# Position Based Fluids

This project aims for a popular variant of particle-based liquid simulation method, Position Based Fluid (PBF). This requires essential programming/software skills for generating computer animations and good understanding of numerical fluid simulations, which solve the Navier-Stokes equations that model a variety of fluid flows. You are expected to perform autonomous study and research investigating how to generate liquid animations using computer.
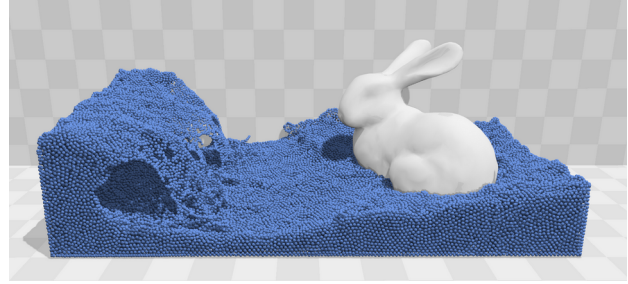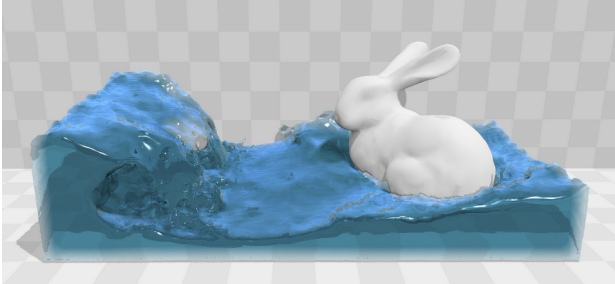
Objectives

The first step is to understand the fundamental knowledge of particle-based fluid simulation approach, which needs to implement/adapt a tool set that handles particle (and auxiliary) data. You will start with implementing a two-dimensional simulator and then continue to a three-dimensional one. You can reuse a code-base used for your previous classes such as IGR202. However, you have to implement yourselves the core of the PBF solver [1]. The simulation output will be a sequence of particle data and triangulated mesh that are representing temporal and spatial changes of water volumes. Thus, you also have to generate triangular meshes from particles and visualize them using a rendering software such as Blender[1] or Mituba[2]. A framework having these (simulation, mesh generation, and rendering) modules must be the outcome of this topic. Once achieving, you are strongly encouraged to improve the modules with own ideas, e.g., speeding up each algorithm via multiprocessing, adding another solver, changing rendering setups, etc.

Topic difficulty: □ *easy* | ■ *intermediate* | □ *advanced*

Prerequisites

- Good programming skill in C/C++ both for implementing new codes and utilizing existing codes
- Knowledge of computer animation and physic-based modeling as well as numerical simulation
- Experience of computer graphics libraries/tools or interest in using them

References

[1] 2013, Macklin and Müller, Position Based Fluids, ACM Trans. Graph.

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1   https://www.blender.org/
2   https://www.mitsuba-renderer.org/

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