Operator ENV_CINE_ YACS

1 Drank

the object of this command is to send (*via* YACS) the displacement and velocities of structure to the interface fluid-structure of the fluid field. These kinematical fields, obtained by a computation 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-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

2 Syntax

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ENV_CINE_YACS (

    ♦/RESULTAT=            (_F (

      ♦RESU        =   resu,          [ resultat_sdaster ]

      ♦NUMÉRIQUE_ORDRE=numord      ,          [R]

            ),),

      /ETAT_INIT       =  (_F (

      ◊DEPL        =depl   ,       [ cham_no_sdaster ]

      ◊VITE        =vite  ,           [ 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]

   ♦PAS                =pas   ,           [R]

   ♦NUMÉRIQUE_ORDRE_YACS=numyacs       ,         [I]

   ◊INFO=/          1   ,                      [DEFAULT]
               /2  ,

)
```

3 Principle of operation

the method of coupling for the interaction fluid-structure based on *Code_Aster* and *Code_Saturne* requires 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 (U7.08.01), the fields by ENV_CINE_YACS (U7.07.01) and MODI_CHAR_YACS (U7.08.02) 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 ENV_CINE_YACS allows to send to the fluid code the kinematical fields the interface: fields of displacement and velocity, which are necessary to the stage ALE in the fluid field. This stage of fluid-structure coupling, which one must reactualize with each time step (even iteration into implicit) breaks up as follows:

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

This command does not generate an object with the meaning Aster.

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

4 Factor key word **RESULTAT**

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

4.1 Key word **RESU**

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

4.2 Key word **NUME_ORDRE**

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

5 Factor key word **ETAT_INIT**

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

6 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).

7 Key word VIS_A_VIS

Like MODI_CHAR_YACS makes in-house a stage of projection, one finds part of the syntax of PROJ_CHAMP. One thus returns towards U4.72.05 documentation 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.