The Mandelbrot Set

Neill Warrington
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Introduction

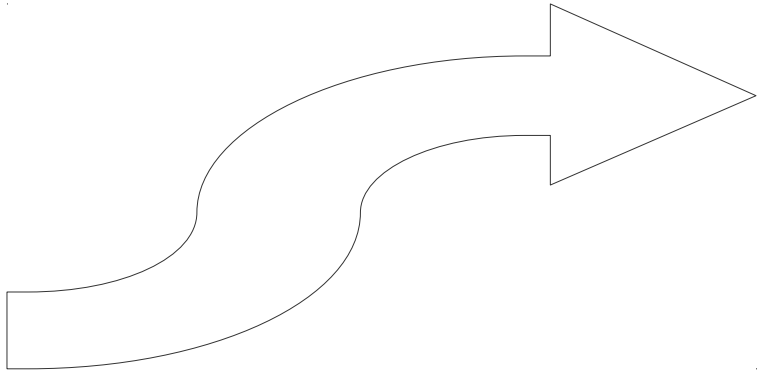
What is the Mandelbrot Set?

$$M=\{c\in\mathbb{C},\ \forall\, n\geq N,\ |P_c^n|\leq s\}$$

where,

$$c=a+bi$$

$$P(0):z\to z^2+c$$



$$z_0=c$$

$$z_1=c^2+c=z_0^2+c$$

$$z_2=(c^2+c)^2+c=z_1^2+c$$

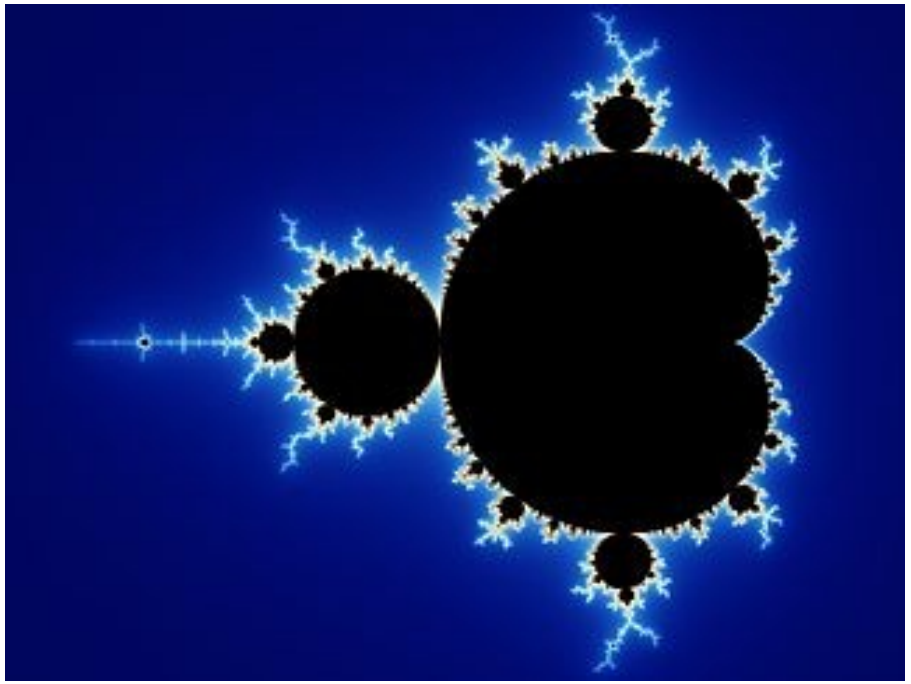
$$z_n=z_{n-1}^2+c$$

Overview

– In everyday terms?
  • A collection of numbers whose properties produce a fractal!

– Black area = in the set
  • Everything else = not an element of the set

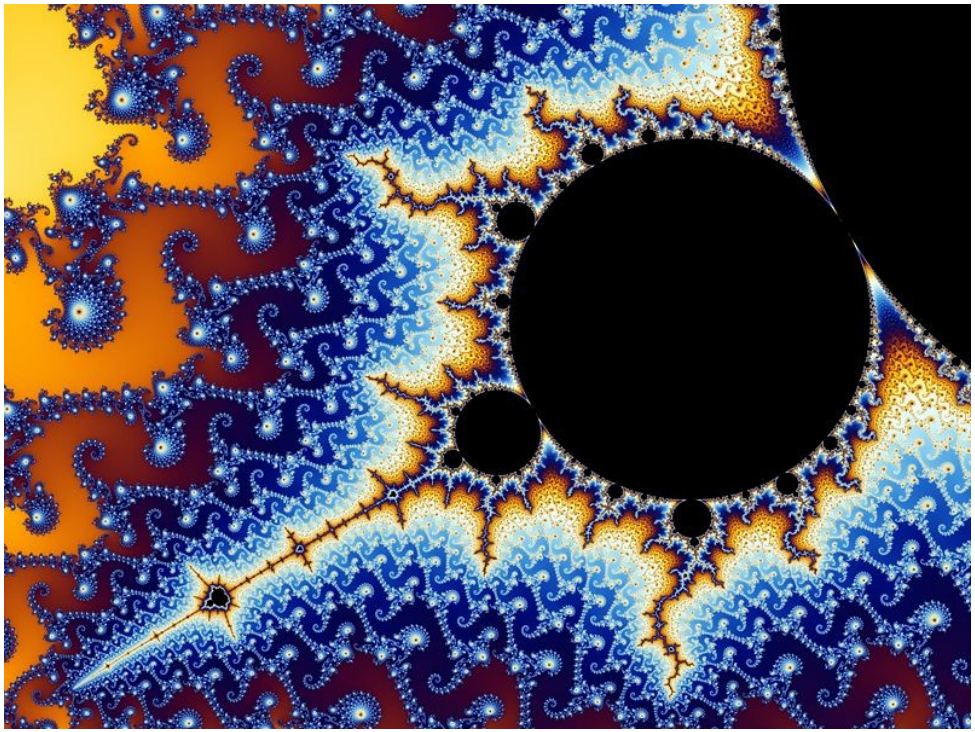
– Color due to speed of divergence

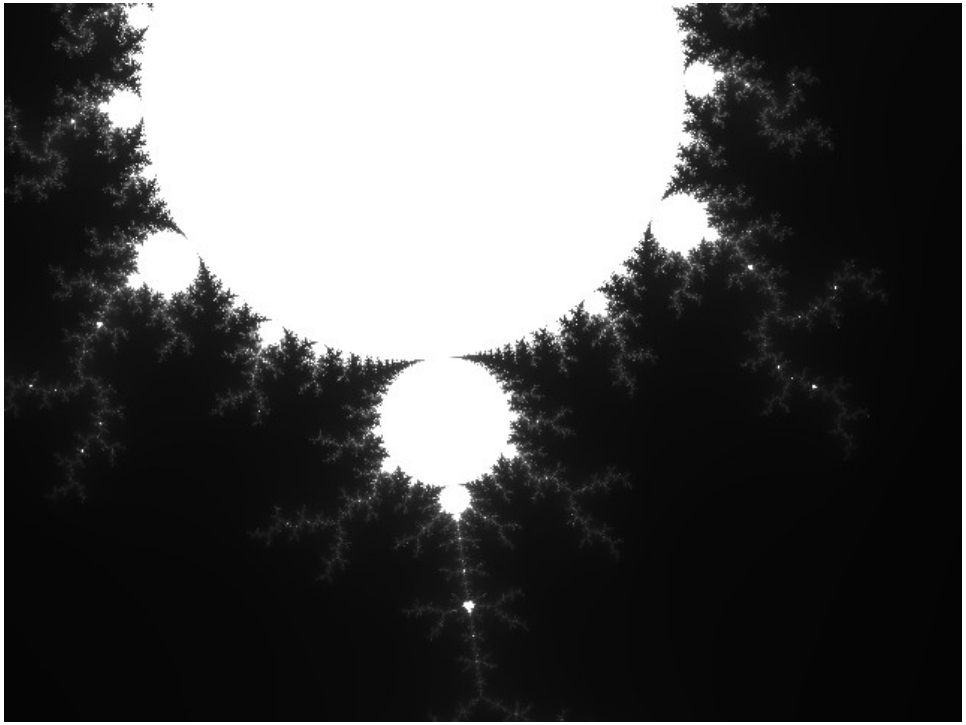


[1] <http://en.wikipedia.org/wiki/Mandelbrot_set>

Problem/Goals

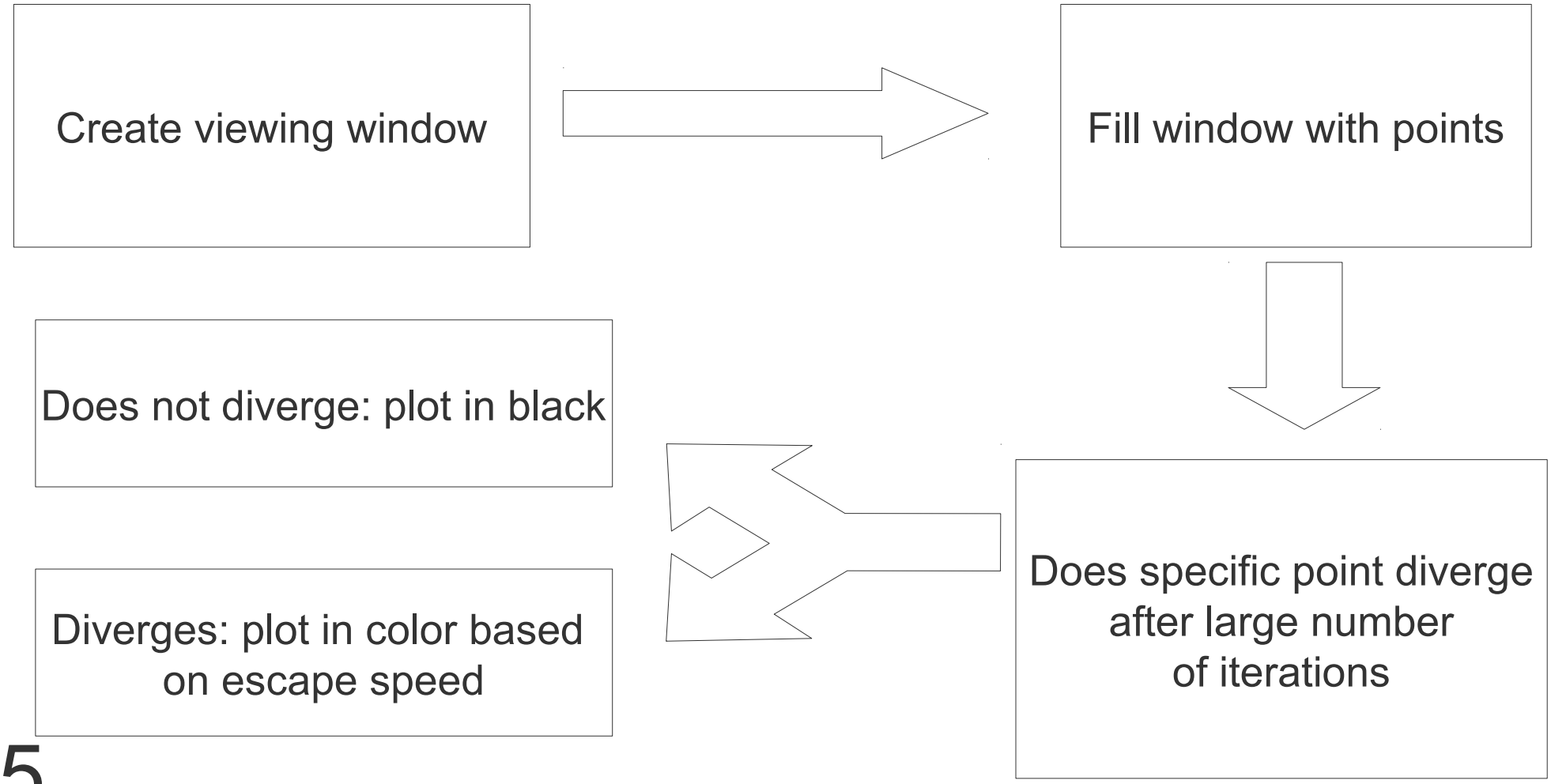
– Two parts to this project:
  - Static plotting of the set (first)
  - Dynamic zooming (second)



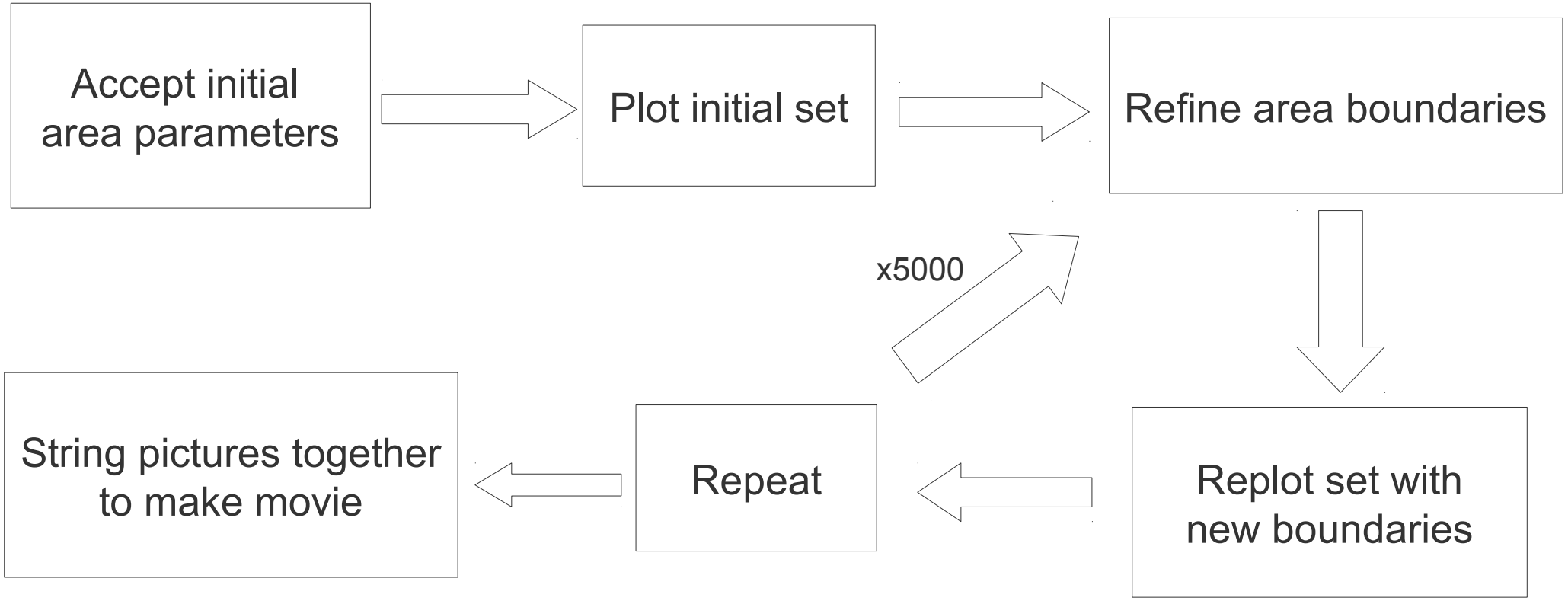


[2] <http://www.misterx.ca/Mandelbrot_Set---Thumb_Print_of_God.html>

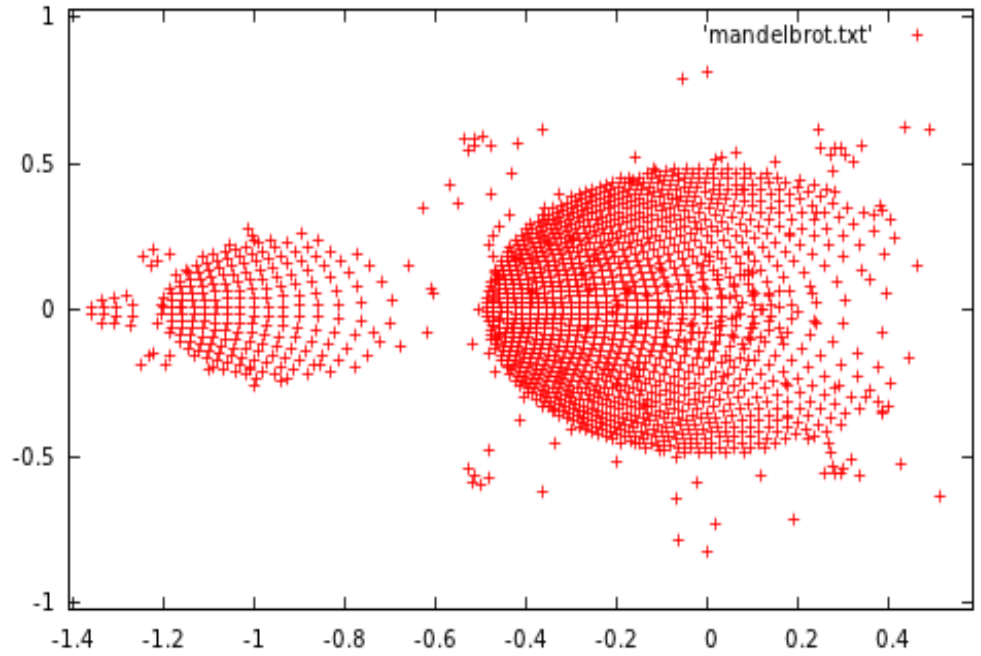
Part 1: Static Plotting Structure

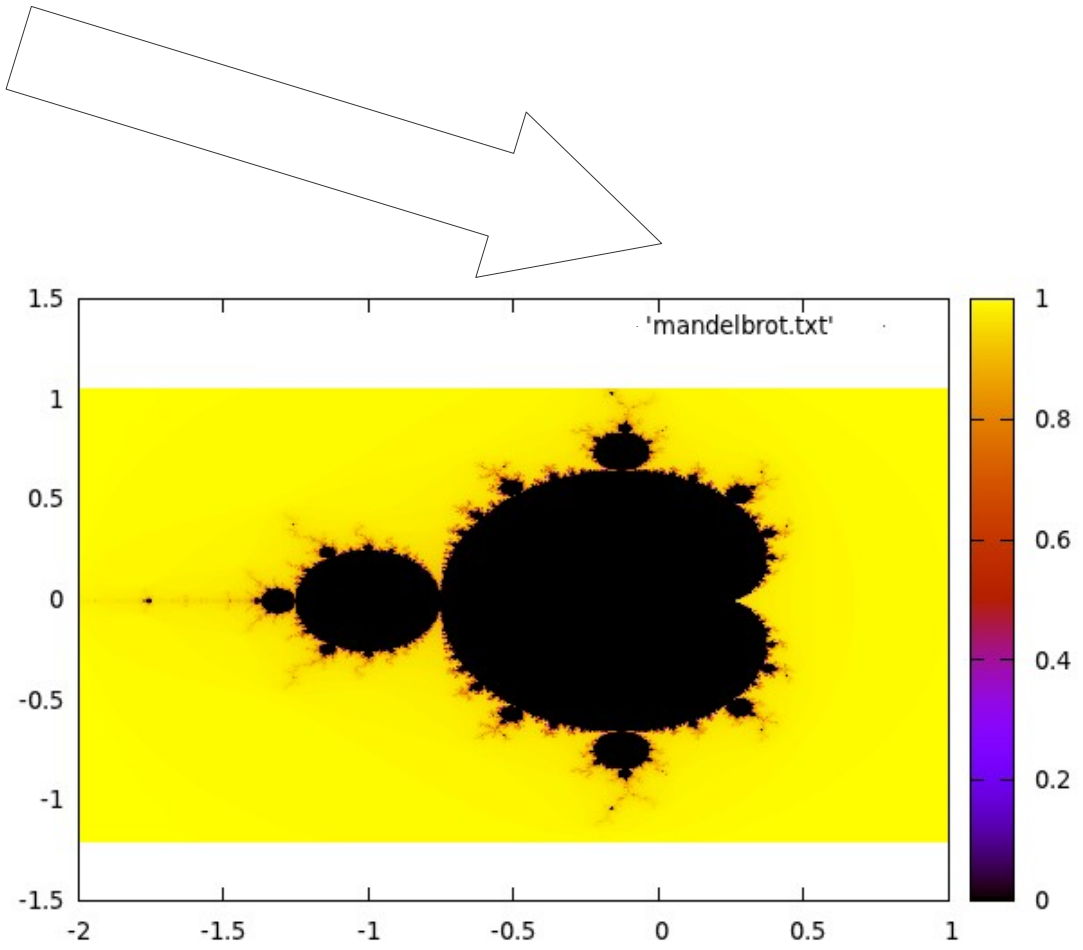


Part 2: Dynamic Zooming Structure



Results: Part 1





Results: Part 2

Watch the movie!!!!

Acknowledgments

Special thanks to Kevin Croker!

Code can be found at http://www2.hawaii.edu/~neillwar/