Operator ENV_CINE_YACS

1 Goal

The object of this order is to send (*via* YACS) the displacement and speeds of the structure to the interface fluid-structure of the fluid field. These fields kinematics, obtained by a calculation on the structure, are projected by this operator on the fluid discretization, so that *Code_Saturne* can exploit them directly.
This operator is used by the macro-order CALC_IFS_DNL (*cf.* U7.06.01 documentation) which allows calculations fluid-structures coupled in non-linear transitory mode. For that, one comes to couple *Code_Aster*, for the structure part, with *Code_Saturne*, for the fluid field, *via* supervisor YACS of Salomé.

Contents

2 Syntax

```
ENV_CINE_YACS (

    ♦ /  RESULT =    (_F (
      ♦  RESU          =   resu,          [ resultat_sdaster ]
      ♦  NUME_ORDRE    =  numord,         [R]
           ),),
      /  ETAT_INIT =   (_F (
      ◊  DEPL          =  depl ,          [ cham_no_sdaster ]
      ◊  QUICKLY       =  quickly,           [ cham_no_sdaster ]
      ◊  ACCE          =  acce,           [ cham_no_sdaster ]
           ),),

    ♦  MATR_PROJECTION  =  matrproj,       [ corresp_2_mailla ]

    ♦  VIS_A_VIS =   (_F (
      ♦  GROUP_MA_1    =  lgma1  ,        [l_gr_maille]
      ♦  GROUP_NO_2    =  lgno2  ,        [l_gr_noeud]
           ),),
    ♦  INST             =  inst,          [R]
    ♦  NOT              =  not,           [R]
    ♦  NUME_ORDRE_YACS  =  numyacs,       [I]
    ◊  INFORMATION   =  / 1,                    [DEFECT]
                        / 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 order 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 (grids, displacements, speeds or efforts 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 (U7.08.01), fields by ENV_CINE_YACS (U7.07.01) and MODI_CHAR_YACS (U7.08.02) or the operator IMPR_MAIL_YACS who recovers, via YACS, the fluid grids of the interfaces. All these orders are called by CALC_IFS_DNL.

The operator ENV_CINE_YACS allows to send to the fluid code the fields kinematics the interface: fields of displacement and speed, which are necessary to the stage ALE in the fluid field. This stage of the coupling fluid-structure, which one must reactualize with each step of time (even iteration into implicit) breaks up as follows:

- one extracts the fields kinematics from a result object coming from DYNA_NON_LINE or one leaves directly fields given by the user like initial state,
- thanks to the structure of data of the type corresp_2_mailla generated by PROJ_CHAMP (U4.72.05), one will project these fields on the fluid grid with the interface,
- by two calls YACS, one sends the two fields projected to the interface (which are thus defined on the fluid grid).

This order does not generate an object with the direction Aster.

To be able to use this functionality it is thus necessary to lay out, as a preliminary, of fields of displacement and speed (being able to be in a result object) and a structure of data corresp_2_mailla for projection.

4 Keyword factor **RESULT**

The operator ENV_CINE_YACS will search the fields kinematics in the result object thus specified.

4.1 Keyword **RESU**

The user gives the name of the result object to question.

4.2 Keyword **NUME_ORDRE**

This keyword makes it possible to specify with which sequence number one will extract the fields from displacement and speed. The fact of using as variable of access the sequence number and not the moment is not a problem because in the algorithm of coupling of CALC_IFS_DNL , this stage is repeated with all the sequence numbers.

5 Keyword factor **ETAT_INIT**

Instead of going to extract the fields in a result object with a given sequence number, one can return these fields directly, like defining an initial state. For that, the user indicates directly the fields kinematics with the keyword DEPL , QUICKLY and ACCE .

6 Keyword MATR_PROJECTION

This keyword makes it possible to define the matrix of projection of the fluid grid towards the solid grid (structure of data of the type corresp_2_mailla calculated with PROJ_CHAMP).

7 Keyword VIS_A_VIS

Like MODI_CHAR_YACS in-house fact a stage of projection, one finds part of syntax of PROJ_CHAMP. One thus returns towards U4.72.05 documentation for the keyword factor VIS_A_VIS and its keyword simple GROUP_MA_1 and GROUP_NO_2. For the coupling fluid-structure, GROUP_MA_1 corresponds to the meshs of the grid structure on the level of the interface fluid-structure and GROUP_NO_2 point on the group of nodes of the fluid grid in opposite to the interface.

8 Keyword INST, NOT and NUME_ORDRE_YACS

MODI_CHAR_YACS need for a communication YACS has to read the fluid efforts at a given moment. However, communications YACS need certain arguments as starter:

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

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