

# Quantum Fractal Art for Educational Purposes and Exhibitions

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Project #38

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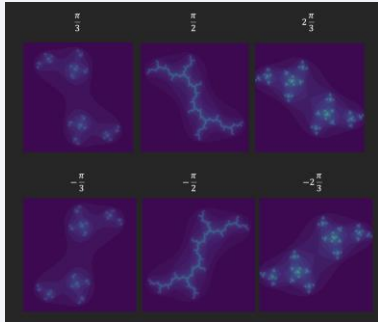
# Project Overview

- Background: Fractals have the potential to be an exciting way to visualize quantum information that bridges art, science, and nature. The project builds upon [previous work](#).
- The original aim is to create fractal representations of common 1- and 2-qubit gates and circuits delivering at least 5 fractal images and identifying at least one art exhibition that has expressed interest in displaying the quantum fractals.
- Approaches: In creating the fractal representations we are exploring the possibilities of e.g.
  - Creating a sensible 1-1 mapping of what key quantum gates e.g. Hadamard gate, look like.
  - Creating a sensible representation of the effect of gate operations.
- Status:
  - We are exploring an extended scope:
    1. Single qubit images and animations – e.g. is it possible to couple fractal shape and position with the position of the statevector on the Bloch sphere.
    2. 2- and 3-qubit gates & circuits fractal images and animations, incl. e.g. fractal representations of the Bell states and Grover's.
    3. >3-qubit circuit fractal images and animations.
  - First results on next slides.
- [Collaboration tools: QAMP plan box note and Trello board]

# First results

## Single qubit images and animations

- Rx, Ry and Rz qubit gate representations at different phases e.g. Rz phase images

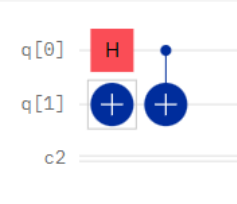
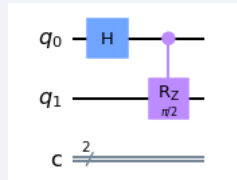


- Animations of each of the above e.g. Rx animation



## 2- and 3-qubit gates & circuits

- 2 qubit visual representations started



## >3-qubit circuit circuits

- Mathematical Julia set equation for n qubits developed. Python implementation in progress

