Kirigami periodic cores: Vibration filtering properties
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Introduction
Honeycomb sandwich panels are well known to provide interesting static out of plane properties (compression and bending) due to their high equivalent stiffness whilst containing mass. However, this makes such structures possess high natural vibration frequencies.

Research objectives
Obtain sandwich panel cores with improved vibroacoustic performances maintaining unaltered the desired structural properties. Its potential use as a platform for periodic absorbing material or resonating solutions is considered during design stage to further improve vibroacoustic performance.

Manufacturing Methods
**KIRIGAMI:** Japanese Origami derived technique which consists in creating 3D structures by folding onto itself, forwards and backwards, a slotted 2D sheet of material, which can vary from paper to composite material prepregs. It allows creation of futures at the early stage of manufacturing.

**INTERLOCKING:** Novel technique which allows previously Kirigami forbidden cell topologies as well as hybrid material cellular cores, through partial interpenetration of different cores. Features like ventilation holes can be included for specific applications.

Periodic structures
- Full scale structures are created by spatial tessellation of the UNIT CELL.
- The FLOQUET-BLOCH wave theory relates the node displacements and forces on the left of the unit cell with the ones on the right. The 2D relates the cell corners as well as top and bottom nodes.

Numerical Simulations

**STRUCTURE**
- FINITE (DIRECT METHOD)
- INFINITE (INVERSE METHOD)

**PRE-PROCESS**
- CAD input (Matlab®)

**PROCESSING**
- Harmonic analysis Ansys® APDL

**POST PROCESS**
- FRE Ansys® APDL / Matlab®

**DISPERSION CURVE**
- Computational advantage
- Full bandgap identification
- Wave bandgap identification possible with single simulation
- Difficult to interpret when structure is complex (coupling effects)

**FREQUENCY RESPONSE**
- Full bandgap identification
- Large models (finite structure)
- Wave bandgap identification only possible through separate simulations

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