Particle Life Simulator

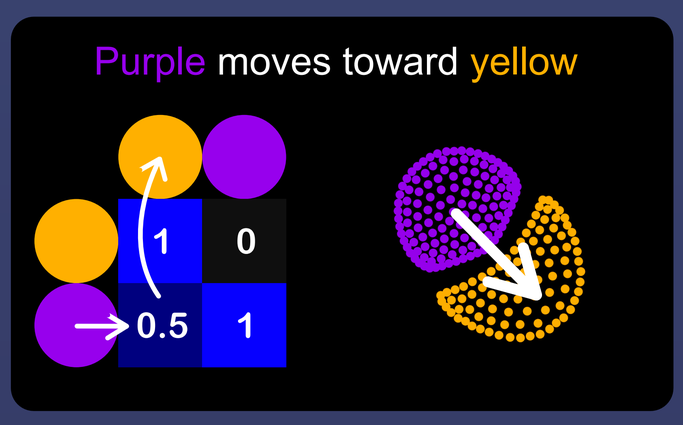
About the Project

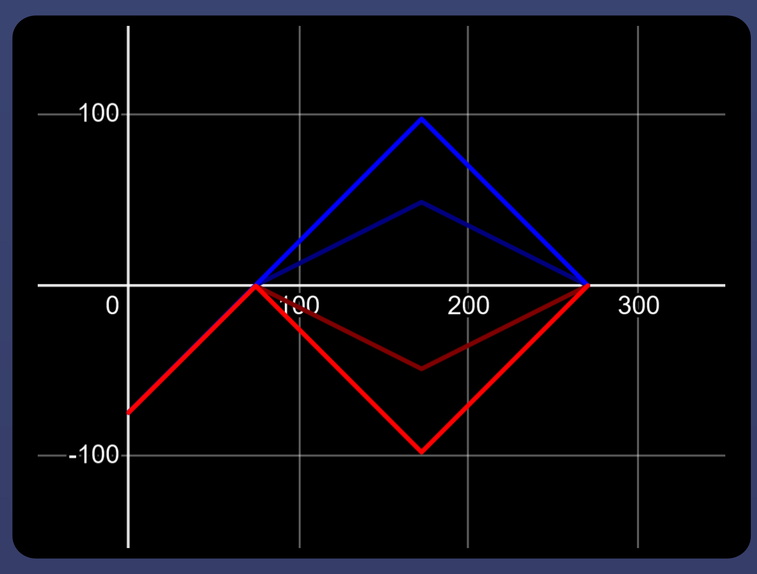
"Particle Life" was originally created by Jeffrey Ventrella. It is a simulation designed to generate emergent life-like behavior from particles following simple rules. Many similar applications have been developed based on this concept.

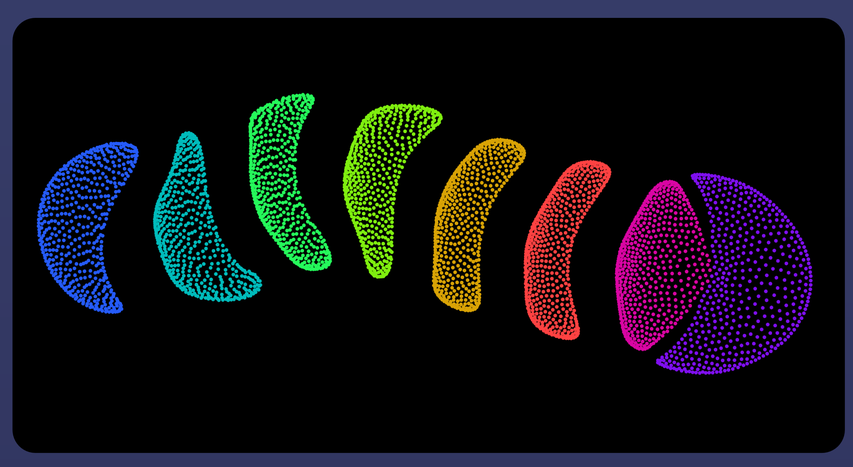
This C++17 implementation was developed in one month (using SFML 3.0) and is capable of simulating 100,000+ particles with multithreading, spatial partitioning and other optimizations.

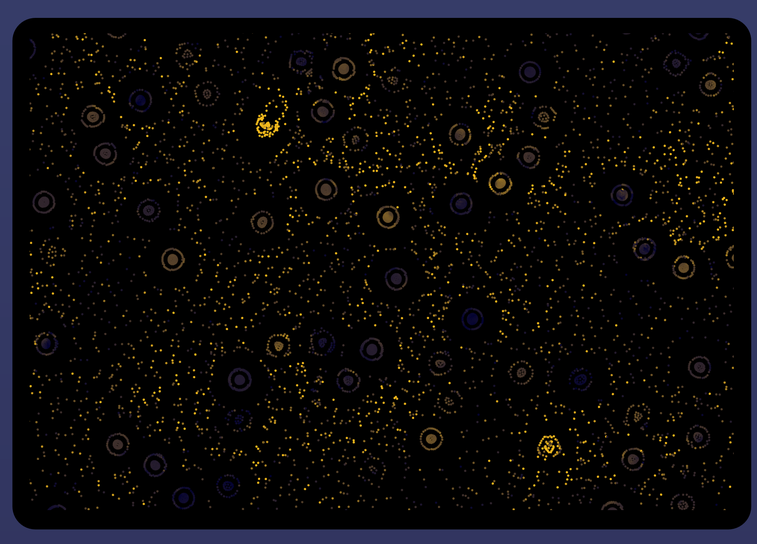
How it Works

Particles interact via a distance based force equation:
Repel at close range and attract/repel if in proximity.
(based on a color coded matrix).
Blue means attraction.
Red means repulsion.
Black means neutral.

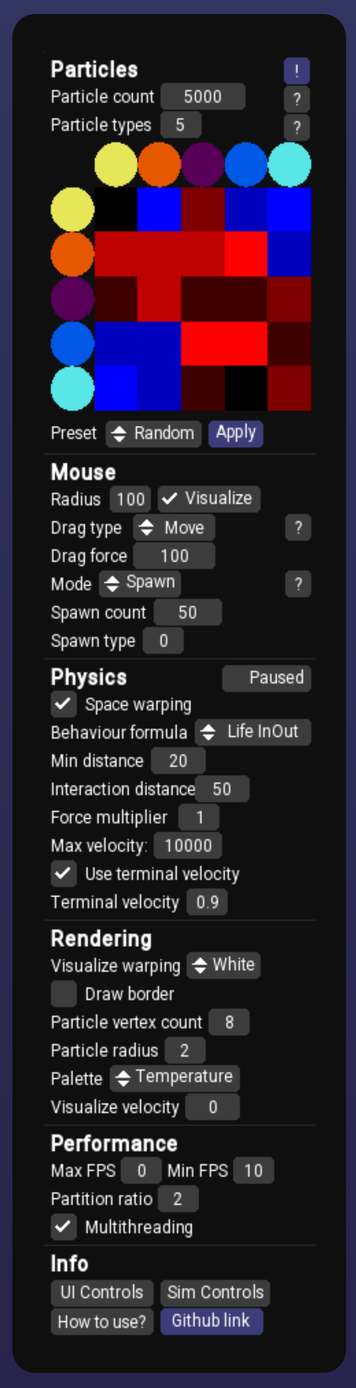








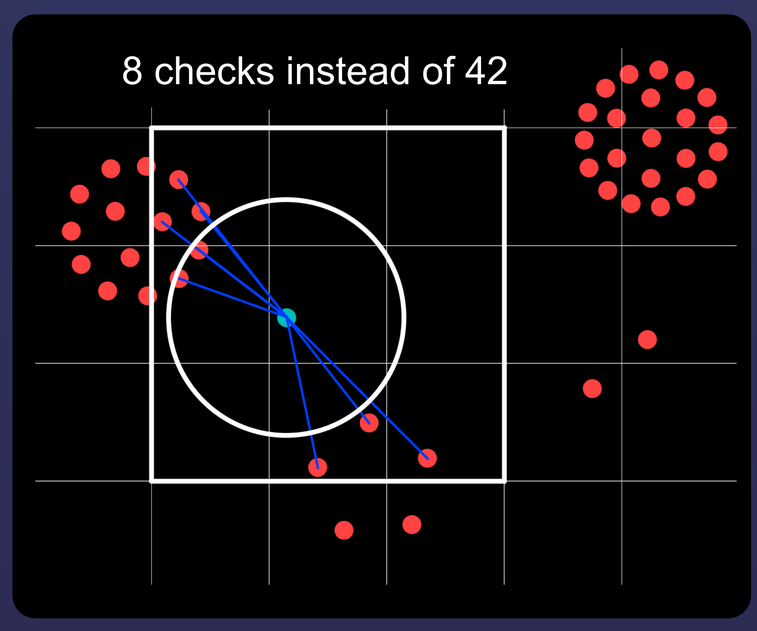
Custom UI



Spatial Partitioning Optimization

Particle simulations require all particles to be able to interact with each other. But if the code checks the distance from every single particle to every other particle, it will be very slow ($O(n^2)$).

This project uses an optimization that divides space into smaller regions, which reduces number of checks needed. In example on the left, the interaction radius equals one cell's width, so it only needs to check 3x3 area.



Other features:

- Camera movement using mouse
- Simple custom made UI (uses only SFML)
- Particle spawning, dragging, color palettes
- Velocity visualization
- Matrix presets

GitHub and Download

Video Demo

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Project: https://github.com/GrmSeven/CPPParticleSimulator