Visualization and Connectedness of Quadratic Julia Sets

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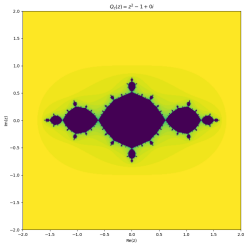

Abstract

In this research project we study the Julia sets of the complex quadratic function $Q_c^k : z \mapsto z^2 + c$, for complex c. Julia sets represent the chaotic dynamics of complex functions and are visualized by repeatedly applying the complex function to 'seed' points in the complex plane. In this project we understand the theoretical reasoning of the escape criteria $Q_c^k(z) > \max\{|c|, 2\}$ to produce images of the filled Julia sets using code written in Python using NumPy and Matplotlib for visualization, as well as through GPU shaders. We observe that the connectedness property changes abruptly as we take c increasingly further from the origin.