Operator `DEFI_LIST_FREQ`

1 Goal

To create a list of realities while possibly refining around values of frequencies informed by the user.

Product a structure of data of the type `listr8`.
2 Syntax

Lr [lstr8] = DEFI_LIST_FREQ
   (     ♦ / VALE=  lr8 , [l_R]
       / ♦ DEBUT=   debu , [R]
       ♦ INTERVALLE= (_F ( ♦ JUSQU_A = r1, [R]
                       ♦ / NUMBER = n1, [I]
                       / NOT = r2, [R]
                   ),),
     ),
     ◊ RAFFINEMENT= (_F (                      # Keyword only associated with the criteria ‘RELATIVE’ and ‘ABSOLUTE’:
       ♦ LIST_RAFFINE = lr8 , [l_R]
       ◊ NB_POINTS = / 5 , [DEFECT]
                   / Pt , [I]
       ◊ PAS_MINI = / 0.001 , [DEFECT]
                   / not , [R]
       ◊ CRITERION = / ‘RELATIVE’ ,
                   / ‘ABSOLUTE’ ,
                   / ‘LARGEUR_3DB’,
     ),
     # Keyword only associated with the criterion ‘LARGEUR_3DB’:
     ◆ / AMOR_REDUIT = lr8_amor, [l_R]
     / LIST_AMOR = l_amor , [lstr8]
     ◆ INFORMATION = / 1 ,
     [DEFECT]
     / 2 ,
     ◆ TITLE = title , [l_Kn]
)
3 Operands

3.1 Operand VALE

VALE = lr8
List of "basic" realities which will automatically be part of the structure of data listr8 result. This list can be built starting from a list Python.

3.2 Operand BEGINNING

♦ BEGINNING = debu
The first reality of the list of "basic" realities which one wants to build.

3.3 Operand INTERVAL

♦ INTERVAL =
  ♦ JUSQU_A = r1
    End of the interval which one will cut out with a constant step.
  ♦ / NUMBER = n1
    Many steps which one wants in the interval which ends in r1.
  / NOT = r2
    Pas de division interval.

Notice:
All the values required in the basic list are automatically in the final list at exit of DEFI_LIST_FREQ.
When the keyword is used NOT it may be that the number of calculated step is not rigorously whole. One "will then adapt" the last interval to fall down exactly on the end value (JUSQU_A).

3.4 Keyword REFINEMENT

3.4.1 Operand LIST_RAFFINE

♦ LIST_RAFFINE = lr8
List of the frequencies around which one wishes to refine. This list can be built starting from a list Python. This keyword is particularly interesting in the case of a harmonic analysis of a structure (operator DYNA_VIBRA [U4.53.03]), because it will make it possible to calculate the harmonic answer around the Eigen frequencies of the structure and thus to recover the local extrema of them. It is possible to directly recover the Eigen frequencies in a structure of data of the type mode_XXX exit of a modal calculation carried out for example with the order CALC_MODES. It is enough for that to use the function LIST_VARI_ACCES ()
It is pointed out that it is then essential to carry out the code in mode PAR_LOT=' NON' (keyword of the order BEGINNING or CONTINUATION. For more details to see documentation [U1.03.02]).

Example:
MODES=CALC_MODES (MATR_RIGI=MATASSR,
                       MATR_MASS=MATASSM,
OPTION = 'ADJUSTS',
    CALC_FREQ=_F (FREQ= (5., 10., 15., 20.,
    24., 27.))

list_freq = MODES.LISTE_VARI_ACCES () ['FREQ']

list_freq is thus a list python containing the list of the Eigen frequencies present in
the result MODES.

3.4.2 Operand PAS_MINI

◊ PAS_MINI = / 0,001 , [R]

If the difference between two values is lower than PAS_MINI then one of them is removed.

Exception: if the two values concerned belong one to the list given under LIST_RAFFINE and
the other with the basic list, then they are kept both.

3.4.3 Operand DISPERSION

◊ DISPERSION = / 0.01 , [DEFECT]

DISPERSION is the width of the interval surrounding each frequency of LIST_RAFFINE where
one wants to refine.

3.4.4 Operand CRITERION

◊ CRITERION = / 'RELATIVE' , [DEFECT]

If CRITERION = 'RELATIVE' or 'ABSOLUTE':

◊ DISPERSION = / 0.01 , [DEFECT]

The width of the interval $df$ surrounding each frequency $freq_i$ of LIST_RAFFINE
where one wants to refine is worth:

• If CRITERE=' RELATIF' :
  $df = \text{disp} \cdot freq_i$

• If CRITERE=' ABSOLU' :
  $df = \text{disp}$

If CRITERE=' LARGEUR_3DB':

◊ / AMOR_REDUIT = lr8_amor

List of reduced depreciation ($\eta_1$, $\eta_2$, ..., $\eta_n$ expressed as a percentage)
corresponding to each clean mode of the system in the form of list of realities.

/ LIST_AMOR = l_amor

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provided as a convenience.
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Name of the concept of the type listr8 containing the list of reduced depreciation (\( \eta_1, \eta_2, ..., \eta_n \) expressed as a percentage).

**Notice:**

If the number of reduced depreciation given is lower than the number of basic vectors used in the modal base, depreciation of the additional vectors is taken equal to the last damping of the list.

If damping \( \eta_i \) is nonnull, the frequency \( \text{freq}_i \) used to calculate Llength of the interval has \( \text{df} \) is the frequency \( \text{freq}_i \) of \text{LIST\_RAFFINE} shifted at the frequency of resonance of a forced system: 

\[
\text{freq}_i = \text{freq}_i \sqrt{1 - 2 \eta_i^2}
\]

The length of the interval \( \text{df} \) surrounding each frequency \( \text{freq}_i \) where one wants to refine is worth:

- If \( \eta_i \neq 0 \):
  \[ \text{df} = 2 \eta_i \text{freq}_i \]
- If \( \eta_i \neq 0 \):
  \[ \text{df} = 0.01 \text{freq}_i \]

### 3.4.5 Operand NB\_POINTS

\[
\begin{align*}
\diamond \text{NB\_POINTS} &= /5/, [\text{DEFECT}] \\
&/ \text{Pt}, [\text{I}]
\end{align*}
\]

\( \text{NB\_POINTS} \) is the number of points which one wants to add around the frequencies of the list \text{LIST\_RAFFINE}.
The added points are uniformly distributed in the interval \( \text{df} \). Thus if \( \text{NB\_POINTS} \) is an odd number the frequencies of \text{LIST\_RAFFINE} will be in the final list.
If \( \text{CRITERE='LARGEUR_3DB'} \) and \( \text{NB\_POINTS} \) is an even number, the frequency is kept \( \text{freq}_i \) of \text{LIST\_RAFFINE} and the frequency of resonance is added of a forced system such as:

\[
\text{freq}_i = \text{freq}_i \sqrt{1 - 2 \eta_i^2}
\]

### 3.5 Operand INFORMATION

\[
\begin{align*}
\diamond \text{INFORMATION} &= \text{I}
\end{align*}
\]

Indicate the level of impression of the results of the operator.

1: no impression,
2: impression of the list of realities created

### 3.6 Operand TITLE

\[
\begin{align*}
\diamond \text{TITLE} &= \text{title}
\end{align*}
\]

Title which the user wants to give to his list of realities.
4 Examples

The cas-test sld21b presents an example of use of **DEFI_LIST_FREQ**.

**Example 1:**

Let us imagine that one wants to create the basic list:

\[ 1. \ 3. \ 5. \ 10. \ 15. \]

who is such as the step is:

\[ 2. \ \text{of} \ 1. \ \text{with} \ 5. \]

\[ 5. \ \text{of} \ 5. \ \text{with} \ 15. \]

And that one wants to refine around frequency 3.5 with the criterion ‘ABSOLUTE’.

One can write:

\[
L_r = \text{DEFI\_LIST\_FREQ} \ (\text{BEGINNING} = 1., \ \\
\text{INTERVAL} = (_F (\text{JUSQU\_A}= 5., \text{NOMBRE}= 2,), \ \\
_F (\text{JUSQU\_A}= 15., \text{PAS}= 5,),),) , \\
\text{REFINEMENT} = (_F (\text{LIST\_RAFFINE}= 3.5, \ \\
\text{PAS\_MINI}= 0.001, \ \\
\text{NB\_POINTS}= 5, \ \\
\text{CRITERE}= 'ABSOLU', \ \\
\text{DISPERSION}= 0.02),),)
\]

A list then is obtained **listr8** containing the values:

[1. , 3. , 3.49,3.495,3.5,3.505,3.51,5. , 10. , 15. ]

**Example 2:**

By using the criterion ‘RELATIVE’ for refinement one can write:

\[
L_r = \text{DEFI\_LIST\_FREQ} \ (\text{VALE} = [1. , 3. , 5. , 10. , 15.], \ \\
\text{REFINEMENT} = (_F (\text{LIST\_RAFFINE}= 3.5, \ \\
\text{PAS\_MINI}= 0.001, \ \\
\text{NB\_POINTS}= 6, \ \\
\text{CRITERE}= 'RELATIF', \ \\
\text{DISPERSION}= 0.03),),)
\]

A list then is obtained **listr8** containing the values: