Pixies

Pixies is a simple particle swarm program in which the particles are represented as pixels on the screen. Each particle has a position (where it is drawn) and speed vector associated with it.

Before rendering, the speed vector and position are updated. The position of the particle is calculated as the sum of the previous position and current speed of the particle where as the speed is calculated as the sum of the previous speed and the current acceleration of the particle. The colour of the pixies represents the current speed of the pixie. If a pixie leaves the window, it is re-spawned randomly inside the window.

The acceleration intensity is constant, but the direction is dependent on the current state of the background noise. To get the direction we first have to fetch the value of the noise at the position of the particle. Once fetched we transform the value to an angle that defines the direction of the acceleration vector.

For the background noise there were several possibilities to chose from, but in the end Perlin noise was used (adjusted Simplex noise can be used with similar results).

There are 2 implementations of background noise classes that can be used interchangeably, they do the same job. One uses a noise generator implemented by me, while the other one uses the FastNoiseLite library for generating Perlin noise.

While the program can be run out of the box, the main intention was to make a simple library for plotting this family of particle systems.

The program takes several arguments as input, depending on the type of the particles. The possible arguments are:

- **type** – the type of the pixies rendered (noisy, perlin, plankton, naive)
- **count –** the number of pixies rendered (up to 1,000,000)
- **max speed –** the maximal speed of the pixies
- **acceleration –** the acceleration intensity
- **noise scaling factor –** the background noise scaling factor, the higher the number the more rigid the terrain in which the pixies are moving
- **random intensity** – random noise intensity added to the position of the pixies

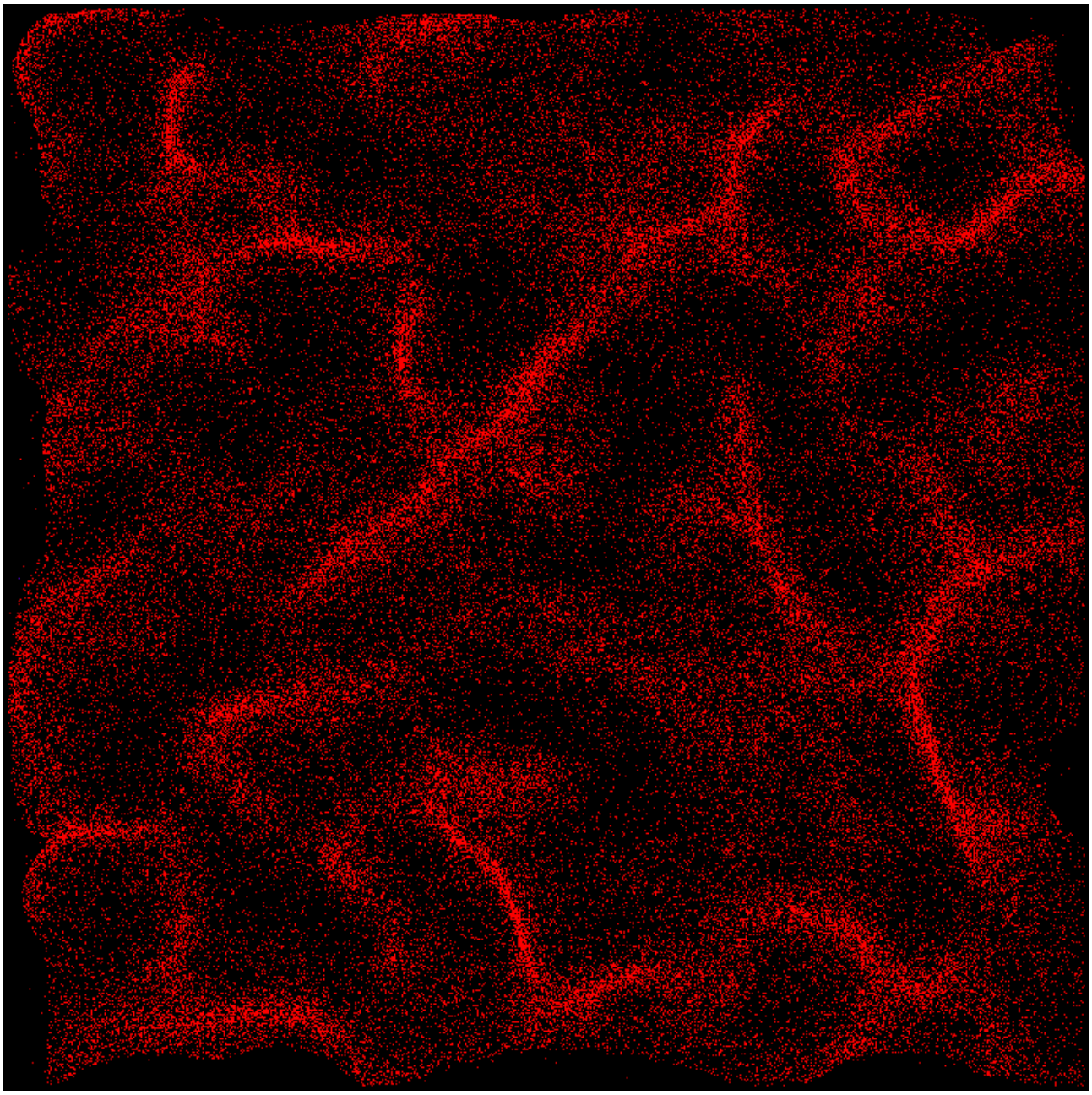
Predefined pixie types:

- **naive –** class of pixies that just moves randomly. It does not move according to the underlying background noise
  - **pixies noisy** <count>
- **plankton –** class of pixies that is influenced only by the current acceleration
  - **pixies** plankton <count> <speed> <acceleration> <noise scale>
- **noisy –** same as plankton but adds noise to the movement of the pixies. This class of pixies does not group together as easy as the plankton pixies
  - **pixies** noisy <count> <speed> <acceleration> <noise scale>
- **perlin –** same as noisy, but uses the perlin noise generator I implemented
  - **pixies** perlin <count> <speed> <acceleration> <noise scale>

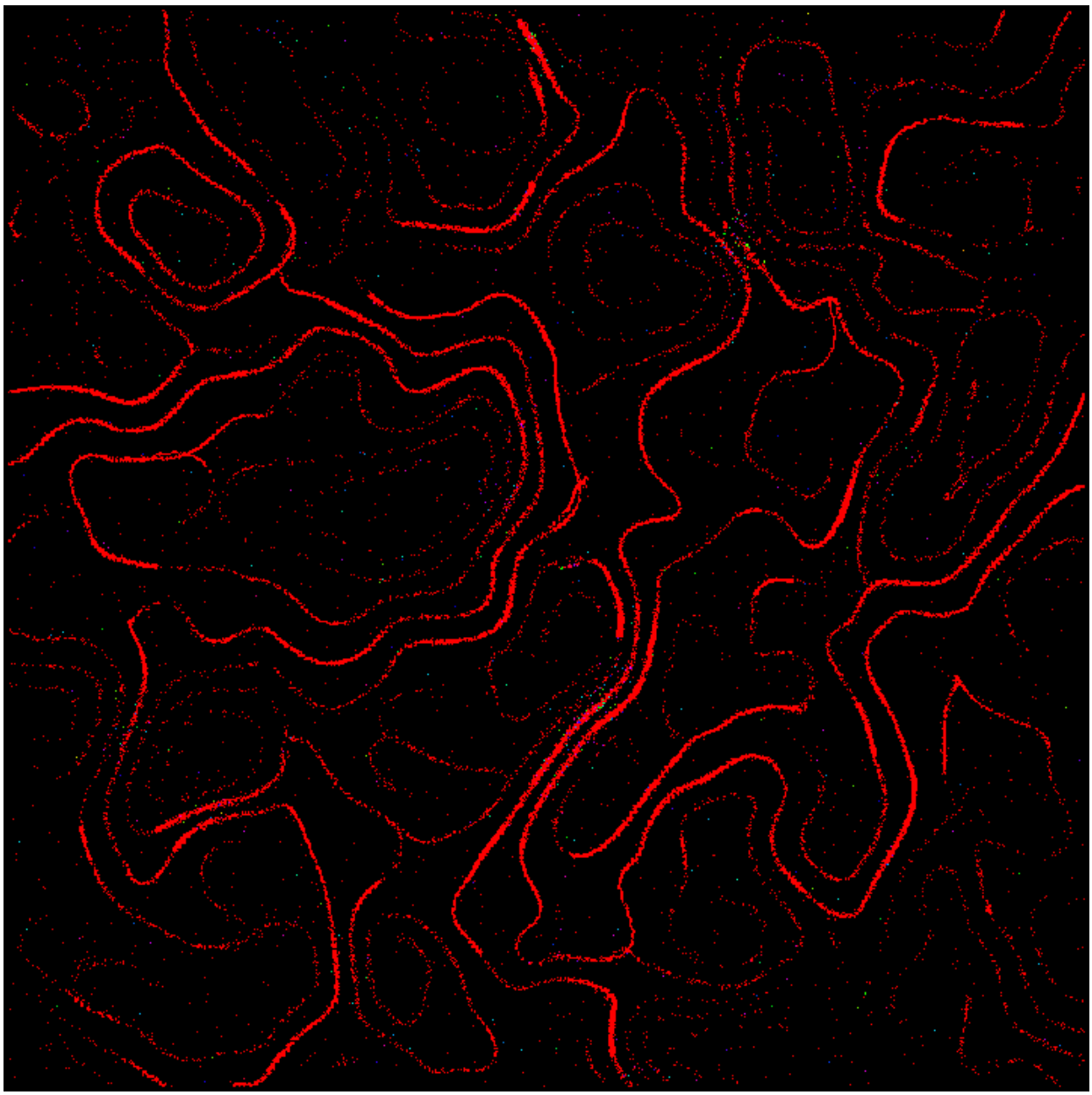
Runtime commands:

- **UP –** turn on the drawing of the background noise
- **DOWN –** turn off the drawing of the background noise
- **LEFT –** turn off the drawing of pixies
- **RIGHT –** turn on the drawing of pixies
- **R –** random reset the position of all pixies

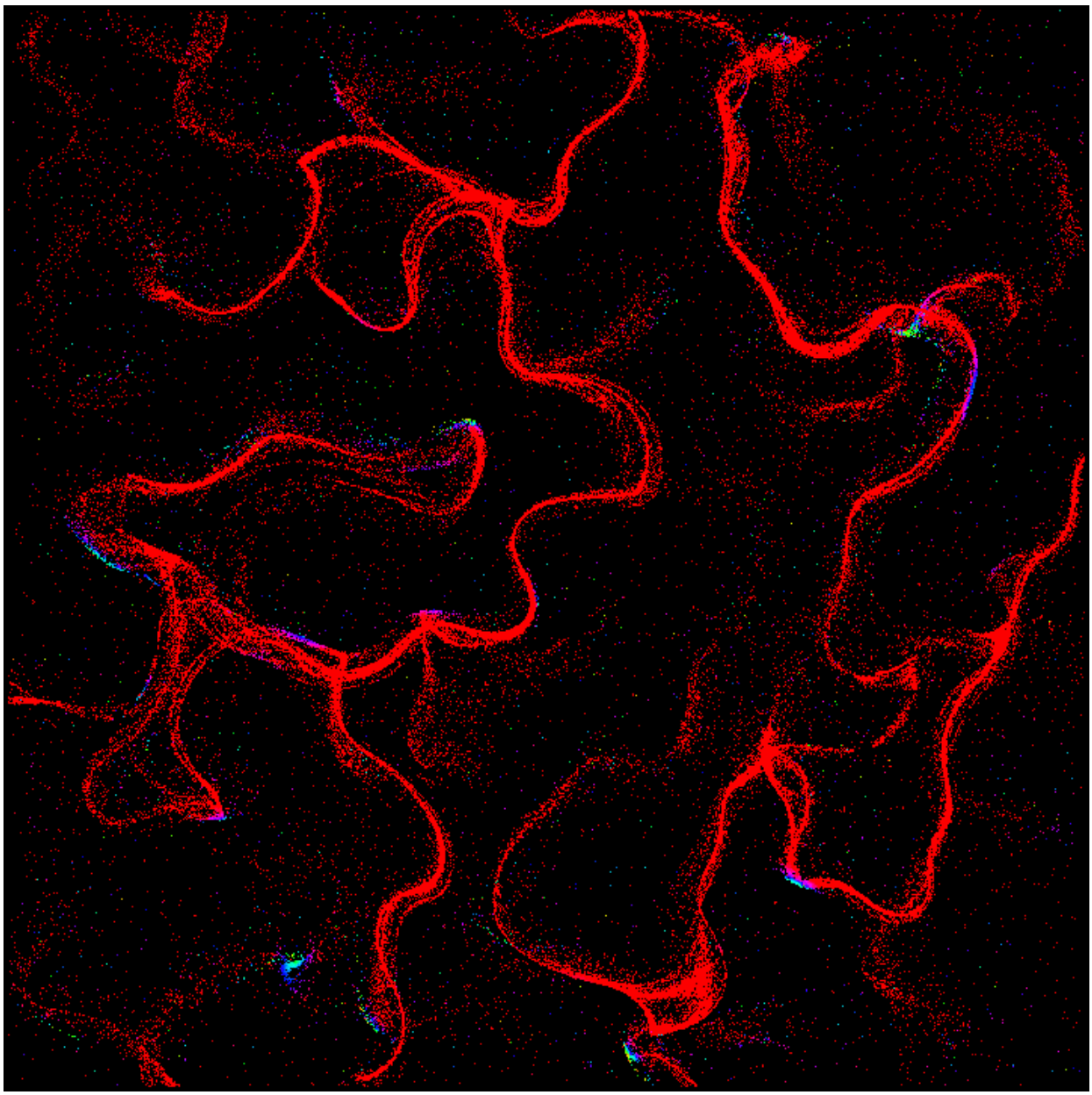
Examples:



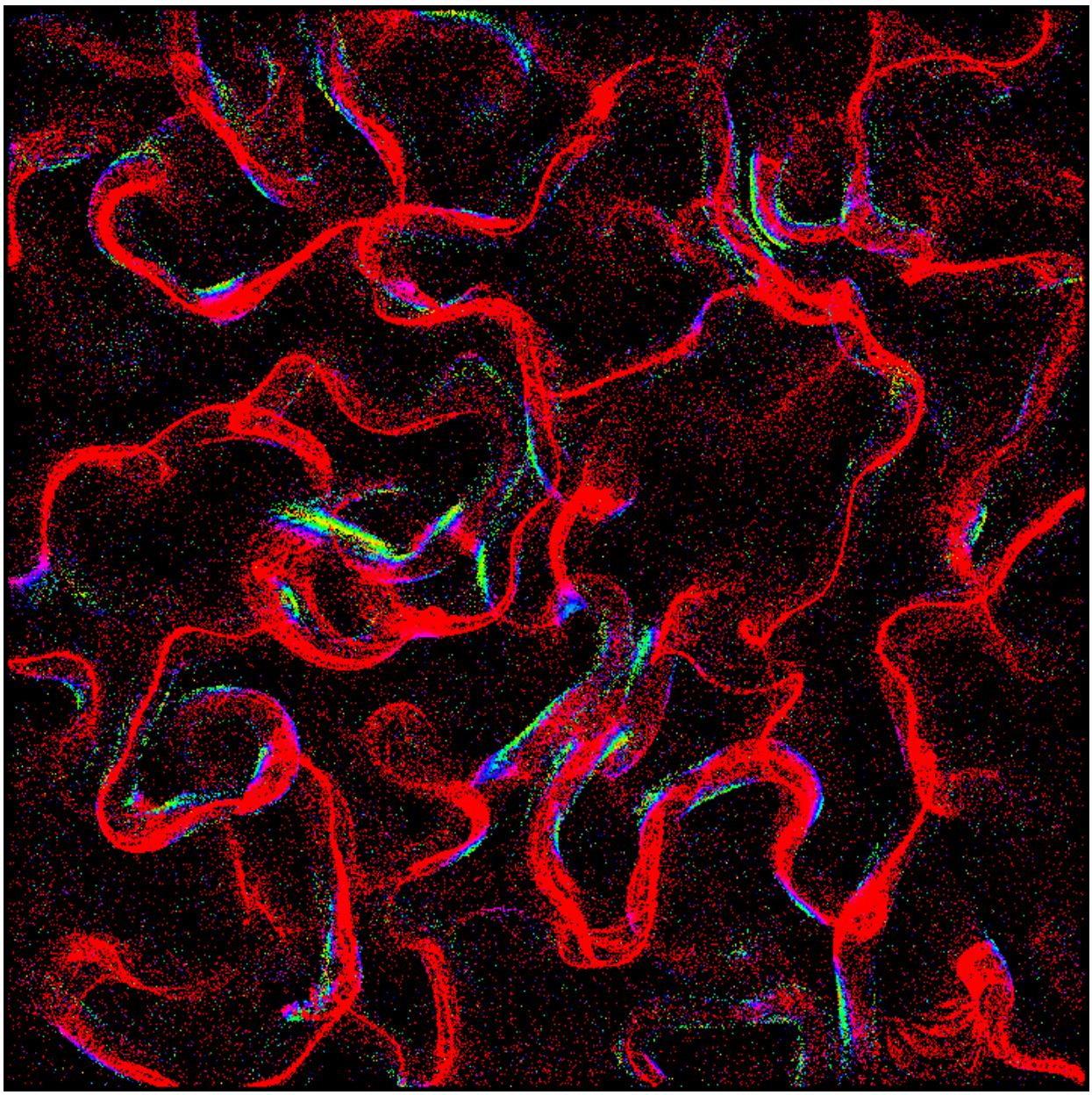
- **pixies plankton** 100000 0.001 0.0015 2.0



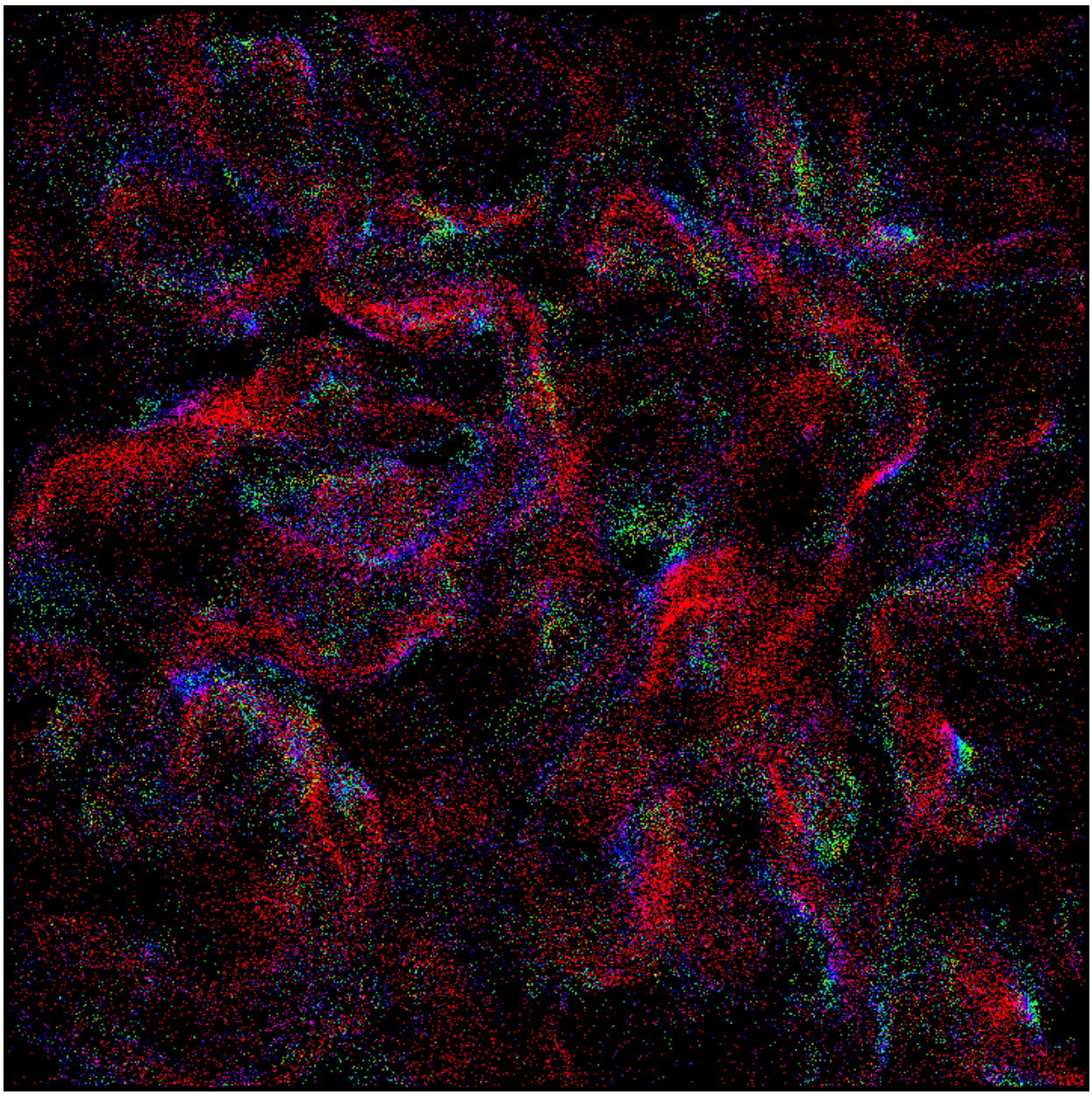
- **pixies plankton** 100000 0.001 0.0015 2.0



- **pixies plankton** 250000 0.005 0.0005 4.0



- **pixies plankton** 500000 0.005 0.0005 6.0



- **pixies noisy** 100000 0.005 0.0002 6.0 0.001