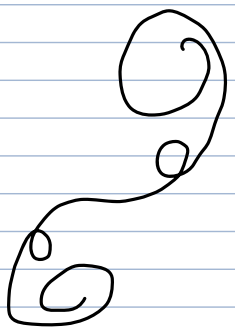
13. HW 4

von Kármán vortex street

(1) How do we produce the familiar von Kármán vortex street patterns in a fluid simulation?

Note: K is the vorticity strength variable.



(1) Make sure that the positive and negative vorticity strengths add up to +1 and -1, respectively.

For example, if you have 100 particles with positive vorticity strength and 50 particles with negative vorticity strength, you should set each positive-strength particle to have

$$K = \frac{1}{100}$$

and each negative-strength partice to have

$$K = -\frac{1}{50}.$$

Troubleshooting tips

(2) My simulation is exploding. What should I do?

(2) (i) Try initializing the velocity field to zero at every time step before you update it.

(ii) Try decreasing the time step.

(iii) Verify that the vector $\Phi_p - \Phi_q$ is properly rotated by 90°.

(3) How do I make my simulation look more realistic?

(3) (i) Try increasing the number of particles to make the particle distribution denser.

(ii) Assign different colors to the positive and negative vorticity strength particles.