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Parallel Computational Acoustics Library - Mesh Generation Reference Manual

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Parallel Computational Acoustics Library

Mesh Generation Reference Manual*

by F. Magoulès and F.-X. Roux

June 13, 2002

Contents

1	Modules	3
1.1	mesh_struct	3
2	Functions	4
2.1	split_mesh	4
2.2	split_element	4
2.3	split_facet	5
2.4	build_glob_dirichlet	5
2.5	build_glob_robin	6
2.6	build_glob_neumann	6
2.7	build_glob_mesh	7
2.8	imove	7
2.9	rmove	8
2.10	echo_dirichlet	8
2.11	echo_neumann	9
2.12	echo_coor	9
2.13	echo_geom	10
2.14	echo_mesh	10
2.15	echo_splitting	11
2.16	inivec	11

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Index

Alphabetical

- build_glob_dirichlet, 5
- build_glob_mesh, 7
- build_glob_neumann, 6
- build_glob_robin, 6
- echo_coor, 9
- echo_dirichlet, 8
- echo_geom, 10
- echo_mesh, 10
- echo_neumann, 9
- echo_splitting, 11
- imove, 7
- inivec, 11
- mesh_struct, 3
- rmove , 8
- split_element, 4
- split_facet, 5
- split_mesh, 4

- echo_geom, 10
- echo_mesh, 10
- echo_neumann, 9
- echo_splitting, 11
- imove, 7
- inivec, 11
- rmove , 8
- split_element, 4
- split_facet, 5
- split_mesh, 4

Modules

- mesh_struct, 3

Files

- mesh_struct.f90
 - mesh_struct, 3
- splitmesh_main.f90
 - split_mesh, 4
- splitmesh_routines.f90
 - build_glob_dirichlet, 5
 - build_glob_mesh, 7
 - build_glob_neumann, 6
 - build_glob_robin, 6
 - echo_coor, 9
 - echo_dirichlet, 8
 - echo_geom, 10
 - echo_mesh, 10
 - echo_neumann, 9
 - echo_splitting, 11
 - imove, 7
 - inivec, 11
 - rmove , 8
 - split_element, 4
 - split_facet, 5

Sorted

Functions

- build_glob_dirichlet, 5
- build_glob_mesh, 7
- build_glob_neumann, 6
- build_glob_robin, 6
- echo_coor, 9
- echo_dirichlet, 8

1 Modules

1.1 **mesh_struct**

NAME

mesh_struct

SYNOPSIS

```
MODULE mesh_struct
```

DESCRIPTION

Mesh structure for split_mesh program.

ARGUMENTS

```
nodes_per_element – integer (= number of nodes per element)  
numb_elements – integer (= number of elements)  
  geometry – integer array (= geometry)  
  space_dim – integer (= number of coordinates per node)  
numb_nodes – integer (= number of nodes)  
  coordinates – real array (coordinates)  
numb_clamp_nodes – integer (= number of clamped nodes)  
  clamp_nodes – integer array (= clamped nodes)  
nodes_per_facet – integer (= number of nodes per facet)  
  numb_facets – integer (= number of facets)  
    facets – integer array (= facets)  
    facet2elem – integer array (= facet to element correspon-  
      dance)  
numb_clamp_facets – integer  
  clamp_facets – integer array (= clamped facets)
```

2 Functions

2.1 `split_mesh`

NAME

split_mesh

SYNOPSIS

```
PROGRAM split_mesh
```

DESCRIPTION

Build subdomains from a global domain divided in grid and mesh with regular hexahedron with all the same material properties: $\omega = 2\pi F/c$, with $c = 1$. The variables ω , F and c denotes respectively the wavenumber, the frequency, and the celerity.

ARGUMENTS

None

MODULES

```
USE mesh_struct
```

2.2 `split_element`

NAME

split_element

SYNOPSIS

```
SUBROUTINE split_element (ni,nj,nk,nsdi,nsdj,nsdk,      &
&                          subdom_num, num_elem, elem2subdom)
```

DESCRIPTION

Decompose regular hexaedric mesh of domain into subdomains and build elements to subdomain correspondance.

ARGUMENTS

ni – integer
nj – integer
nk – integer
nsdi – integer
nsdj – integer
nsdk – integer
subdom_num – integer
num_elem – integer
elem2subdom – integer array

2.3 split_facet

NAME

split_facet

SYNOPSIS

SUBROUTINE `split_facet` (`dom,elem2dom,facet2dom`)

DESCRIPTION

Detect facets on rear face of domain.

ARGUMENTS

dom – mesh structure
elem2dom – integer array
facet2dom – integer array

MODULES

USE `mesh_struct`**2.4 build_glob_dirichlet**

NAME

build_glob_dirichlet

SYNOPSIS

SUBROUTINE `build_glob_dirichlet` (`front,back,right,left,top,botton, &`
& `dom`)

DESCRIPTION

Detect clamped nodes on face of domain with the convention front ($x > 0$), back ($x < 0$), right ($y > 0$), left ($y < 0$), top ($z > 0$), botton ($z < 0$).

ARGUMENTS

front – integer
back – integer
right – integer
left – integer
top – integer
botton – integer
dom – mesh structure

MODULES

USE `mesh_struct`

2.5 build_glob_robin

NAME

build_glob_robin

SYNOPSIS

```

SUBROUTINE build_glob_robin (front,back,right,left,top,botton,    &
&                               dom)

```

DESCRIPTION

Detect robin facet on face of domain with the convention front ($x > 0$), back ($x < 0$), right ($y > 0$), left ($y < 0$), top ($z > 0$), botton ($z < 0$).

ARGUMENTS

front – integer
back – integer
right – integer
left – integer
top – integer
botton – integer
dom – mesh structure

MODULES

```

USE mesh_struct

```

2.6 build_glob_neumann

NAME

build_glob_neumann

SYNOPSIS

```

SUBROUTINE build_glob_neumann (front,back,right,left,top,botton,  &
&                               dom)

```

DESCRIPTION

Detect clamped facet on face of block with the convention front ($x > 0$), back ($x < 0$), right ($y > 0$), left ($y < 0$), top ($z > 0$), botton ($z < 0$).

ARGUMENTS

front – integer
back – integer
right – integer
left – integer
top – integer
botton – integer
dom – mesh structure

MODULES

USE mesh_struct

2.7 **build_glob_mesh**

NAME

build_glob_mesh

SYNOPSIS

SUBROUTINE build_glob_mesh (ni,nj,nk,dx,dy,dz,dom)

DESCRIPTION

Compute geometry and coordinates of regular hexaedric mesh.

ARGUMENTS

ni – integer
nj – integer
nk – integer
dx – real
dy – real
dz – real
dom – mesh structure

MODULES

USE mesh_struct

2.8 **imove**

NAME

imove

SYNOPSIS

SUBROUTINE imove (dim,x,y)

DESCRIPTION

Move integer array.

ARGUMENTS

dim – integer
x – integer array
y – integer array

2.9 **rmove**

NAME

rmove

SYNOPSIS

SUBROUTINE `rmove (dim,x,y)`

DESCRIPTION

Move real array.

ARGUMENTS

dim – integer
x – real array
y – real array

2.10 **echo_dirichlet**

NAME

echo_dirichlet

SYNOPSIS

SUBROUTINE `echo_dirichlet (file_num,dom,frequency,theta,phi)`

DESCRIPTION

Write list of clamped nodes with Dirichlet boundary conditions.

ARGUMENTS

file_num – integer
dom – mesh structure
frequency – real
theta – real
phi – real

MODULES

USE mesh_struct

2.11 **echo_neumann**

NAME

echo_neumann

SYNOPSIS

```

SUBROUTINE echo_neumann (file_num,dom,frequency,theta,phi,      &
&                        frontR,backR,rightR,leftR,topR,bottonR,  &
&                        frontN,backN,rightN,leftN,topN,bottonN)

```

DESCRIPTION

Write rhs associated to Robin and/or Neumann boundary conditions.

ARGUMENTS

```

file_num – integer
dom – mesh structure
frequency – real
theta – real
phi – real
frontR – integer
backR – integer
rightR – integer
leftR – integer
topR – integer
bottonR – integer
frontN – integer
backN – integer
rightN – integer
leftN – integer
topN – integer
bottonN – integer

```

MODULES

USE mesh_struct

2.12 **echo_coor**

NAME

echo_coor

SYNOPSIS

```

SUBROUTINE echo_coor (file_num,space_dim,numb_nodes,coordinates)

```

DESCRIPTION

Write coordinates of nodes.

ARGUMENTS

file_num – integer
space_dim – integer
numb_nodes – integer
coordinates – real array

2.13 **echo_geom**

NAME

echo_geom

SYNOPSIS

```
SUBROUTINE echo_geom (file_num,nodes_per_element,numb_elements,  &
&                      geometry,region,type_elem)
```

DESCRIPTION

Write topology.

ARGUMENTS

file_num – integer
nodes_per_element – integer
numb_elements – integer
geometry – integer array
region – integer
type_elem – integer

2.14 **echo_mesh**

NAME

echo_mesh

SYNOPSIS

```
SUBROUTINE echo_mesh (file_num,dom)
```

DESCRIPTION

Write mesh.

ARGUMENTS

file_num – integer
dom – mesh structure

MODULES

USE mesh_struct

2.15 **echo_splitting**

NAME

echo_splitting

SYNOPSIS

```

SUBROUTINE echo_splitting (file_num,numb_elem,elem2subdom,      &
&                          numb_facet,facet2subdom)

```

DESCRIPTION

Write element to subdomain correspondance including facet element.

ARGUMENTS

file_num – integer
numb_elem – integer
elem2subdom – integer array
numb_facet – integer
facet2subdom – integer array

2.16 **inivec**

NAME

inivec

SYNOPSIS

```

SUBROUTINE inivec (lx,x)

```

DESCRIPTION

Pseudo random number generator.

ARGUMENTS

lx – integer
x – complex array

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