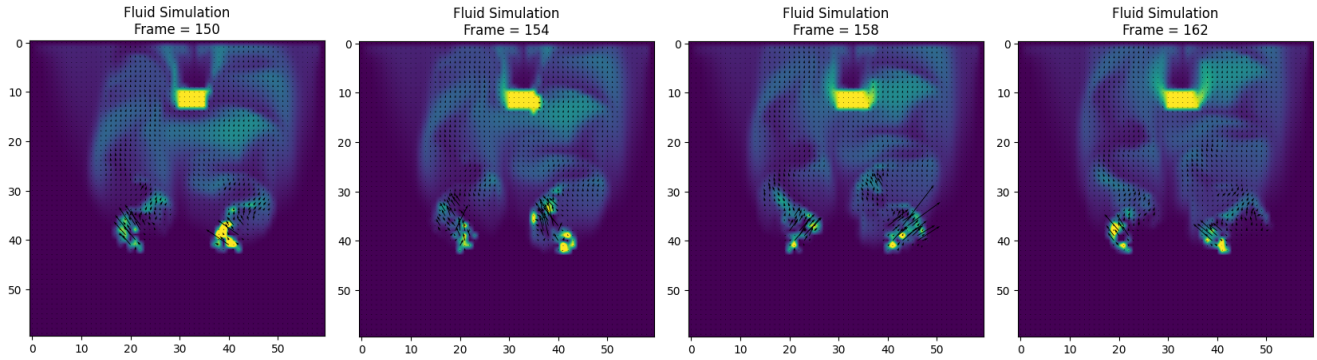
Fluid Simulation: An Extended Solver

Mariana Ávalos Arce
Universidad Panamericana



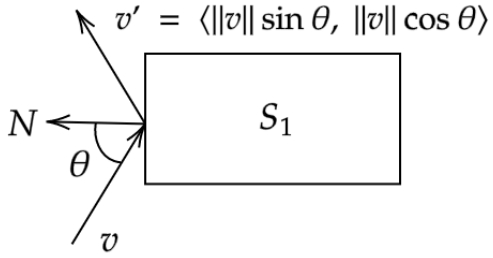
1 Introduction

Based on the legendary publication of *Real-Time Fluid Dynamics For Games* by Jos Stam[1], the following document presents an extended version of Stam's solver, meaning that the fluid simulation based on Navier-Stokes Equations and a density and velocity solver is used as Stam once suggested in his pioneering paper, but also some extensions are offered to the reader of this document. These extensions include the capability of the solver to simulate the presence of solid objects inside the fluid and different behaviours of the velocity/density emitters based on classic mathematical models.

2 Objects In The Fluid

An important extension to the existing solver is the presence of arbitrary objects inside the fluid. These are assumed to be solid and heavy enough to not be carried along the fluid, but the latter should interact with the *walls* of each object.

In order to solve this task, we began by defining how the liquid will interact whenever it collides with the walls of an object. The way any force, in this case the **velocity** of the stream of water should *bounce* against the walls of the object, just like a ball would bounce off the ground when thrown.



Incoming Force Reflection

References

[1] J. Stam. "Real-Time Fluid Dynamics for Games". In: *Game Developer Conference* (2003). DOI: https://www.dgp.toronto.edu/public_user/stam/reality/index.html.