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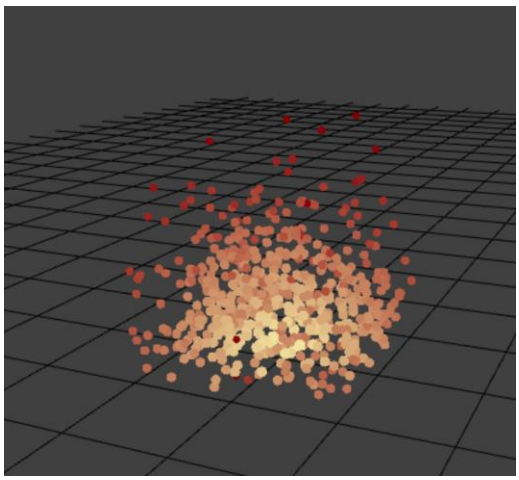
Project A: Fire, Tornado, Boid Cluster, and Spring Rope

User's Guide:

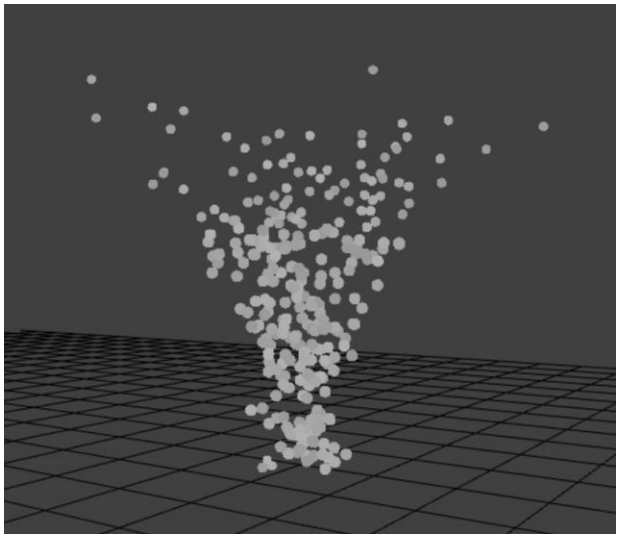
WASD keys control forward/backward movement and left/right strafe. Arrow keys adjust the camera angle and tilt. The 'p/P' key pauses the simulation, and the space bar allows for single-stepping through the animation. The 'z/Z' key switches the solver between Euler, Backward Euler, Midpoint, Backward Midpoint, and Velocity Verlet. At the center of the screen is a large segment of 'rope' connected by springs, with the vertices at either end fixed in position. Under the rope is a cluster of boids that coalesce inside a maximum radius, but try to move out of the way of other boids. To the left is a fire whose particles change color and size depending on their position. Last, to the right is a tornado with particles that spin up and out and get smaller towards the top of the tornado. All particle systems are constrained to z+, and the fire and tornado are additionally constrained on all 4 sides to keep their motion contained to a smaller radius. At the bottom of the screen are additional user controls that change the length and damping of the spring rope, and the position of the center of the boid cluster.

Results:

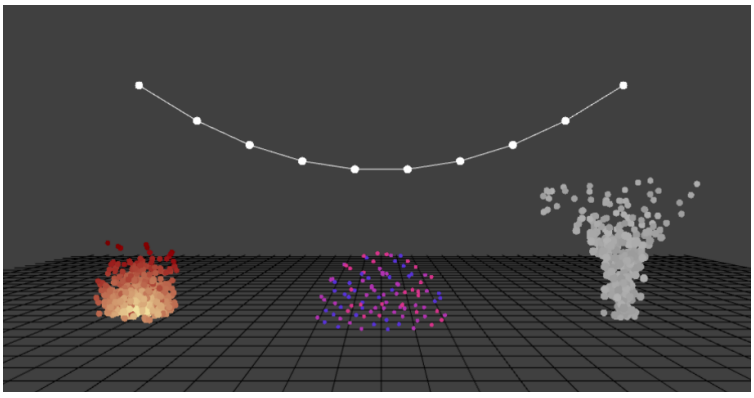
1. Fire closeup



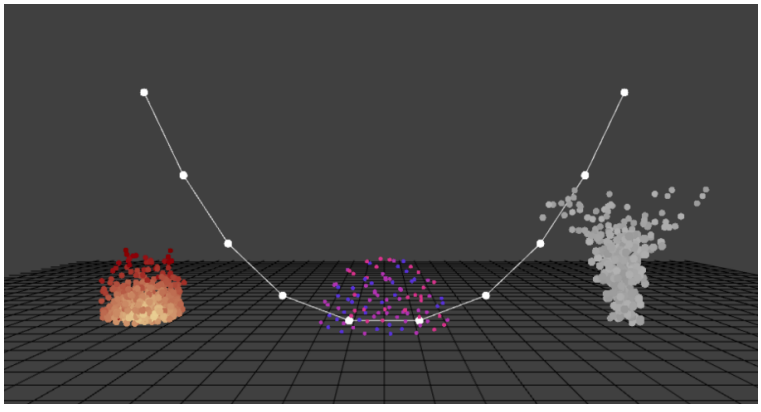
2. Tornado closeup



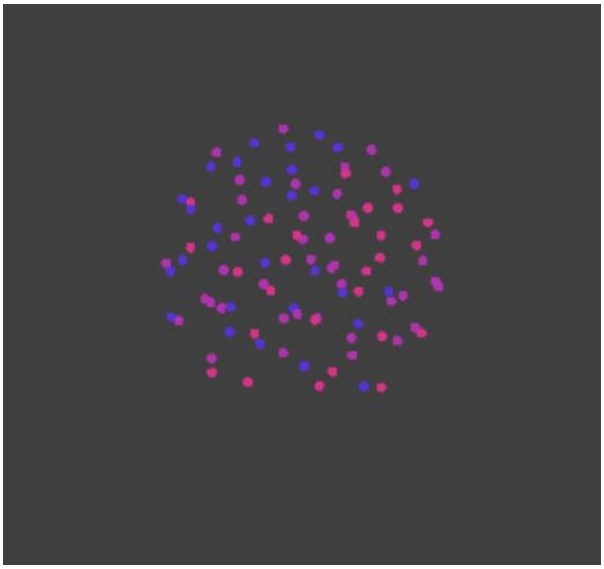
3. Springs with minimum rest length



4. Springs with longer rest length



5. Boids in rest state (spherical cluster)



6. Boids in motion, moving center