PLANES Users Guide

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Contents

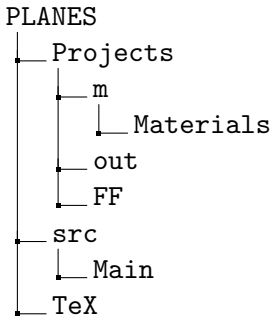
Chapter 1

General overview

1.1 Presentation

PLANES (Porous LAum NumErical Simulator) project is a collection of Matlab/Fortran scripts to simulate the vibroacoustics response of coupled systems including acoustic, elastic, porous materials, PML...

1.2 General organisation



All the information relative to a project are in the `Projects` folder. As a user, you do not need (theoretically) to modify the files in the other folders.

1.2.1 Labels for materials

The convention is as follows:

- 0 AIR
- 1XXX Elastic medium
- 2XXX Equivalent fluid (rigid frame) material
- 3XXX Limp model
- 4XXX Poroelastic Material (or FEM: 1998 formulation)
- 5XXX BIOT (or FEM: 2001 formulation)
- 80xy PML x and y boolean direction

1.2.2 Type of boundaries

- 1 RIGID WALL
- 2 UNIT PRESSURE (FLUID)
- 3 UNIT NORMAL VELOCITY
- 4 UNIT TANGENTIAL VELOCITY
- 5 SLIDING (PEM)
- 6 BONDED (PEM) or CLAMPED (elastic)
- 7 UNIT PRESSURE (PEM)
- 8 UNIT NORMAL VELOCITY (PEM)
- 9 UNIT NORMAL VELOCITY (PEM)
- 10 INCIDENT AIR PLANE WAVE on ACOUSTIC/Biot98 ELEMENT
- 11 INCIDENT AIR PLANE WAVE on ELASTIC ELEMENT
- 12 INCIDENT AIR PLANE WAVE on Biot2001 ELEMENT
- 13 DtN Plate
- 20 TRANSMITTED AIR PLANE WAVE on ACOUSTIC/Biot98 ELEMENT
- 21 TRANSMITTED AIR PLANE WAVE on ELASTIC ELEMENT
- 21 TRANSMITTED AIR PLANE WAVE on Biot2001 ELEMENT
- 60 UNIT NORMAL VELOCITY on H12 with FLUX APPLICATION
- 98 PERIODICITY LEFT

- 99 PERIODICITY RIGHT
- 4xx ZOD impair/pair
- 400 FSI
- 1xyz Excitation wave 1 angle xyz in degree(PEM)
- 2xyz Excitation wave 2 angle xyz in degree(PEM)
- 3xyz Excitation wave 3 angle xyz in degree(PEM)
- 500 VELOCITY DIFFRACION CYLINDRE EF

1.2.3 Models for elements

- 1 TR6
- 2 H12
- 3 TR3
- 10 DGM on TR
- 11 DGM on H

Chapter 2

How to use the Multilayer solver

The Multilayer solver can be launched with a call

`PLANES_Multilayer(Name,Number,data_model,multilayer_1,frequency)`

- `Name` is a string associated to the name of the project. This string is the same than the folder in The project area.
- `Number` is an integer. This is the number of the subproject
- `data_model` is a structure that contains the data of the model. In the present case, it only contains the angle of incidence.
- `multilayer` is a structure array which contains one or several multilayer structures. It is associated to several arrays
  - `multilayer.nb(1,#m)` correspond to the number of layer of multilayer structure`#m`.
  - `multilayer.termination(1,#m)` correspond to the termination condition of multilayer structure`#m`. The value is 0 for rigid backing and 1 for a radiation condition
  - `multilayer.d(#l,#m)` correspond to the thickness of the layer `#l` of multilayer structure `#m`. It is a real number.
  - `multilayer.mat(#l,#m)` correspond to the material of the layer `#l` of multilayer structure `#m`. The label is an integer associated to the convention presented in section 1.2.1.
- `data_model` is a structure that contains the data of the model. In the present case, it only contains the angle of incidence. It can be either a real number or an array of two real numbers.

- `frequency` is the structure associated to frequency

The result of the Multilayer solver is a File:

`Name of the project_#subproject.PW`

It is a text file in which each line has $1 + 6l$ columns. The first one correspond to the frequency. The remaining $6l$ columns correspond to the result for multilayer structure $\#l$ and are ordered

- Absorption coefficient
- Real part of the reflexion coefficient
- Imaginary part of the reflexion coefficient
- Transmission loss
- Real part of the transmission coefficient
- Imaginary part of the transmission coefficient

Chapter 3

How to use the FEM/DGM solver

The result of the Multilayer solver is a File:

`Name of the project_#subproject.PL`

Chapter 4

Benchmarks

4.1 Kundt Tube

Sous projets

- 0: TR6
- 1: H12
- 2: TR6/H12
- 3: DGM on TR
- 4: DGM on H
- 5: DGM on TR / DGM on H
- 6: H12 / DGM on H
- 7: TR6 / DGM on H

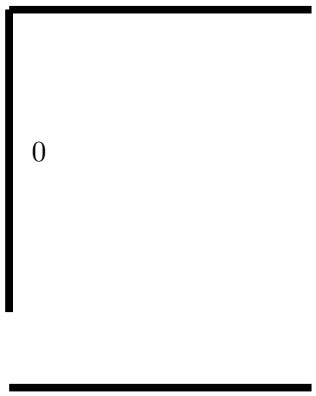


Figure 4.1: caption