Project Documentation

The Mandelbrot Set

Team 3

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# Inception Artifact

## Project Description

The Mandelbrot Set describes the behavior of the complex-valued function *f(x) = x^2 + c* under iteration. We want to create an application that will allow a user to specify an arbitrary plane in C2 and render that slice of the Mandelbrot set that lies in that plane.

## Exemplary Use-case

* The user will input a valid arbitrary plane
* The application will render a picture of the set that lies in the specified plane
* Depending on the plane given: the application will render the picture in a timely manner

### Background

The Mandelbrot Set describes the behavior of the complex-valued function *f(x) = x^2 + c* under iteration. It is a function of the initial input *x* and the offset *c*, both of which are complex numbers, making it a 4-dimensional object overall. The normal image that we see (the one that's our server icon) is the two-dimensional slice through the plane *c=0*.

## History

* Modification
* Date

# Analysis Artifact

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## Identified Classes

* Controller Classes: Plane, Holomorphism
* Output Classes: Color Scheme

## Class Responsibilities

* Accept angles and convert them into orthonormal basis: **Plane**
* Generate/yield all the points in our image, respecting image edges and resolution: **Plane**
* Iterate our function on each point until divergence/threshold, store result in an array: **Holomorphism**
* Display array of numbers as color-coded image: **Window**

## Class Relations

## • Additional use cases.

* The user will input an invalid arbitrary plane
  + Such as two colinear vectors or uses angles bigger than pi-pi-2pi
* The application will give a meaningful error message
  + Such as Invalid plane input

## History

* Modification
* Date