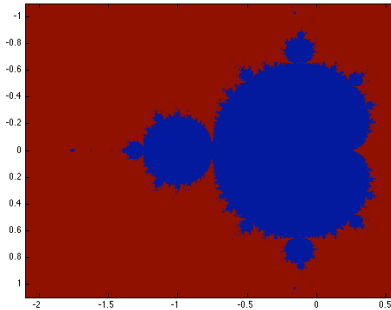


## Computer Lab Assignment 2

# Mandelbrot Set

*This lab is focused on the Mandelbrot set that was discussed in the lecture. The goal is to produce this image and to understand the algorithm for its generation:*



(1) Since the more Matlab instructions are needed and we do not want to retype them each time, we put them into a script file e.g. “example.m”. The extension “.m” labels it as a Matlab file. Please download the file “example.m” from bSpace and put in your ~/MATLAB directory.

Now execute the “example.m” script by typing “example” in your command window. Now open “example.m” in the Matlab editor. Do you recognize the commands that were just executed?

Now add some commands of your choice to “example.m”, save the file (!), and execute this script again. Did Matlab execute your additional commands correctly?

To execute all the commands in the script file, type “example” in the command window. Matlab will then look for “example.m” in your ~/MATLAB directory and execute the instructions it contains.

(2) Please download the file “mandelbrot14.m” from bSpace, open it in the editor, and read through it.

Each point in the  $(x,y)$  plane corresponds to a complex number  $c=x + Iy$  that enter the iteration formula  $z_{n+1} = (z_n)^2 + c$ . Please add two lines of code to map the indices ‘i’ and ‘j’ onto x and y intervals:

```

##### map the index 'i' onto the interval [xmin,xmax]
##### i=1      must yield 'xmin'
##### i=nPoints must yield 'xmax'
x(i) = % add line here

##### map the index 'j' onto the interval [ymin,ymax]
##### j=1      must yield 'ymin'
##### j=nPoints must yield 'ymax'
y(j) = % add line here

```

Scroll down and look at the actual iteration loop over ‘n’. Enter the iteration formula after “z=”.

- (3) Now run the script and see what graphics you. Increase the resolution 'nPoints' step by step until you are satisfied with the image quality.
- (4) The iteration stops if the modulus of  $z$  has exceeded the value of  $z_{\max}$ . In this case  $Z(j,i)$  is set to 1. Let us now set it to 'n' as a measure of how long it took for the series to diverge. Rerun the script. Does it look more appealing now?
- (5) Now zoom into the interval  $-0.8 < x < -0.7$  and  $0.05 < y < 0.15$  and run the code again. Now increase the number of iteration "it\_max" first to 75 and later to 100. What change do you see in the resulting image?
- (6) Now zoom in further two more times and get lost in the neverworld of fractals. What was the most beautiful image you obtained?