Rust Concurrency - Generating the Mandelbrot Set

Ian Channing https://github.com/ianchanning/mandelbrot

March 10, 2021

Taken from the Rust Book

Based on the Concurrency section of Chapter 2 (A Tour of Rust) from the O'Reilly "Programming Rust" book.

Introduction

The Mandelbrot set.

Complex numbers and iterating complex numbers.

Generating the Mandelbrot set with one processor.

The required changes to use multiple processors.

Fearless concurrency.

The Mandelbrot set

Complex number z

$$z = a + bi$$

Iterate z from 0, square it and add another complex number c

$$z_0 = 0$$
$$z_{n+1} = z_n^2 + c$$

For some values of c, z will stay within a distance of 2 from the origin

Those are 'in' the Mandelbrot Set

Complex numbers and iterating complex numbers

Addition

$$(a + bi) + (c + di) = (a + c) + (b + d)i$$

Multiplication

$$\begin{aligned}(a + bi) \times (c + di) &= ac + (ad + bc)i + bdi^2 \\ &= (ac - bd) + (ad + bc)i\end{aligned}$$

Generating the Mandelbrot set with one processor

The required changes to use multiple processors

Fearless concurrency