Models for Interfaces

Component
École Nationale Supérieure d'Électrotechnique d'Électronique

In brief

- **Code:** N9EM01A
- **Open to exchange students:** No

Presentation

Objectives

Numerical simulation of flows at a deformable interface (with a solid or other liquid) is relevant to a wide range of applications, including the environment, geophysics, engineering and fundamental physics. This course presents numerical methods for solving the Navier-Stokes equations at deformable interfaces. Specific problems are induced by this type of geometry: position and deformation of the interface (generally in motion), modification of the topology (rupture-coalescence) and consideration of the discontinuity of physical quantities across the interface (density, viscosity, pressure, etc.).

Description

The methods presented can be divided into two groups, depending on the type of mesh used to solve such problems.
For evolutionary mesh methods (Lagrangian methods), the interface is a boundary between two subdomains. Two main methods are presented: integral boundary methods (Stokes flow or potentials) and direct methods where the Navier-Stokes equations are solved in each phase in curvilinear coordinates and the mesh is adaptive. For fixed-mesh methods (Eulerian methods), the interface moves on a fixed grid. Different methods for tracking the interface are presented: marker methods, Level set or Volume of Fluid (VOF) using either a front capture or front tracking method.