Romir Tandon

Nicholas Farinella

Design Projects In Computer Science

May 31, 2025

CFD (Computational Fluid Dynamics)

Objective:

The purpose of this project was to see if I could program a fluid simulator utilizing only what I knew. Utilizing nothing except the Java Swing libraries, I created a successful and semi-realistic CFD program.

Outcome:

Although difficult at first, I found myself learning more and approaching my goal every faster once I began to reference research papers and other sources.

Attached are my references.

- CFD For Games - Carnegie Mellon University - Jos Stam
    - https://www.cs.cmu.edu/afs/cs/academic/class/15462-s13/www/lec_slides/StamFluidforGames.pdf
- CFD Wikipedia Page
    - https://en.wikipedia.org/wiki/Computational_fluid_dynamics
- “10 Minute Physics” Eulerian Fluid Simulation - Matthias Müller
    - https://matthias-research.github.io/pages/tenMinutePhysics/17-fluidSim.pdf
- Unity Fluid Simulation without Particles - RL Hugh
    - https://www.youtube.com/watch?v=x6mcua0HOJs

Conclusion:

This project was successfully completed. My program works as intended and two examples are attached in MP4 Format. Additionally, several different setups are also attached on my Github as Jar files, to be run and observed for entertainment purposes.

Firstly, the MP4 Titled “WavesStream.mp4” observes a single wing cross section as it undergoes two streams of dye which are moved around as fluid flows around the wing as if it were placed in a wind tunnel.

Secondly, the MP4 Titled “WavesWing.mp4” observes a single wing cross section as it undergoes a repeating layer of dye which is moved around as fluid flows around the wing as if it were placed in a wind tunnel.

I hope the code and its examples prove substantial for my intended goal.