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Start of project : 2020

ABOUT ME

I studied Mechanical Engineering to Masters level at the University of Bristol.

My passion is my wife and son.

ModIC team

Modélisation et Ingénierie par le Calcul

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Keywords

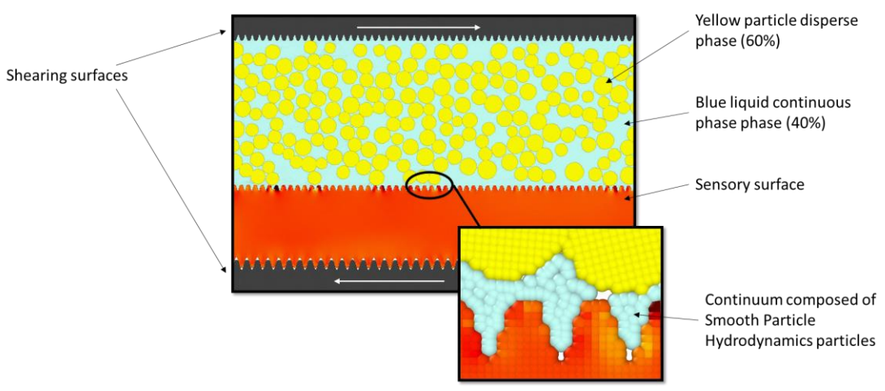
multiscale modelling, simulation, mechanics, mass transfer, food structures

APPLICATION OF NOVEL MESH-FREE TECHNIQUES FOR THE SIMULATION OF MECHANICAL PROBLEMS

Abstract

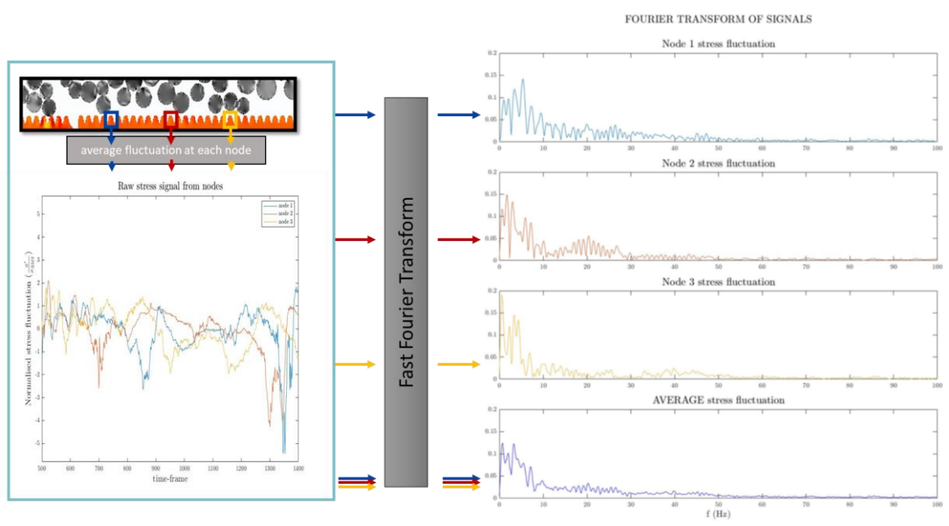
Many phenomena can be accurately simulated with conventional simulation tools based on *either molecular dynamics* below the thermodynamic limit, *or using mesh-based methods* above the thermodynamic limit

- Many phenomena can be accurately *simulated with one concept or the other*
- There are a subset of challenging problems where micro- and macro scale physics are strongly coupled – *the simulation requires a multiscale modelling technique*
- This PhD focuses on such *problems as those found in oral processing*



< Figure 1: Consider the shearing of a solid-in-liquid suspension of deformable solids, as presented in

- The *moving interfaces* make this *challenging* to *simulate with a mesh-based* method
- Even highly *course-grained molecular dynamics* techniques will *not* attain the scale of *several µm*



>Figure 2: A technique such as *Smoothed Particle Hydrodynamics* can readily calculate *stress fluctuations* at the wall and in the solid disperse phase, allowing the interpretation of, e.g. the *frequency of fluctuations by Fourier transform*

Objectives

- To apply novel computational techniques to food
- Combine two or more simulation techniques across the micro-macroscale threshold
- Apply the combined novel technique to one or several case studies

Techniques used

- Mesh-free particle based simulations
- Signal analysis
- Multi-scale coupling

Financers

Cargill