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INTERNSHIP PROPOSAL - Fixed-term contract

Optimisation of spray parameters for liquid injection in combustion chambers

Reference: CFD-2023-CUE-01
Team: CFD
Research unit: Energetics and propulsion
Salary: 7.8 K€/year (gross)
Duration: 6 months - **Starting date**: Feb./Mar. 2023

Location: 42 avenue Gaspard Coriolis – 31057 Toulouse
Contact person: Bénédicte Cuenot
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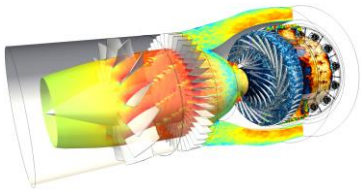
riber@cerfacs.fr
Level of education required: Master of science

HOST LABORATORY

The **Cerfacs** is a fundamental and applied research center specializing in modelling and digital simulation. Through its resources and expertise in high-performance computing, it addresses major scientific and technical problems in public and industrial research. The Cerfacs teams develop innovative methods and software solutions to meet the needs of the aeronautics, space, climate, energy and environment sectors. Cerfacs works in close interaction with its seven associates: **Airbus**, **Cnes**, **EDF**, **Météo France**, **Onera**, **Safran** and **TotalEnergies**.

HOSTING TEAM

The CFD (Computational Fluid Dynamics) team is the largest team at CERFACS. It focuses on the simulation of flows by developing advanced numerical methods and applying them to aircraft, rockets, helicopters, car engines, turbines, etc. This team develops essential tools in many application fields with a well-known leitmotiv in industry today: let's calculate systems (aircraft, engines, etc.) before building them.



JOB DESCRIPTION

Topic(s): Combustion

Context: Today, mathematical modeling and the power of computers make it possible to accurately predict turbulent combustion in industrial systems. However, one key element remains difficult to model: liquid fuel injection. Injection systems are designed to atomize the liquid jet into a spray of very fine droplets, resulting in more efficient combustion. This atomization phenomenon is very difficult to model accurately, and an alternative strategy involving the injection of an already-formed spray is now in use. However, this strategy requires knowledge of the spray's properties, which is not always available. For this reason, a technique for optimizing spray parameters in relation to available measurements, both at spray and flame level, has been developed.

Mission:
The task will involve setting up a spray parameter optimization chain based on existing Python libraries: scikit-learn, OpenTurns or TensorFlow. The optimization methodology will be based on that developed in previous projects. With this new optimization chain, we will (i) reproduce restults obtained previously with another numerical optimization tool (B. Rochette's thesis) and (ii) produce spray parameters for a new case study (SSB burner). Simulations of turbulent flames for the cases studied will be carried out using the AVBP combustion code.

DESIRED PROFILE

Background required:

Numerical simulation | Fluid dynamics | Programming in Python
Scikit-learn library | Languages: French and English | Combustion

Abilities:

Capacity for analysis and synthesis | Innovation capacity | Ability to work independently
Relational qualities | Rigorous

PLEASE SEND CV + COVER LETTER