

Programming (FEB22012X)

7. Exercise

Deadline for submission: **2013-10-18 23:59 CET**
Note the non-standard submission deadline (Friday)!

Instructions

This week we will compute membership in the mandelbrot set and visualize it. Mandelbrot set is the most well-known fractal set. It is defined as the set of numbers c in the complex plane (i.e. plane with the real- and imaginary parts of complex numbers) for which the absolute value of applying infinitely the iteration

$$z_{n+1} = z_n^2 + c,$$

starting with $z_1 = 0$, remains bounded. For more information on the Mandelbrot set, see http://en.wikipedia.org/wiki/Mandelbrot_set.

Exercise

Implement a 2-d visualization of the Mandelbrot set with a resolution of 500 x 500 evaluation points so, that the x-axis is the real component of the complex number within the range $[-2.1, 0.6]$, and the y-axis its imaginary component within the range $[-1.1, 1.1]$. That is, you should have two nested for-loops so, that in the inner loop you compute the membership for the given coordinate.

For each pixel in the resulting graph, iterate up to 100 times starting from $z_1 = \text{complex}(x, y)$. The iteration should stop when the absolute value of z_n has exceeded 2. Now, for each point in the plot, store the minimum $n \in \{1, \dots, 100\}$ required for $|z_n| > 2$, or 101 in case the series is bounded. Plot the membership values (the evaluated coordinate belongs to the set if, for $n \in 1, \dots, 100$, $|z_n| \leq 2$) with `imagecs`, which automatically chooses a colormap according to the range of the values to plot.