
Data format `sd_ligrel` and `sd_modele`

Summarized:

The structure `DE` given `sd_modele` represents result assignment of finite elements on meshes of a mesh.

A structure of data `sd_ligrel` is `U` does not list groups of finite elements in the same way standard.

Note: The `sd_modele` is not the only data structure being able to contain a `sd_ligrel`.

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1 data structures in some keys

In short:

- a `sd_ligrel` contains a set of finite elements and/or of static substructures. A finite element being the formed couple of a mesh (mesh of the mesh or "late" mesh) and of a kind of finite element (`type_elem`),
- a `sd_ligrel` can contain static substructures: "activation" the superone of the `sd_maillage` [D4.06.01 §2]. If a `sd_ligrel` does not contain finite elements, then it must contain substructures.
- meshes supporting the finite elements can be meshes mesh or the meshes additional ones (or late),
- a `sd_modele` contains a `sd_ligrel` ; but it can also exist a `sd_ligrel` in other SD; for example in a `sd_char_meca` [D4.06.04],
- to allow the parallelism of elementary computations and assemblies, one arranges oneself so that one can, in general, "to go up" of a `sd_ligrel` until a `sd_modele` (which contains the `sd_partition`).
- in a `sd_ligrel`, a mesh of the mesh can carry only one finite element to more (object `.REPE`),
- in a `sd_modele`, a node of the mesh can support only one finite element with more (object `.NOEU`). The possibility of affecting of the finite elements on nodes makes impossible the use of the `cham_elem_s` ; this use thus should be avoided as much as possible.
- with a `sd_ligrel` is associated a `PHENOMENE` and only one: "MECHANICAL", "THERMAL",...
- with each `PHENOMENE` is associated a particular `mode_local`: "DDL_MECA", "DDL_THER" or "DDL_ACOU". This `mode_local` of the finite elements determines (via the catalog of `type_element`) the `ddl`s of the `sd_ligrel` (objects `.PRNM` and `.PRNS`),
- a `sd_ligrel` (as a `sd_modele`) is always associated with a `sd_maillage`.

2 Tree structures

```
sd_ligrel      (K19)      .: =record

(O)   ".NBNO" :      OBJ      S      V      I
(O)   ".LGRF" :      OBJ      S      V      K8      long=2
(O)   ".PRNM" :      OBJ      S      V      I

| % if the sd_ligrel of the finite elements contains
(O)   ".LIEL" :      OBJ      XC     V      I      NU ()

(F) % if the sd_ligrel contains elements on meshes      mesh:
      ".REPE" :      OBJ      S      V      I

(F) % if the sd_ligrel contains elements on the meshes
late ones:
      ".NEMA" :      OBJ      XC     V      I      NU ()

(F) % if the sd_ligrel contains late nodes:
      ".PRNS" :      OBJ      S      V      I
      ".LGNS" :      OBJ      S      V      I

| % if the sd_ligrel contains static substructures
(O)   ".SSSA" :      OBJ      S      V      I

| % if the sd_ligrel contains elements needing the vicinity
(O)   ".NVGE" :      OBJ      S      V      K16 (long=1)

sd_modele     (K8)      .: =record

(O)   ".MODELE" :      sd_ligrel

(F) % if the sd_modele contains of the finite elements:
      ".MAILLE" :      OBJ      S      V      I
      ".NOEUD"  :      OBJ      S      V      I

(F) % if the sd_modele comes of the command MODI_MODELE_XFEM :
      "$VIDE"   :      sd_modele_XFEM

(F) % if the user wishes parallel elementary computations:
      ".PARTIT" :      OBJ      S      V      K8
```

3 Contained of the JEVEUX objects of the sd_ligrel

3.1 Object ".LGRF"

".LGRF" : S V K8 (long=2)

V (1) : name of the mesh associated with the sd_ligrel.

V (2) : name of the sd_modele giving access a sd_partition (parallelism of elementary computations). If this information is missing, one cannot parallel elementary computations (nor assemblies).

Attribute "DOCU" of this object contains: "MECA"/"THER"/"ACOU". This information makes it possible to determine the ddls carried by the nodes (objects .PRNM and .PRNS)

3.2 Object ".NBNO"

".NBNO" : S V I (long=1)

the number of late nodes of the sd_ligrel Object

3.3 ".PRNM"

".PRNM Contains" : S V I

This object describes the degrees of freedom carried by the nodes of the sd_ligrel. He takes account of the degrees of freedom brought by the finite elements and those brought by substructures.

That is to say:

V = .PRNM

nbno = many nodes of the mesh

nec = many coded integers necessary to the fundamental quantity associated with the sd_ligrel
nec = (many CMP (fundamental quantity)/ 30) +1

for I = 1, nbno :

V (nec* (i-1) +1)	1st integer coded of node I
V (nec* (i-1) +2)	2nd integer coded of node I
...	
V (nec* (i-1) +nec)	last integer coded of node I

3.4 Object ".LIEL"

".LIEL" : XC V I NU ()

collection `.LIEL` contains the numbers of meshes supporting of the finite elements. The elements are gathered by groups of elements in the same way standard (`GREL`) [D0.04.02]. An object of the collection corresponds to a `GREL`.

That is to say I the ième `GREL` of `SD_LIGREL`

```
V = .LIEL (I)
N = LONG (V) = l+nbre of meshes of the ième GREL
```

V (1)	number of the mesh associated with the 1st element of the <code>GREL</code>
V (2)	number of the mesh associated with the 2nd element of the <code>GREL</code>
...	
V (n-1)	number of the mesh associated with the last element of the <code>GREL</code>
V (N)	number of the type of element associated with the <code>GREL</code> I (object &CATA.TE.NOMTE [D4.04.01]) important

Conventions: if the mesh

- is a mesh of the mesh its number is stored such as it is. if the mesh
- is a late mesh, its number is stored with the minus sign (cf object `.NEMA`), the number of
- `GREL` of a `sd_ligrel` is worth : `NUITOC` ("`.LIEL` ") (Attention: the collection can be oversize: `NMAXOC` \geq `NUITOC`) Object `".REPE`

3.5 " ".REPE " : s

```
V I Is V = "
```

```
.REPE
```

```
"nbma = number of meshes
of the mesh associated with the LONG sd_ligrel (V) = 2*nbma for I = 1,
```

```
nbma V (2 (i-1) +1) :
number of the GREL associated with mesh I with the mesh V (2 (i-1) +2):
position in the GREL of the mesh I of the mesh This object is
```

I" "opposite" of L" object `.LIEL` concerning meshes of the mesh If I am

a nonaffected mesh: $V (2 (i-1) +1) = V (2 (i-1) +2) = 0$ Object `".NVGE`

3.6 " ".NVGE" : s

```
V K16 (long =1) V (1) : name
```

of the `sd_voisinage` assigned to the ligrel Object `".SSSA`

3.7 " ".SSSA" : s

```
V I Is : V = "
```

```
.SSSA
```

```
" nb_sm = number
```

of super - meshes of the LONG mesh (V) = Nb
_sm + 3 V (i=1, nbsm)

/1 if the super one	- mesh I am affected ("active" substructuring)/0 if not V (nbsm+1) many
super	- meshes of the mesh V (nbsm+2) many
active	substructures V (nbsm+3) many
nodes	of Lagrange of the mesh Note: V

(nb_sm+1) and

V (nb_sm+ 3) do not have to be used any more, information existing already in the mesh (object. DIME). Object ".NEMA

3.8 " ".NEMA": xc

V I NU This collection describes meshes late sd_ligrel. II exists an object of collection by late mesh. Caution:

This collection

is perhaps oversize. The real number of meshes late is obtained by NUTIOC (.NEMA). That is to say : nbmas

= number of meshes

late of the sd_ligrel nbmas = NUTIOC
(.NEMA) for I = 1,

nbmas V = .NEMA (I)

N = LONG (V)
= (many nodes of the mesh) + 1 V (L) number

of the 1st	node of the mesh I V (2) number
of the 2nd	node of the mesh I... V (n-1)
number	
of the last	node of the mesh I V (N) number
of the type	of the mesh I If the number

of a node is negative, it is the opposite of the number of a late node of the sd_ligrel (cf object . NBNO). Object ". PRNS

3.9 " ".PRNS": s

Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.

V I This object describes

the ddls carried by the late nodes of the sd_ligrel. That is to say: $V =$

.PRNS nbnos

= many

late nodes of the sd_ligrel nec = many

coded integers necessary to the fundamental quantity associated with the sd_ligrel nec = (many
CMP (fundamental quantity) / 30) + 1 for $I = 1,$

nbnos : $V (nec * (i-1) +$

1) 1st integer coded	of node I $V (nec * (i-1) +$
2) 2nd coded	integer of node I... $V (nec * ($
$i-1) +$	
nec) last coded	integer of node I "the small "

piece of .PRNS concerning node I am what L "one calls a Descriptor-Quantity [D4.06.05]. Object" .LGNS

3.10 “.LGNS”: s

V I the length

of this vector is higher than the number of late nodes of the sd_ligrel (L " object on - is dimensioned). V (INO): number

indicating how the late node of Lagrange INO must be numbered (see sd_nume_ddl) . V (INO): 0

node INO	is not a node of Lagrange V (INO): +1
node INO	is a node of Lagrange of the type "1". It must be numbered before the physical ddls that it constrained. V (INO): - 2
node INO	is a node of Lagrange of the type "2". It must be numbered after the physical ddls that it constrained. V (INO): - 1
node INO	is a node of Lagrange of the type "1". It must be numbered after the physical ddls that it constrained. V (INO): +2
node INO	is a node of Lagrange of the type "2". It must be numbered before the physical ddls that it constrained. Notice on

3.11 the redundant objects of the sd_ligrel Certain objects

of the sd_ligrel can result from other objects. The purpose of this redundant information is accelerating certain processing (from the point of view of the TEMPS CPU). Object .REPE

can result from .LIEL the objects . PRNM and .PRNS can result from .LIEL, .SSSA and .LGRF the routine

cormgi.f makes it possible to calculate .REPE the routine initel.f makes it possible to calculate .PRNM and .PRNS. Contents of the JEVEUX objects

4 of the sd_modele Object “.NET” “. ”.

4.1 NET”: S V I

Is V = LONG “. ”

.MAILLE ” (V) = number of meshes
of the mesh = nbma for I = 1, nbma

V (I): number of the type
of element carried by mesh I (= 0 if the mesh
is not affected by a finite element) Object “.NOEUD” “.NOEUD

4.2 ”: S V I Is

V = LONG “.NOEUD

” (V) = many
nodes of the mesh = nbno for I = 1, nbno v

(I): number of
the type of element carried by node I (= 0 if the node
is not affected by a finite element) Note:: A node

“does not carry

” not really of finite element. But to simplify the work of the user, the command AFFE_MODELE makes it possible to affect of the finite elements “specific” on nodes of the mesh. That avoids with the user thinking of creating meshes POI1 in its mesh . This possibility is however not recommended; indeed, such a model will not be able to be the nonlinear object of computation (in general). In this case, the point element is carried by a late mesh of type POI1 created by AFFE_MODELE . Object “.PARTIT” “. ”.

4.3 LEFT”: S V K8

length = 1 V (1): name of

the sd_partition describing the parallelism of elementary computations. Examples SD sd_modele

5 MOTH

5.1 =AFFE _MODELE (

```
MAILLAGE=MAIL, AFFE =_F (TOUT = "OUI"  
    , MODELISATION = "AXIS", PHENOMENE = "THERMAL ") product:
```

```
-----  
-----  
PRINTING SEGMENT  
OF VALUES >MOTH .MAILLE < 1 - 289 289 300  
300 300
```

```
-----  
PRINTING OF THE COLLECTION  
: MOTH .MODELE .LIEL PRINTING OBJET OF  
COLLECTION CONTIGUE>MOTH .MODELE .LIEL< OC : 1 1 - 1 2 289 PRINTING  
OBJET OF  
COLLECTION CONTIGUE>MOTH .MODELE .LIEL< OC : 2 1 - 3 4 5 300
```

```
-----  
PRINTING SEGMENT  
OF VALUES >MOTH .MODELE .NBNO < 1 - 0
```

```
-----  
PRINTING SEGMENT  
OF VALUES >MOTH .MODELE .LGRF < 1 - >MAIL <
```

```
-----  
PRINTING SEGMENT  
OF VALUES >MOTH .MODELE .PRNM < 1 - 2 2 2 2 2  
6 - 2 0 0 0 0  
... 41 - 0 0 0 2  
2  
0 46 - 0 0 0 0  
0 51 - 0 0 0 0  
0 56 - 0 0 0 0  
0 61 - 0 0 0 0
```

```
-----  
PRINTING SEGMENT  
OF VALUES >MOTH .MODELE .REPE < 1 - 1 1 1 2 2  
6 - 1 2 2 2 3
```

```
-----  
PRINTING SEGMENT  
OF VALUES >MOTH .NOEUD < 1 - 0 0 0 0 0  
6 - 0 0 0 0 0  
... 56 - 0 0 0 0  
0  
0 61 - 0 0 0 SD  
sd_ligrel (load
```

5.2) CHTH=AFFE _CHAR_THER

Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.

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Responsable : Jacques PELLET

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```
(MODELE=MOTH, TEMP_ IMPO=_F (NOEUD  
= "N4", TEMP = 100.0)) produced:
```


PRINTING SEGMENT

```
OF VALUES >CHTH .CHTH.LIGRE.LGNS < 1 - 1 -2 0 0 0 6 - 0 0 0
```

PRINTING OF THE COLLECTION: CHTH

```
.CHTH.LIGRE.LIEL PRINTING OBJET OF COLLECTION CONTIGUE>CHTH .CHTH.LIGRE.LIEL<  
OC: 1 1 - -1 92
```

PRINTING SEGMENT OF VALUES >CHTH .CHTH.LIGRE.NBNO < 1 - 2

PRINTING OF THE COLLECTION: CHTH .CHTH.LIGRE.NEMA PRINTING OBJET OF COLLECTION
CONTIGUE>

```
CHTH .CHTH.LIGRE.NEMA< OC: 1 1 - 4 -1 -2 4
```

PRINTING
SEGMENT OF VALUES
>CHTH .CHTH.LIGRE.LGRF < 1 - >MAIL <

PRINTING SEGMENT OF VALUES
>CHTH .CHTH.LIGRE.PRNM <
1 - 0 0 0 2 0 6 - 0 0 0 0 0... 61 - 0 0 0

PRINTING
VALUES OF
SEGMENT > CHTH
.CHTH.LIGRE.PRNS
< 1
- 16 16