Final Project

PHY250 - Fall 2021

Deadline: 12/17/2021

Submission Instructions

You must submit a zip file to moodle containing:

- The Octave codes.
- The animated video for the fluid.
- The sound files of exercise 2.
- Answer the questions using comments in your Octave codes.

1- Simulate flow passing a sphere

We are goin to consider the case of the steady flow of an incompressible, non-viscous, circulation-free liquid passing an sphere of radius a with initial velocity v_0. This is an artificial idealized situation valid for the case of a stretched sheet. Under this considerations, the solution of the Navier-Stokes equations is:

$$\vec{v} = \nabla\left[-v_0 * x\left(1 + \frac{a^3}{2(x^2+y^2)^{3/2}}\right)\right]$$

Re-use the code of Homework 2 to make a simulation for this fluid, considering $a = 0.4$ and $v_0 = 10$.

Questions:

1. What does "incompressible, non-viscous, circulation-free liquid" mean?
2. What is the difference between this fluid and the one we considered when we solved problems during the course?
3. Do you think that the volume rate flow is just "vA" in this case? Why yes o why not?
4. How would you improve this model?

2- Simulate the sound of different instruments

1. Download two different sound sources from https://theremin.music.uiowa.edu/index.html, convert the files to .wav (you can do it in https://convertio.co/es/).
2. Plot the signal and the spectrum of the sources using Octave.
3. Generate a new sound wave considering those frequencies, plot the signal and its spectrum (bars graph) overlapped with the original source plots.
4. Compare your sounds with the sources. What are the differences between your signals and the sources?
5. How could you improve the quality of the digitalized sounds?