
Prismatic grid generation around body surface

Initializing ...

Done

Reading parameters ...

hexa_parameter_read: input.txt

successfully opened file: Input.txt 2

version: 1 1 0

successfully opened file: Input_Adv.txt 4

hexa_prism_t1 is specified (nlayer is computed): 1.0000000E-06

hexa_split_method: none

boundary_attribute_auto_set: external

cart_hanging_node: F

Done

Reading Cartesian grid in unstructured format ...

grid_read_binary: post.bin

header: Hexagrid Work file includes Cells,Faces and nodes.

solver: fluent

version: 1 2 0

ncell, nface, nnode: 514055 1382593 332173

grid_read_binary: done

Cell, face, node count: 514055 1382593 332173

grid_connect_cell_to_node ...

hexa : 220980

tetra : 57444

pyramid: 235631

prims : 0

total : 514055

grid_connect_cell_to_node: done

grid_faces_fix_orientation ...

fixed orientation: 0

grid_faces_fix_orientation: done

check_grid_connectivity ...

check_grid_connectivity: done

Done

Reading body surface (STL data)...

body_read_components ...

input_components_stl_binary ...

ss2-3.STL

1 1554 4662

total: 1554 4662

input_components_stl_binary: done

Input stl file is BINARY

body_read_components: done

Done

Preparing body surface ...

body_add_info ...

ncomp, nattComp: 1 1

icomp, firstFace, lastFace: 1 1 1554

attribute values of body surface:

i,natt: 10 1554

body_add_info: done

statistics of body surface attribute before filtering:

body_stat_attr ...

value: 10 , count: 1554

body_stat_attr: done

body_filter_tri_outside_domain ...

body surface min-max:

37862.00 0.000000E+00 101.1250

53805.18 8346.759 6601.125

domain:

30000.00 -15000.00 101.1250

70000.00 25000.00 39898.88

body is fully inside domain

statistics of body surface attribute after filtering:

body_stat_attr ...

value: 10 , count: 1554

body_stat_attr: done

body_remove_non_valid ...

smallest number: 2.2204460E-16

nface, nnode: 1554 4662

non valid triangles: 0

body_surface_copy_selective: need to adjust body surf info accordingly!

nface, nnode: 1554 4662

body_remove_non_valid: done

body_adt_store_real8 ...

body_adt_store_real8: done

Done

Constructing grid boundary ...

```

surf_grid_make: body
surf_grid_make_winged_edge_data ...
  nface, nnode:      24265      24378
check face -> node connection ...
check face -> node connection: done:      0
surf_grid_make_winged_edge_data: done
      face, edge, node count:
  surface      :      24265      48642      24378
  winged-edge:      24265      48642      24378
surf_grid_make: done
surf_edges_length_min_max ...
lmin, lmax:      77.72998      156.2500
surf_edges_length_min_max: done
surf_write_vtk: surface_cart.vtk
surf_write_vtk: done
Done

Smoothing grid boundary ...
surf_smooth_area: ncycle, neigWeight:      3  0.5000000
surf_smooth_area: done
Done

Snapping grid boundary to body surface ...
surf_write_vtk: surface_before_snap.vtk
surf_write_vtk: done
surf_body_nodes_snap ...
  node:      20000 /      24378
Time elapsed:  0.5879111      second
surf_body_nodes_snap: done
surf_compute_node_snap_similarity

  min, mean, max, sdev: -0.5290      0.9443      1.000      0.1832
  classification:
-0.5290      -0.4525      17  0.1%
-0.4525      -0.3761      129  0.5%
-0.3761      -0.2996      23  0.1%
-0.2996      -0.2232      0  0.0%
-0.2232      -0.1467      6  0.0%
-0.1467      -0.7029E-01      12  0.0%
-0.7029E-01  0.6156E-02      338  1.4%
0.6156E-02  0.8261E-01      28  0.1%
0.8261E-01  0.1591      27  0.1%

```

0.1591	0.2355	34	0.1%
0.2355	0.3120	27	0.1%
0.3120	0.3884	24	0.1%
0.3884	0.4649	44	0.2%
0.4649	0.5413	69	0.3%
0.5413	0.6178	11	0.0%
0.6178	0.6942	11	0.0%
0.6942	0.7707	46	0.2%
0.7707	0.8471	585	2.4%
0.8471	0.9236	2507	10.3%
0.9236	1.000	20440	83.8%

----- +

total : 24378

min, ave, max: -0.5289911 0.9443443 1.000000

surf_write_vtk: surface_after_snap.vtk

surf_write_vtk: done

statistic of surface grid face attribute:

surf_stat_face_attribute:

value: 10 , count: 24265

surf_stat_face_attribute: done

Done

Capturing body surface features ...

surf_body_edges_distance ...

max search distance: 1562.500

distance to body surface: 0.0000000E+00 0.9789641 168.1140

Time elapsed: 0.4979241 second

surf_body_edges_distance: done

surf_feature_capture ...

No concave feature capturing

Convex feature decapturing

surf_feature_capture_convex ...

min area: 1208.390

degenerate faces: 3548

degenerate faces: 3274

degenerate faces: 3113

degenerate faces: 2884

degenerate faces: 2800

degenerate faces: 2801

surf_feature_capture_convex: done

Fix concave faces

surf_fix_concave_faces_dot_product ...

```

    concave, total faces:          0          24265
surf_fix_concave_faces_dot_product: done
surf_fix_concave_faces_jacobian ...
    concave, fixed, total faces:      4          4          24265
surf_fix_concave_faces_jacobian: done
smooth_surface_around_feature: ncycle, neigWeight:          5  0.3000000
    nnodeOnFeature:          0
    range, count:          1          0
    range, count:          2          0
    range, count:          3          0
smooth_surface_around_feature: done
surf_smooth_reduce_low_quality:          20
    non flat faces, tagged nodes:          1          4
    cycle, number of nodes to move:          1          12
    cycle, number of nodes to move:          2          0
surf_smooth_reduce_low_quality: done
surf_stat_face_flatness: outputCode, nclass:          0          10
    nface:          24265
min, mean, max:  0.6461          0.9980          1.000
classification:
0.8000          1.000          24235  99.9%
0.6000          0.8000          30  0.1%
0.4000          0.6000          0  0.0%
0.2000          0.4000          0  0.0%
0.2220E-15  0.2000          0  0.0%
-0.2000          0.2220E-15          0  0.0%
-0.4000          -0.2000          0  0.0%
-0.6000          -0.4000          0  0.0%
-0.8000          -0.6000          0  0.0%
-1.000          -0.8000          0  0.0%
-----+
total          :          24265
surf_stat_face_flatness: done
surf_feature_capture: done
surf_write_vtk: surface_feature.vtk
surf_write_vtk: done
Statistic of surface grid face attribute:
surf_stat_face_attribute:
    value:          10 , count:          24265
surf_stat_face_attribute: done
surf_stat_face_jacobian: outputCode, nclass:          2          10
    nface:          24265

```

min, mean, max: 0.000 0.9043 1.000

classification:

0.8000	1.000	20504	84.5%
0.6000	0.8000	1717	7.1%
0.4000	0.6000	667	2.7%
0.2000	0.4000	598	2.5%
0.000	0.2000	779	3.2%
-0.2000	0.000	0	0.0%
-0.4000	-0.2000	0	0.0%
-0.6000	-0.4000	0	0.0%
-0.8000	-0.6000	0	0.0%
-1.000	-0.8000	0	0.0%

-----+
total : 24265

surf_stat_face_jacobian: done

area of body (input): 1.3976496E+08

area of surface grid: 1.1033513E+08 -0.2105666

surf_body_faces_set_property: feature

nfaceToSet: 0

surf_body_faces_set_property: done

statistic of grid cell attribute:

value: 0 , count: 514055

statistic of grid face attribute:

value: 0 , count: 1351218

value: 2005 , count: 193

value: 2001 , count: 284

value: 2003 , count: 6196

value: 2002 , count: 176

value: 2004 , count: 197

value: 2006 , count: 64

value: 10 , count: 24265

statistic of grid node attribute:

value: 0 , count: 301181

value: 2005 , count: 201

value: 2001 , count: 247

value: 2003 , count: 5728

value: 2002 , count: 160

value: 2004 , count: 197

value: 2006 , count: 81

value: 10 , count: 24378

Done

Statistic of grid face flatness at boundary:

min, mean, max: 0.6461 0.9985 1.000

classification:

0.8000	1.000	31345	99.9%
0.6000	0.8000	30	0.1%
0.4000	0.6000	0	0.0%
0.2000	0.4000	0	0.0%
0.2220E-15	0.2000	0	0.0%
-0.2000	0.2220E-15	0	0.0%
-0.4000	-0.2000	0	0.0%
-0.6000	-0.4000	0	0.0%
-0.8000	-0.6000	0	0.0%
-1.000	-0.8000	0	0.0%

----- +
total : 31375
grid_vtk_write_face_list: 0

Splitting bad grid boundary faces ...

grid_split_bad_boundary_hexa ...

cell, face, node:	514055	1382593	332173
max cell, face, node:	4000000	14400000	4800000
split hexa:	97		
cell, face, node:	514540	1383757	332270

grid_split_bad_boundary_hexa: done

grid_split_bad_boundary_pyramid ...

cell, face, node:	514540	1383757	332270
max cell, face, node:	4000000	14400000	4800000
non flat faces :	86		
non convex faces:	21		
split pyramid :	107		
cell, face, node:	514647	1383971	332270

grid_split_bad_boundary_pyramid: done

surf_grid_make: body

surf_grid_make_winged_edge_data ...

nface, nnode:	24352	24378	
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check face -> node connection ...

check face -> node connection: done: 0

surf_grid_make_winged_edge_data: done

face, edge, node count:

surface :	24352	48729	24378
winged-edge:	24352	48729	24378

surf_grid_make: done

surf_write_vtk: surface_split.vtk

surf_write_vtk: done

Done

Adding prism grid ...

Cell, face, node count:

before: 514647 1383971 332270

grid_prism_make_all ...

material : fluid

grid side of body: external

small length : 77.72998

nlayer is specified? F

prism_nlayer, nlayer: 20 20

Generate prism for solid surface

grid_boundary_make ...

nface, nnode: 31482 30992

check face -> node connection ...

check face -> node connection: done: 0

grid_boundary_make: done

make_prism3: surbsurface class: solid

attrMin, attrMax: 1 1599

nsubface, nsubedge, nsubnode: 31482 62472 30992

nprismFace, nprismEdge, nprismNode: 24352 48729 24378

t1: 1.0000000E-06

nlayer: 77

prism_thickness: 115.9127

number of layer: 77

grid ncell, nface, nnode: 514647 1383971 332270

grid ncell, nface, nnode: 2389751 7011208 2209376

compute_prism_nodes_vector_direction ...

compute_prism_nodes_vector_direction_boundary ...

nnodeOnBoundary: 440

compute_prism_nodes_vector_direction_boundary: done

compute_prism_nodes_vector_direction: done

smooth_prism_node_vectors_feature ...

smooth_prism_node_vectors_feature: done

smooth_prism_node_vectors_non_feature ...

smooth_prism_node_vectors_non_feature: done

Total: 0

compute_nodes_vector ...

loop, node to move: 1 24378

loop, node to move: 2 24378

loop, node to move: 3 24378


```
loop, node to move:      4      24378
loop, node to move:      5      24378
compute_nodes_vector: done
```

```
compute_layer_thickness_distribution_exp_t1: intermediate layers: 76
```

```
allocating trigid:      77
```

```
normalized prism layer thickness:
```

```
  1  8.6271834E-09
  2  1.9411162E-08
  3  3.2891137E-08
  4  4.9741104E-08
  5  7.0803566E-08
  6  9.7131640E-08
  7  1.3004173E-07
  8  1.7117934E-07
  9  2.2260136E-07
 10  2.8687890E-07
 11  3.6722579E-07
 12  4.6765942E-07
 13  5.9320143E-07
 14  7.5012900E-07
 15  9.4628842E-07
 16  1.1914877E-06
 17  1.4979869E-06
 18  1.8811107E-06
 19  2.3600157E-06
 20  2.9586467E-06
 21  3.7069356E-06
 22  4.6422965E-06
 23  5.8114979E-06
 24  7.2729995E-06
 25  9.0998765E-06
 26  1.1383473E-05
 27  1.4237969E-05
 28  1.7806087E-05
 29  2.2266237E-05
 30  2.7841425E-05
 31  3.4810408E-05
 32  4.3521635E-05
 33  5.4410673E-05
 34  6.8021967E-05
 35  8.5036088E-05
```

36 1.0630373E-04
37 1.3288829E-04
38 1.6611900E-04
39 2.0765737E-04
40 2.5958035E-04
41 3.2448405E-04
42 4.0561371E-04
43 5.0702575E-04
44 6.3379080E-04
45 7.9224713E-04
46 9.9031755E-04
47 1.2379056E-03
48 1.5473906E-03
49 1.9342469E-03
50 2.4178172E-03
51 3.0222801E-03
52 3.7778588E-03
53 4.7223321E-03
54 5.9029236E-03
55 7.3786634E-03
56 9.2233382E-03
57 1.1529181E-02
58 1.4411485E-02
59 1.8014364E-02
60 2.2517964E-02
61 2.8147465E-02
62 3.5184339E-02
63 4.3980431E-02
64 5.4975551E-02
65 6.8719447E-02
66 8.5899316E-02
67 0.1073742
68 0.1342177
69 0.1677721
70 0.2097152
71 0.2621440
72 0.3276800
73 0.4096000
74 0.5120000
75 0.6400000
76 0.8000000
77 1.0000000

```

compute_layer_thickness_distribution_exp_t1: done
done
  done
grid_prism_make_all: done
  after :      2389751      7011208      2209376
surf_write_vtk: surface_prism.vtk
surf_write_vtk: done

```

Done

```

  statistic of grid cell attribute:
  value:      0 , count:      2389159
  value:     -128 , count:        592
  statistic of grid face attribute:
  value:      0 , count:      6945846
  value:     2005 , count:        193
  value:     2001 , count:        284
  value:     2003 , count:      40096
  value:     2002 , count:        176
  value:     2004 , count:        197
  value:     2006 , count:         64
  value:      10 , count:      24352
  statistic of grid node attribute:
  value:      0 , count:      2144504
  value:     2005 , count:        201
  value:     2001 , count:        247
  value:     2003 , count:      39608
  value:     2002 , count:        160
  value:     2004 , count:        197
  value:     2006 , count:         81
  value:      10 , count:      24378

```

```

grid_min_scaled_jacobian_statistic ...
min, mean, max: -0.9863      0.8231      1.000

```

```

classification:
  0.8000      1.000      1710551  71.6%
  0.6000      0.8000      205007   8.6%
  0.4000      0.6000      229224   9.6%
  0.2000      0.4000      117025   4.9%
  0.000       0.2000      124784   5.2%
 -0.2000      0.000        2846    0.1%
 -0.4000     -0.2000         99    0.0%
 -0.6000     -0.4000        117    0.0%
 -0.8000     -0.6000         58    0.0%
 -1.000      -0.8000         40    0.0%

```

```

----- +
total                :    2389751
  cells with negative jacobian:    3160
  worst cell:          514152      13
grid_min_scaled_jacobian_statistic: done
Done

Improving internal grid quality ...
grid_set_node_elasticity_fluid_specific:    10
grid_set_node_elasticity_fluid_specific: done
grid_smooth_laplace_node_average_limit ...
  restore_folded_face:    2
  restore_folded_face:    2
  restore_folded_face:    2
  restore_folded_face:    2
grid_smooth_laplace_node_average_boundary ...
grid_smooth_laplace_node_average_boundary: done
grid_smooth_laplace_node_average_limit: done
grid_smooth_laplace_node_average_limit_bad ...
  min values of face flatness & cell Jacobian:    0.2000000    0.0000000E+00
  elasticity range:    0.0000000E+00    0.2000000
  loop, bad cells, faces & nodes:
      1      3978      11      15567
  restore_worsening_face:    0
  restore_worsening_cell:    2
      2       50       0       239
  restore_worsening_face:    0
  restore_worsening_cell:    0
      3        5       0       23
  restore_worsening_face:    0
  restore_worsening_cell:    0
      4        2       0       10
  restore_worsening_face:    0
  restore_worsening_cell:    0
      5        0       0        0
grid_smooth_laplace_node_average_limit_bad: done
grid_vtk_write_cart_prism_interface: cart_prism_interface.vtk
grid_vtk_write_cart_prism_interface: done
Done

Grid statistic of cell geometry (cell count and %)
  hexa (Cartesian) :    220883    9.242929
  hexa (quad prism):    1845074    77.20779

```

tri prism	:	30030	1.256616
pyramid	:	236106	9.879942
----- +			
Total	:	2389751	

Statistic of grid face flatness at boundary:

min, mean, max: 0.9009 0.9995 1.000

classification:

0.8000	1.000	65362	100.0%
0.6000	0.8000	0	0.0%
0.4000	0.6000	0	0.0%
0.2000	0.4000	0	0.0%
0.2220E-15	0.2000	0	0.0%
-0.2000	0.2220E-15	0	0.0%
-0.4000	-0.2000	0	0.0%
-0.6000	-0.4000	0	0.0%
-0.8000	-0.6000	0	0.0%
-1.000	-0.8000	0	0.0%

----- +			
total	:	65362	
grid_vtk_write_face_list:		0	

statistic of grid face flatness:

min, mean, max: 0.3125 0.9969 1.000

classification:

0.8000	1.000	7009947	100.0%
0.6000	0.8000	1090	0.0%
0.4000	0.6000	164	0.0%
0.2000	0.4000	7	0.0%
0.2220E-15	0.2000	0	0.0%
-0.2000	0.2220E-15	0	0.0%
-0.4000	-0.2000	0	0.0%
-0.6000	-0.4000	0	0.0%
-0.8000	-0.6000	0	0.0%
-1.000	-0.8000	0	0.0%

----- +			
total	:	7011208	
worst face:		1400335	
cell 1	:	522280	12
cell 2	:	538956	12

grid_vtk_write_face: 1400335

statistic of grid cell attribute:

```

value:          0 , count:    2389159
value:        -128 , count:      592
statistic of grid face attribute:
value:          0 , count:    6945846
value:        2005 , count:     193
value:        2001 , count:     284
value:        2003 , count:    40096
value:        2002 , count:     176
value:        2004 , count:     197
value:        2006 , count:      64
value:         10 , count:    24352
statistic of grid node attribute:
value:          0 , count:    2144504
value:        2005 , count:     201
value:        2001 , count:     247
value:        2003 , count:    39608
value:        2002 , count:     160
value:        2004 , count:     197
value:        2006 , count:      81
value:         10 , count:    24378

```

Statistic of grid cell min scaled Jacobian: cartesian

min, mean, max: 0.000 0.6017 1.000

classification:

0.8000	1.000	210989	41.0%
0.6000	0.8000	3940	0.8%
0.4000	0.6000	128464	25.0%
0.2000	0.4000	108336	21.1%
0.000	0.2000	62918	12.2%
-0.2000	0.000	0	0.0%
-0.4000	-0.2000	0	0.0%
-0.6000	-0.4000	0	0.0%
-0.8000	-0.6000	0	0.0%
-1.000	-0.8000	0	0.0%

----- +
total : 514647

cells with negative jacobian: 0

worst cell: 372967

grid_min_scaled_jacobian_statistic_specific: done

grid_vtk_write_cell: 372967

```

Statistic of grid cell min scaled Jacobian: prism
min, mean, max:   0.000   0.8851   1.000
classification:
0.8000   1.000   1500756  80.0%
0.6000   0.8000   204211  10.9%
0.4000   0.6000   62695   3.3%
0.2000   0.4000   50326   2.7%
0.000    0.2000   57116   3.0%
-0.2000  0.000    0        0.0%
-0.4000 -0.2000  0        0.0%
-0.6000 -0.4000  0        0.0%
-0.8000 -0.6000  0        0.0%
-1.000  -0.8000  0        0.0%
-----+
total          :   1875104
  cells with negative jacobian:      0
  worst cell:   1101954

```

ヤコビアン（セル体積）のチェック
ヤコビアンは、すべてのセルで正が望ましい。良い品質の格子生成の指標。

Cells with negative jacobian
上記理由より、0 が望ましい。

```

grid_min_scaled_jacobian_statistic_specific: done
grid_vtk_write_cell:   1101954
surf_grid_make: body
surf_grid_make_winged_edge_data ...
  nface, nnode:   24352   24378
check face -> node connection ...
check face -> node connection: done:      0
surf_grid_make_winged_edge_data: done
          face, edge, node count:
  surface   :   24352   48729   24378
  winged-edge:  24352   48729   24378
surf_grid_make: done
surf_grid_transfer_node_attribute ...
surf_grid_transfer_node_attribute: done

```

レイヤー格子作成後のセル/フェイス/ノードの数
大きすぎると計算に時間がかかります。授業では、100万セル以内程度に留めることをお勧めします。

```

Writing grid ...
grid_write_binary_post: post.bin
  ncell,nface,nnode:  2389751  7011208  2209376
grid_write_binary_post: done

```

```

Binary file written for post program
Done
Grid generation completed
Time elapsed:      51  seconds
=====

```