To introduce a new degree of freedom and the associated boundary conditions

Summarized:
What should be made when one adds a new degree of freedom in one of quantities DEPL_R, TEMP_R or PRES_C?

In particular, that does one have to make so that one can “force” this degree of freedom by linear relations dualized (AFFE_CHAR_MECA for example) or eliminated (AFFE_CHAR_CINE)?

1 Presentation

When one adds a component to the one of quantities DEPL_R, TEMP_R or PRES_C, it is frequent that one has to impose kinematical boundary conditions on this new degree of freedom. For example, one wants to be able to block it.

The user wanting to force this degree of freedom will be able to do it, for example, via the following commands and keywords:

Order	Key word factor
AFFE_CHAR_MECA (_F)	DDL_IMPOFACE_IMPO
AFFE_CHAR_MECA_C	DDL_IMPO
AFFE_CHAR_THER (_F)	TEMP_IMPO
AFFE_CHAR_ACOU	PRES_IMPO
AFFE_CHAR_CINE	MECA_IMPO
AFFE_CHAR_CINE	THER_IMPO

So that the program can force this new degree of freedom, it is necessary to modify/add three types of catalogs. There is no FORTRAN to modify.

- The first stage is the inscription with the catalog of quantities of this new degree of freedom “to the end” of quantity DEPL_R in mechanics, of quantity TEMP_R in thermal, quantity PRES_C in acoustics.
- The second phase consists in updating the catalogs of commands AFFE_CHAR_XXX
- the third stage is to create the new element of Lagrange associated with its new degree of freedom while taking as a starting point the existing elements (the only difference between these various elements is the name of the degree of freedom, it is almost a recopy).

Note:

The stage number 3 is necessary to be able dualiser the boundary conditions implying the new degree of freedom. It would be useless if one wished to use only command AFFE_CHAR_CINE (elimination)

With regard to the elements of Lagrange, the finite element making it possible to introduce conditions on a degree of freedom must have as a name:

D_DEPL_R_nom_ddl	in D_TEMP_R_nom_ddl
mechanics	in D_PRES_C_nom_ddl
thermal	in acoustics

the name of a degree of freedom is restricted with 7 characters .

Once these 3 operations carried out, the new degree of freedom is usable for the boundary conditions.

2 Example joining together the three stages to introduce the degree of freedom, GRX (warping of the beams).

2.1 Catalog of quantities

```
%& MODIFICATION COMPELEM  DATES 6/15/2010
…
GRANDEUR_SIMPLE
<<  Standard  ABSC_R: R  Curvilinear abscisse along a telegraphic mesh
       ABSC  : curvilinear abscisse
       ABSC1: curvilinear abscisse of the 1st node of a SEG2
       ABSC2: curvilinear abscisse of the 2nd node of SEG2
>>
       ABSC_R   = R    ABSC     ABSC1    ABSC2

…

<<  DEPL_R Standard: R real Displacement with the nodes
       DX, DY, DZ: translation following X, Y AND Z (total reference)
       …
       LH1     : multiplier of Lagrange pressure through crack HM
>>
    DEPL_R   = R    DX       DY       DZ       DRX      DRY      DRZ      GRX      NEAR
                    PRE1     PRE2     TEMP     PHI      DH       DCX      DCY      DCZ
                    H1X      H1Y      H1Z      LAGR     E1X      E1Y      E1Z      E2X
…
```

2.2 Addition of a catalog of element: d_depl_r_grx.cata %&

```
AJOUT TYPELEM D_
DEPL_R_GRX TYPE

_ELEM ENTETE
__ELEMENT D_DEPL_R_GRX NETS      __SEG3 ELREFE
   __V_  SEG3 ENS
   _NOEUD INTO  1 =     2     3  ENS
   _NOEUD INTO  2 =     1     MODE

_LOCAL MDDLIMF
    =  DDLI_F ELEM   __(C)                MDDLIMR
    =  DDLI_R ELEM   __(C)                MDDLMUR
    =  DDLM_R ELEM   __(A1          )       DDL
    _MECA = DEPL_R ELNO   __DIFF IN
                                  1 (LAGR   )      IN
                                  2 (GRX    )      MGEOMER
    =  GEOM_R ELNO   __DIFF IN
                                  1 ()    IN
                                  2 (X    Y        Z        )        MTEMPSR
    =  INST_R ELEM   __(INST         )     VECTEUR

__MVECTUR
    = VDEP_R DDL_MECA MATRICE

__MMATUUR
    = MDEP_R DDL_MECA DDL_MECA OPTION

__MECA
    _BTLA_R 2         IN      __MDDLMUR   PDDLMUR  DDL  _MECA PLAGRAR OUT
                               __MVECTUR  PVECTUR  MECA
    _BU_R 2           IN      __DDL    _MECA PDDLIMR MDDLMUR  PDDLMUR  OUT
                               __MVECTUR  PVECTUR  …
```

Modification

2.3 of the catalogs of command (AFFE_CHAR_XXX/_C/_F and AFFE _CHAR_CINE/_F) Let us take

the example AFFE_CHAR_MECA of the command . If one wants to allow to block degree of freedom GRX , it is necessary to add this name (GRX) at various places of the catalog, as one can see it below. #&

```
MODIFICATION ORDERS DATE  7/20/2010…
AFFE
_CHAR_MECA=OPER (nom= " AFFE_CHAR_MECA", op= 7,   sd_prod=char_meca, Fr
                    = " Assignment of loads and boundary conditions… reentrant
                     = ',…
           DDL_IMPO

         =FACT         (statut=' f', max=' ** ",…
             rules
             = (AU_MOINS_UN ("TOUT", "GROUP_MA", "MESH", "GROUP_NO", "NOEUD"), AU_MOINS_UN
                    ("DX", "DY", "DZ", "DRX", "DRY", "DRZ", "GRX", "NEAR", "PHI", "TEMP
                                ", "PRE1", "PRE2", "UI2", "UI3", "VI2", "VI3", "WI2",…
                                DRX
             =SIMP              (statut=' F", typ=' R'), DRZ
             =SIMP              (statut=' f', typ=' R'), GRX
             =SIMP              (statut=' f', typ=' R'),…
             FACE_IMPO


         =FACT       (statut=' f', max=' ** ",…
             rules
             = (UN_PARMI ("GROUP_MA", "MESH",), AU_MOINS_UN
                    ("DX", "DY", "DZ", "DRX", "DRY", "DRZ", "GRX", "NEAR","PHI", "TEMP
                                ", "PRE1", "PRE2", "DNOR", "DTAN"),…
             DRX
             =SIMP              (statut=' F", typ=' R'), DRY
             =SIMP              (statut=' f', typ=' R'), DRZ
             =SIMP              (statut=' f', typ=' R'), DNOR
             =SIMP             (statut=' f', typ=' R'), DTAN
             =SIMP             (statut=' f', typ=' R'), GRX
             =SIMP              (statut=' f', typ=' R'),…
```