
Operator MODI_CHAR_YACS

1 Drank

the object of this command is to on the structure recover (*via* YACS) the forces imposed by the fluid. This field of force is project on the mesh structure with the interface fluid-structure and is then added with the preexistent mechanical loading.

This operator is used by the macro-command `CALC_IFS_DNL` (*cf* U7.06.01 documentation) which allows computations fluid-structures coupled in nonlinear transient regime. For that, one comes to couple *Code_Aster*, for the structure part, in *Code_Saturne*, for the fluid field, *via* supervisor YACS of Salomé.

Contents

1	But1.....
2	Syntaxe3.....
3	Principle of fonctionnement4.....
4	Key word CHAR_MECA4.....
5	Key word MATR_PROJECTION4.....
6	Key word NOM_CMP_IFS4.....
7	Key word VIS_A_VIS4.....
8	Key word INST, NOT and NUME_ORDRE_YACS5.....

2 Syntax

```
resu [char_meca] = MODI_CHAR_YACS (
    ♦reuse=charmeca , [char_meca]
    ♦CHAR_MECA=charmeca , [char_meca]
    ♦MATR_PROJECTION =matrproj , [ corresp_2_mailla ]
    ♦NOM_CMP_IFS=lcompifs , [l_Kn]
    ♦VIS_A_VIS = (_F (
        ♦GROUP_MA_1=lgma1 , [l_gr_maille]
        ♦GROUP_NO_2=lgno2 , [l_gr_noeud]
        ),),
    ♦INST =inst , [R]
    ♦PAS =pas , [R]
    ♦ NUME_ORDRE_YACS=numyacs , [I]
    ♦INFO=/ 1 , [DEFAULT]
        /2 ,
    )
```

3 Principle of operation

method of coupling for the interaction fluid-structure based on *Code_Aster* and *Code_Saturne* require the data exchange between these codes. Indeed, it is not about a monolithic approach where all the coupled problem would be solved in a single computer code: one couples two codes, each one being confined with his speciality. This coupling is managed by the command `CALC_IFS_DNL` (U7.06.01).

All the data to be exchanged use protocol YACS of Salomé.

These data can be of two different nature:

- parameters of smalls (of the scalars, for example),
- fields (meshes, displacements, velocities or forces with the interfaces, for example).

In order to keep a good modularity, favourable with the evolutions, different operators were thus developed, each one treating one of the types of data to be exchanged.

The scalar data are handled by `RECU_PARA_YACS` (U7.06.21), the fields by `ENV_CINE_YACS` (U7.06.11) and `MODI_CHAR_YACS` (U7.06.22) or the operator `IMPR_MAIL_YACS` who recover, via YACS, the fluid meshes of the interfaces. All these commands are called by `CALC_IFS_DNL`.

Operator `MODI_CHAR_YACS` allows to take into account the forces due to the fluid the interface fluid-structure, at a given time. This stage of fluid-structure coupling, which one must reactualize with each time step (even iteration into implicit) breaks up as follows:

- by a call YACS, one recovers the forces with the interface (which are defined on the fluid mesh),
- thanks to data structure of the `corresp_2_mailla` type generated by `PROJ_CHAMP` (U4.72.05), one will project this fields on the mesh structure with the interface,
- this field project is finally added with the preexistent mechanical loading.

This command will thus modify an existing data structure of `char_meca` type.

To be able to use this functionality it is thus necessary to lay out, as a preliminary, of a mechanical loading and a data structure `corresp_2_mailla` for projection.

4 Key word CHAR_MECA

This a key word is compulsory makes it possible to specify the mechanical loading which one will modify.

5 Key word MATR_PROJECTION

This key word makes it possible to define the matrix of projection of the fluid mesh towards the solid mesh (data structure of the `corresp_2_mailla` type calculated with `PROJ_CHAMP`).

6 Key word NOM_CMP_IFS

This key word makes it possible to specify which components of the fluid field of force one wants to apply to structure. For example, if one wants 3D to apply all the components for a model, one will write:

```
NOM_CMP_IFS = ("FX", "FY", "FZ").
```

One can thus, contrary, not to take account of certain components, according to the needs.

7 Key word VIS_A_VIS

Like `MODI_CHAR_YACS` makes in-house a stage of projection, one finds part of the syntax of `PRO_CHAMP`. One thus returns towards documentation u4.72.05 for factor key word the `VIS_A_VIS` and his key word simple `GROUP_MA_1` and `GROUP_NO_2`. For fluid-structure coupling, `GROUP_MA_1` corresponds to meshes of the mesh structure to the level of the interface fluid-structure and `GROUP_NO_2` points on the nodes group of the fluid mesh in opposite to the interface.

8 Key word INST, NOT and NUME ORDRE YACS

MODI_CHAR_YACS need a communication YACS to read the fluid forces at a given time. However, communications YACS need certain arguments as starter:

- time running given by the key word INST,
- the last time step known with the key word NOT,
- the call number YACS (sequence number managed by CALC_IFS_DNL).

These parameters, which depend on current time, are managed automatically by CALC_IFS_DNL.