

NAME

`nem_slice` - generate a load-balance file from an ExodusII geometry file

SYNOPSIS

`nem_slice` [**-h**] [**-V**] [**-a** *inpfile*] [**< -n | -e >** **-v** **-m** *machine_desc* **-l** *loadbal_desc* **-s** *eigensolv_desc*] [**-w** *weighting_desc*] [**-o** *outfile*] [*exoIIfile*]

DESCRIPTION

`nem_slice` reads in a FEM description of the geometry of a problem from an *ExodusII* file, *exoIIfile*, generates either a nodal or elemental graph of the problem, calls *Chaco* to load balance the graph, and outputs a *NemesisI* load-balance file.

OPTIONS

The **-h** option causes `nem_slice` to print out usage information. If the **-h** option is specified all other options are ignored.

The **-V** option causes `nem_slice` to print out the version number. If the **-V** option is specified all other options are ignored.

If the **-a** option is specified all parameters will be set from an ASCII input file. Other command line options may be used with **-a** and such options will override anything respecified in the ASCII input file.

The **-n** option specifies that a nodal decomposition should be performed on the input FEM mesh, while the **-e** option specifies that an elemental decomposition should be performed. One of either **-e** or **-n** is required.

The **-v** option is used to indicate that you wish to output an ExodusII file which will allow you to visualize the load balance results. If the mesh consists of one type of element then the visualization is done by element blocks. If the mesh consists of mixed element types then the visualization is done by assigning nodal results variables to each FEM node in the mesh, the value of which corresponds to the processor ID that node is assigned to.

The **-m** option is used to describe the parallel architecture for which the load balance will be performed. There are currently two choices for this option, either *mesh* for an n-dimensional mesh architecture, or *hcube* for a hypercube architecture. Both machine type specifications require a sub-option giving the dimension(s) of the machine, and thus the number of processors, for which the load balance is to be performed.

The **-l** option is used to specify which method to utilize in generating a load balance for the given problem. In addition, a sub-option of **kl** can be specified if Kernighan-Lin refinement is desired and the main method does not use KL by default. The other sub-option is the number of sections to use (see the Chaco User's Guide for further information). This can be specified with the sub-option **num_sects=value**. Supported methods for load balancing are:

multikl
spectral
inertial
linear
random
scattered

The **-s** option is used to specify parameters for the eigensolver, if the method utilizes an eigensolver. Parameters which can be specified are:

tolerance=value
use_rqi
vmax=value

The **-o** option gives the name of the *NemesisI* output file. By default the output file name is generated from the input file name with different additions depending on the method being used for load balancing and the number of processors for which the load balance was generated.

The **-w** option is used to specify how to weight the graph of the problem once it is generated. Currently *read*, *eb*, and *edges* sub-options are supported. The *read* sub-option allows the reading in of weights from

an ExodusII file. Nodal values are read for nodal decompositions and elemental values for elemental decompositions. Along with the *read* sub-option other sub-options which can be specified are the name of the variable, either nodal or elemental depending on the method requested, as it exists in the ExodusII input file. This variable can either be specified via it's name with the *var_name* sub-option. Or it can be specified with it's index via the *var_index* sub-option. In addition the time index from which to read the given variable can also be specified with the *time_index* sub-option. The *eb* sub-option is used to give a specific weight to a given element block. The format to give block *n* a weight of *m* is

eb=n:m

If the sub-option *eb* comes after the *read* sub-option in the weighting specifications, then the value for the element block overwrites the values read in from the ExodusII file. If the *eb* sub-option comes before the *read* sub-option, then it is ignored. The *edges* sub-option is used to turn on edge weights for an elemental decomposition. The default is that edge weights are not calculated. This sub-option is ignored for a nodal decomposition.

INPUT FILE FORMAT

The optional ASCII input file closely mimics the command line options. The file consists of a sequence of keys, each with a tab or "=" separated value. The order of the keys is not significant and a line beginning with a "#" is considered to be a comment. The following keys are recognized by *nem_slice* :

Input ExodusII File
Output NemesisI File
Graph Type
Decomposition Method
Solver Specifications
Machine Description
Weighting Specifications

The case of the words forming a key is not significant.

COMMAND LINE EXAMPLES

To obtain a nodal load balance for a 2D mesh parallel computer with processors arrayed in a 10x20 grid using multi-level decomposition:

nem_slice -n -m mesh=10x20 -l multikl geom.exoII

For the same problem to be run on a 5 dimensional hypercube use:

nem_slice -n -m hcube=5 -l multikl geom.exoII

To generate an elemental based load balance using a spectral method, with KL refinement, for a 3D mesh architecture, with the RQI eigensolver and quadrisecton:

nem_slice -e -m mesh=10x5x2 -l spectral,kl,num_sects=1 -s use_rqi

To generate a nodal based load balance with Inertial+KL with weights read from nodal results contained in an ExodusII file use:

nem_slice -n -m mesh=10x5x2 -l inertial,kl -w read=weights.exoII,vindx=1,time=2

ASCII INPUT FILE EXAMPLE

(See the file "input-ldbl" distributed with the executable)

SEE ALSO

The Chaco User's Guide Version 1.0; B. Hendrickson, R. Leland; Sandia Report SAND93-2339, Nov. 1993

NemesisI: A Set of Functions for Describing Unstructured Finite Element Data on Parallel Computers; G. Hennigan, J. Shadid

NOTES

nem_slice attempts to be smart about parsing command line, or ASCII input file, options. However, some errors may sneak through, in which case **Chaco** is relied upon for error detection.

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