2(x_n, y_n)$$

Where *a,b,c,d* are constants, while B_1, B_2 are quadratic functions.

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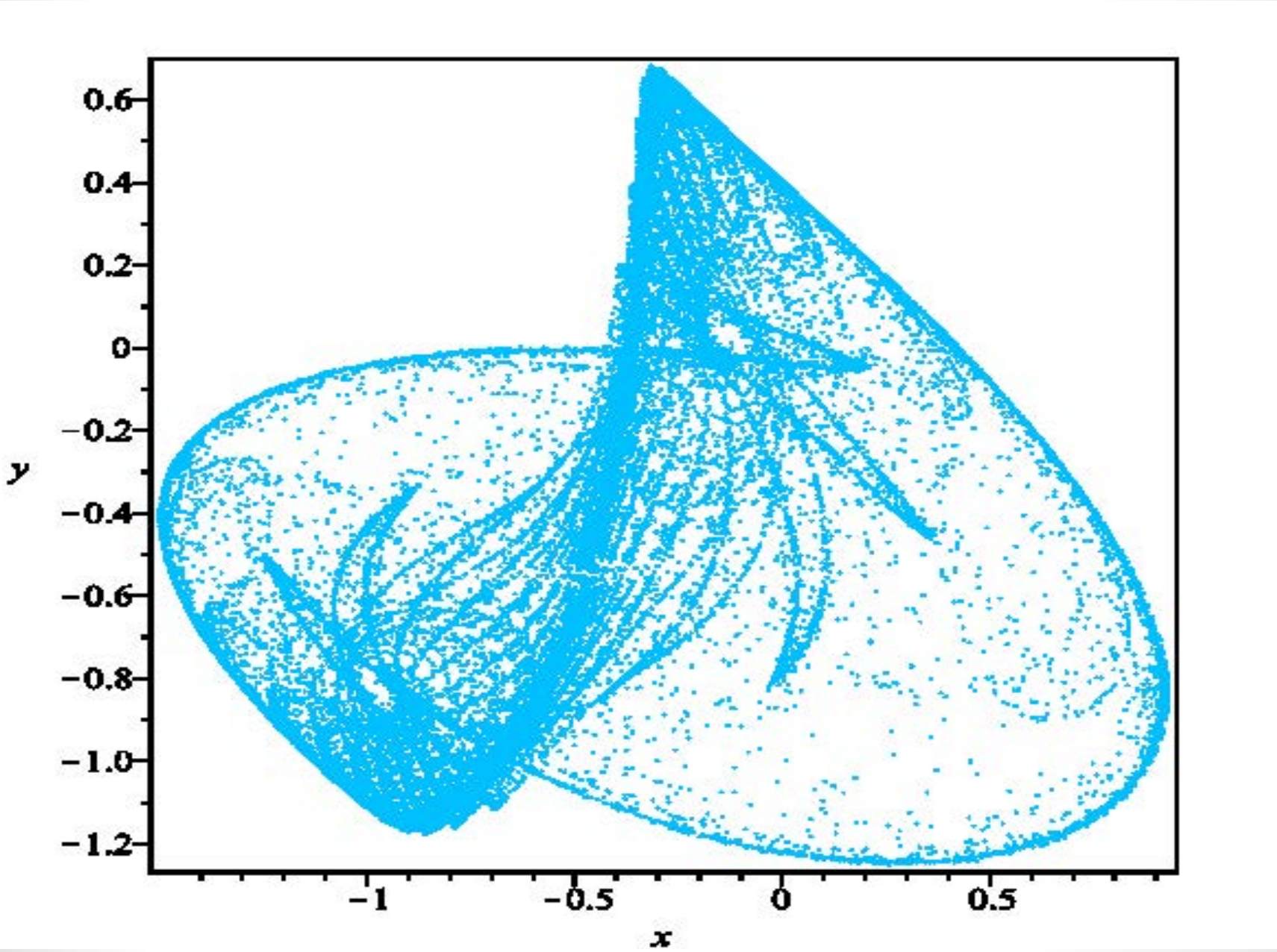
The solution images could not be seen in their full glory without computers and computer technologies and this is one of the greatest gifts of the 21-st century. It is not in vain that some fractals were regarded as exceptional objects, as counter examples, as "mathematical monsters" during 19-th century.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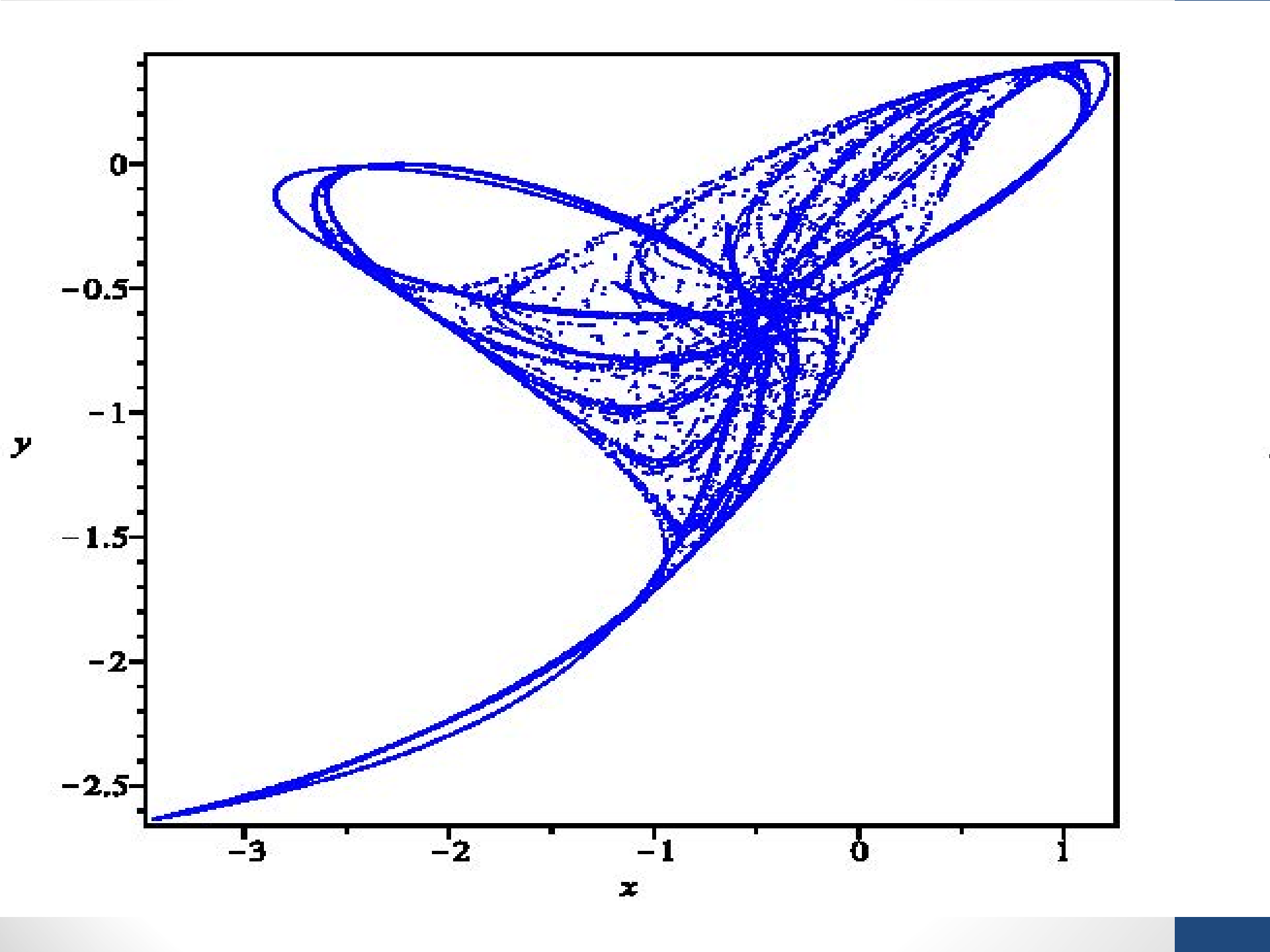
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Other didactic materials can be found in the homepage of the project.

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