

MODELING OF HEAT TRANSFER APPLICATION TO LUBRICATION APPLICATION

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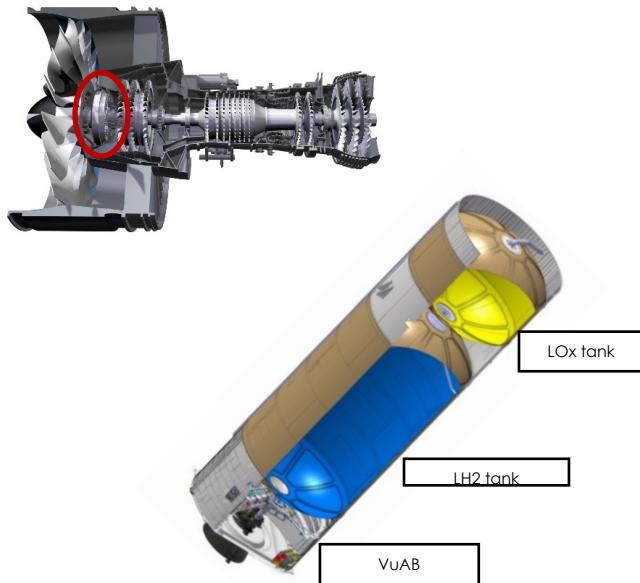
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Context

Industrial context:

- two phase flows
- heat transfers

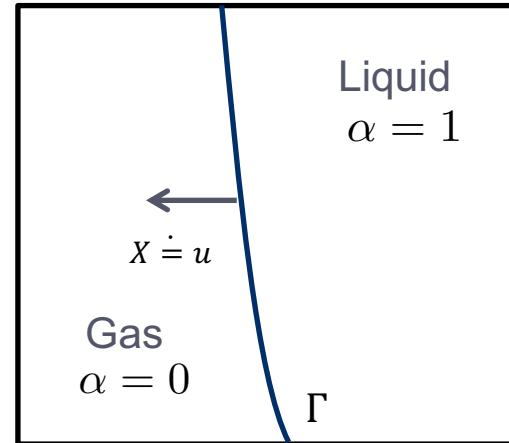


Requirements:

Accurate, robust & **conservative** description of:

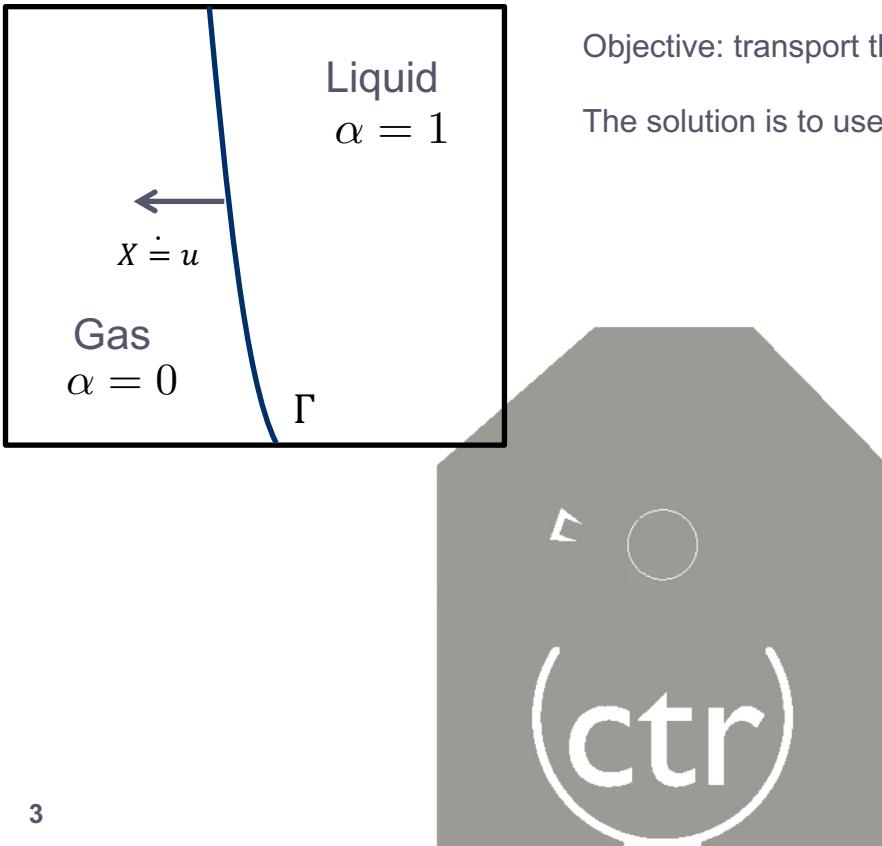
- the liquid dynamics,
- the **heat transfers**

→ Difficult to reach with level-set contrarily to VoF methods



Level-set approach in Yales2

An energy-conserving framework for interfacial flows



Objective: transport the **energy** in a **conservative** manner & **coherently** with the **level-set**

The solution is to use the **flux** of the **level-set** to transport the temperature:

$$\frac{\partial \alpha}{\partial t} + \nabla \cdot F_\phi = \dot{\omega}_\phi \quad \text{Sources due to clipping, BCs, ...}$$

Flux from ϕ :

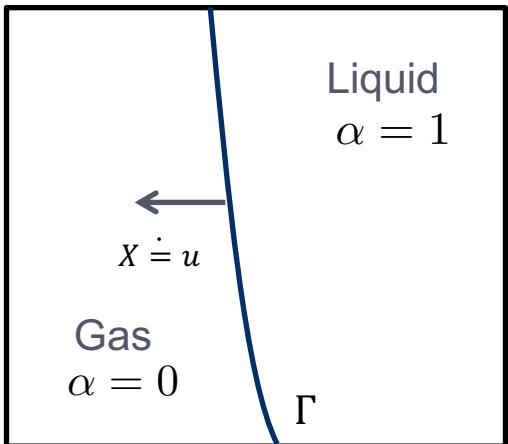
- level-set transport
- level-set reinitialization
- sharpening ?

error

7.204e-10
5.763e-11
-6.051e-10
-1.268e-09
-1.931e-09

Transport of a phase color with level-set fluxes

An energy conservative framework for interfacial flows



Objective: transport the **energy** in a **conservative** manner & **coherently** with the **level-set**

Jump conditions for temperature:

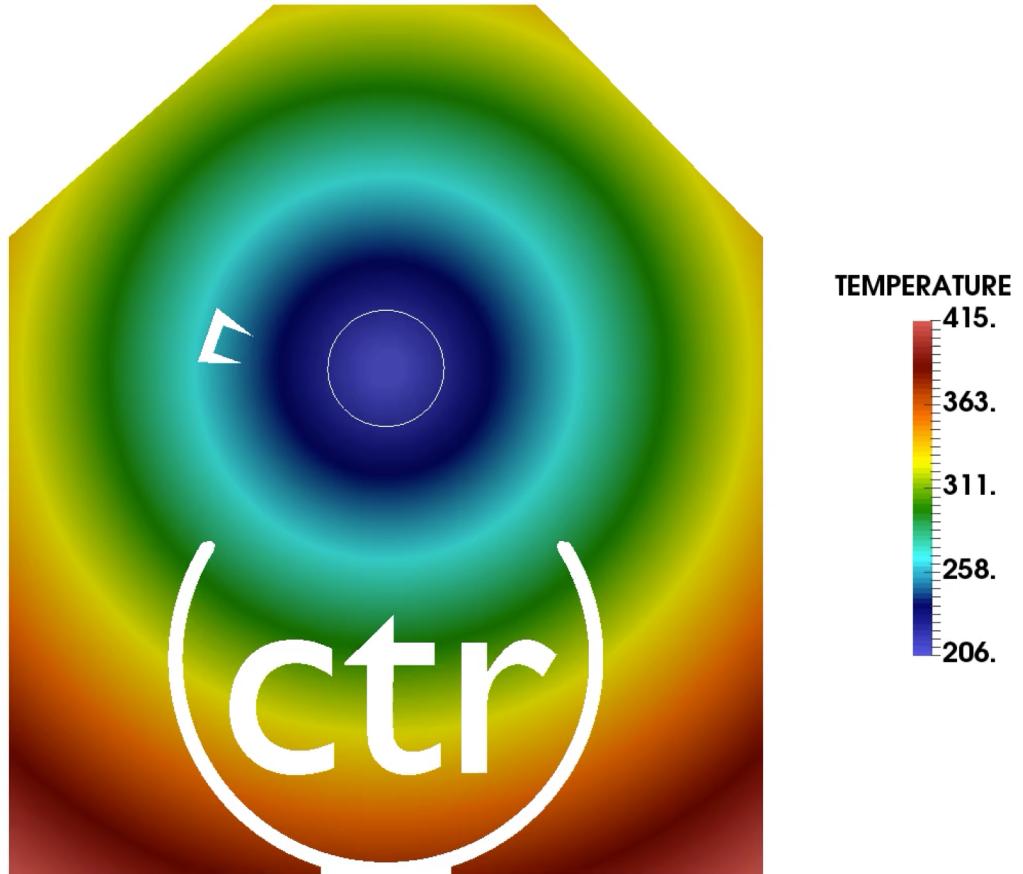
$$[\lambda \nabla T] = 0$$

$$[T] = 0$$

$$\frac{\partial \rho c_p T}{\partial t} + \nabla \cdot (T (\rho c_p|_l F_\phi + \rho c_p|_g F_{1-\phi})) = \dot{\omega}_\phi \rho c_p|_l T - \dot{\omega}_\phi \rho c_p|_g T$$

Sources due to clipping, BCs, ...

Application to the pouring test case



$$\frac{\rho_l}{\rho_g} = 10$$

Perspectives

- Improve temperature diffusion treatment at the interface
- Improve temperature transport
- Include a sharp definition of the phase color with hybrid fluxes including sharpening