**DEM model for NPH simulation**

**Geometry**

I have started using a simplified geometry for the brain.

I have generated a sphere (10 cm radius) and an .stl file using Gmsh.

I converted the .stl file into a .gts file and then imported into my code (sphere.py) as a predicate.

I believe it is possible to create a more realistic model (for example 2 concentric sphere, where the inner one represents the ventricles) or even import a patient specific mesh.

It is possible to add particles to the model knowing radius and position:

s=utils.sphere((0,0,0), radius=1)

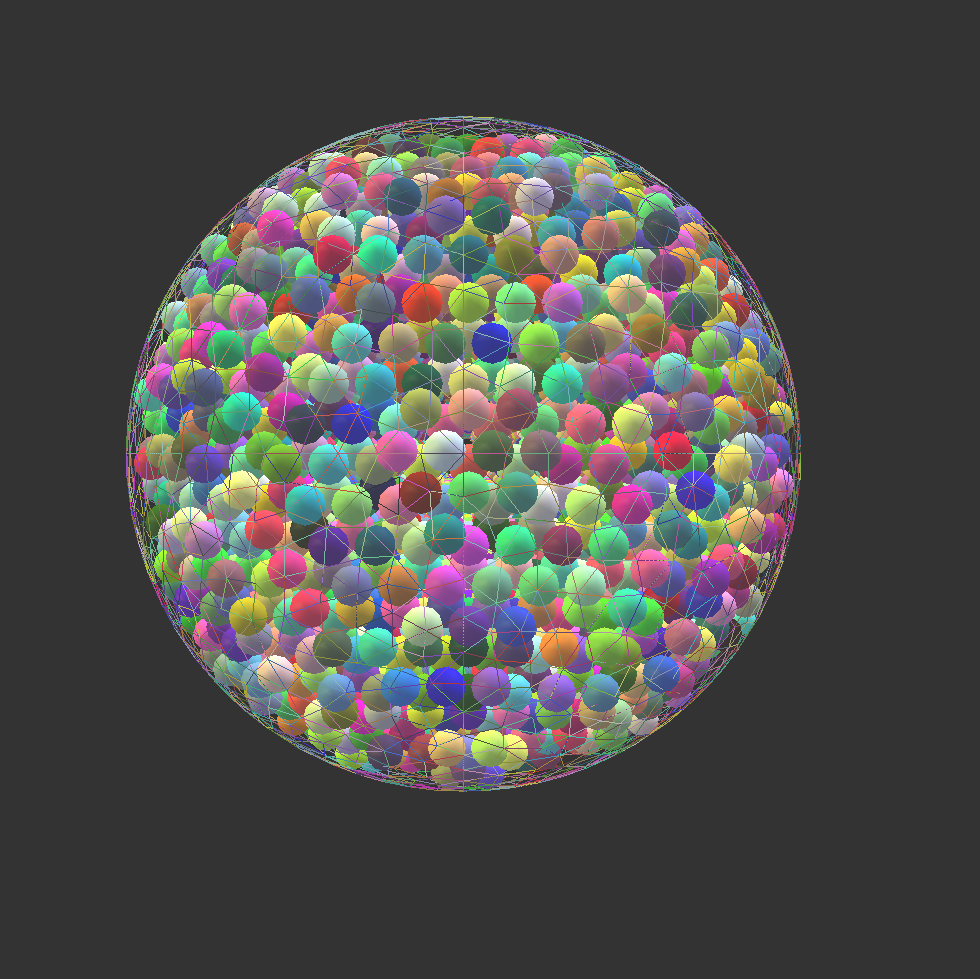
O.bodies.append(s)

**Packing**

The predicate has been filled with spheres using the *regularHexa* function that return set of spheres in regular hexagonal grid,.

The spheres have a radius of 1.0 cm and there is no gap between the spheres.

These values can be easily adjusted.

  
Illustration 1: Snapshot of the model.

**Material properties**

Unfortunately, there is not much agreement on the material properties of brain tissue. The Young’s modulus can vary between 500 to 10000 Pa. As concerns the Poisson ratio this varies between 0.35 and 0.48.

It is possible to specify the material as well for each sphere:

O.bodies[id].material = ElastMat(),

and then to define the properties such that:

O.bodies[id].material.young = 1000

O.bodies[id].material.poisson = 0.35

O.bodies[id].material.density = 1.0

…

The one above is just an example. There are several models implemented in Yade for the material. Depending on the material we decide to use we can choose the best model for computing the interactions between spheres.

**Spheres’ properties**

It is possible to access each sphere’s properties using a for loop:

for b in O.bodies:

if isinstance(b.shape, Sphere):

print "id = ", b.id

print "position = ", b.state.pos

print "radius = ", b.shape.radius

print "mass = ", b.state.mass

**Simulation loop**

From Yade’s manual:

*In a typical DEM simulation, the following sequence is run repeatedly:*

*• reset forces on bodies from previous step*

*• approximate collision detection (pass 1)*

*• detect exact collisions of bodies, update interactions as necessary*

*• solve interactions, applying forces on bodies*

*• apply other external conditions (gravity, for instance).*

*• change position of bodies based on forces, by integrating motion equations.*

*Each of these actions is represented by an Engine, functional element of simulation. The sequence of engines is called simulation loop.*

We can use this setup. Eventually, also a FlowEngine can be incorporated.

O.engines=[

ForceResetter(),

InsertionSortCollider([Bo1\_Sphere\_Aabb(),Bo1\_Facet\_Aabb()],label='collider'),

InteractionLoop(

[Ig2\_Sphere\_Sphere\_ScGeom(),Ig2\_Facet\_Sphere\_ScGeom()],

[Ip2\_FrictMat\_FrictMat\_FrictPhys()],

[Law2\_ScGeom\_FrictPhys\_CundallStrack()],

),

NewtonIntegrator(damping=0.1,gravity=[0,0,0]),

# FlowEngine(label="flow"), commented at the moment

]

**ForceResetter():** itresets forces at each timestep

**InsertionSortCollider():** it manages collision between particles and facets. The functors Bo1\_Sphere\_Aabb() and Bo1\_Facet\_Aabb() are bound functors and define the Axis-aligned bounding boxes (Aabb) for spheres and for facets. At this stage we only have spheres and facets so it should be enough.

There is the aabbEnlargeFactor that should be passed to the Bo1\_ functor that is used to create distant interaction, but is only meaningful with an IGeomFunctor which will not simply discard such interactions: Ig2\_Sphere\_Sphere\_ScGeom::interactionDetectionFactor should have the same value as aabbEnlargeFactor.

At the moment I am not able to understand if this is something we actually need.

**InteractionLoop()**: in this loop the interaction between the spheres. It needs 3 functors: Ig2, Ip2, Law functors respectively.

The functor prefixed with Ig2 will handle collisions between different entities. For example, Ig2\_Sphere\_Sphere\_ScGeom() handles interaction for Sphere + Sphere, Ig2\_Facet\_Sphere\_ScGeom() handles the interaction between Facet and Sphere.

The Ip2 and Law2 functors need to be chosen carefully such that they are compatible.

There is a wide variety of possibilities.

Ip2 functor accepts the given combination of Material types between the particles and Law2 describes the constitutive law of the model.

**NewtonIntegrator**

It performs the integration of the equations.

**Fluid Engine**

It is possible to incorporate the fluid dynamics with the Flow engines.

It seems possible to impose the pressure in one point like this:

flow.imposePressure(Vector3((0.0,0.0,0.0)), 10.0)

Unfortunately, it is not straightforward to impose boundary conditions.

**Tables**

**Spheres properties**

|  |  |
| --- | --- |
| id | 0 |
| position | -7.0 ; -4.80384757729 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 1 |
| position | -7.0 ; -4.80384757729 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 2 |
| position | -7.0 ; -4.80384757729 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 3 |
| position | -7.0 ; -2.49444650053 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 4 |
| position | -7.0 ; -2.49444650053 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 5 |
| position | -8.0 ; -3.07179676972 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 6 |
| position | -7.0 ; -2.49444650053 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 7 |
| position | -7.0 ; -2.49444650053 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 8 |
| position | -7.0 ; -1.33974596216 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 9 |
| position | -8.0 ; -0.762395692966 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 10 |
| position | -7.0 ; -1.33974596216 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 11 |
| position | -8.0 ; -0.762395692966 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 12 |
| position | -7.0 ; -1.33974596216 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 13 |
| position | -7.0 ; 0.969655114603 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 14 |
| position | -8.0 ; 0.392304845413 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 15 |
| position | -7.0 ; 0.969655114603 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 16 |
| position | -8.0 ; 0.392304845413 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 17 |
| position | -7.0 ; 0.969655114603 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 18 |
| position | -8.0 ; 0.392304845413 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 19 |
| position | -7.0 ; 0.969655114603 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 20 |
| position | -7.0 ; 2.12435565298 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 21 |
| position | -8.0 ; 2.70170592217 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 22 |
| position | -7.0 ; 2.12435565298 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 23 |
| position | -8.0 ; 2.70170592217 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 24 |
| position | -7.0 ; 2.12435565298 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 25 |
| position | -7.0 ; 4.43375672974 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 26 |
| position | -8.0 ; 3.85640646055 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 27 |
| position | -7.0 ; 4.43375672974 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 28 |
| position | -7.0 ; 5.58845726812 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 29 |
| position | -5.0 ; -5.95854811567 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 30 |
| position | -5.0 ; -5.95854811567 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 31 |
| position | -6.0 ; -6.53589838486 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 32 |
| position | -5.0 ; -5.95854811567 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 33 |
| position | -5.0 ; -5.95854811567 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 34 |
| position | -6.0 ; -4.2264973081 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 35 |
| position | -5.0 ; -4.80384757729 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 36 |
| position | -6.0 ; -4.2264973081 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 37 |
| position | -5.0 ; -4.80384757729 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 38 |
| position | -6.0 ; -4.2264973081 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 39 |
| position | -5.0 ; -4.80384757729 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 40 |
| position | -6.0 ; -4.2264973081 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 41 |
| position | -5.0 ; -2.49444650053 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 42 |
| position | -6.0 ; -3.07179676972 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 43 |
| position | -5.0 ; -2.49444650053 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 44 |
| position | -6.0 ; -3.07179676972 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 45 |
| position | -5.0 ; -2.49444650053 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 46 |
| position | -6.0 ; -3.07179676972 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 47 |
| position | -5.0 ; -2.49444650053 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 48 |
| position | -6.0 ; -3.07179676972 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 49 |
| position | -5.0 ; -1.33974596216 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 50 |
| position | -6.0 ; -0.762395692966 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 51 |
| position | -5.0 ; -1.33974596216 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 52 |
| position | -6.0 ; -0.762395692966 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 53 |
| position | -5.0 ; -1.33974596216 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 54 |
| position | -6.0 ; -0.762395692966 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 55 |
| position | -5.0 ; -1.33974596216 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 56 |
| position | -6.0 ; -0.762395692966 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 57 |
| position | -5.0 ; -1.33974596216 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 58 |
| position | -6.0 ; 0.392304845413 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 59 |
| position | -5.0 ; 0.969655114603 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 60 |
| position | -6.0 ; 0.392304845413 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 61 |
| position | -5.0 ; 0.969655114603 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 62 |
| position | -6.0 ; 0.392304845413 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 63 |
| position | -5.0 ; 0.969655114603 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 64 |
| position | -6.0 ; 0.392304845413 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 65 |
| position | -5.0 ; 0.969655114603 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 66 |
| position | -6.0 ; 0.392304845413 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 67 |
| position | -5.0 ; 2.12435565298 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 68 |
| position | -6.0 ; 2.70170592217 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 69 |
| position | -5.0 ; 2.12435565298 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 70 |
| position | -6.0 ; 2.70170592217 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 71 |
| position | -5.0 ; 2.12435565298 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 72 |
| position | -6.0 ; 2.70170592217 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 73 |
| position | -5.0 ; 2.12435565298 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 74 |
| position | -6.0 ; 2.70170592217 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 75 |
| position | -5.0 ; 2.12435565298 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 76 |
| position | -5.0 ; 4.43375672974 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 77 |
| position | -6.0 ; 3.85640646055 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 78 |
| position | -5.0 ; 4.43375672974 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 79 |
| position | -6.0 ; 3.85640646055 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 80 |
| position | -5.0 ; 4.43375672974 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 81 |
| position | -6.0 ; 3.85640646055 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 82 |
| position | -5.0 ; 4.43375672974 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 83 |
| position | -5.0 ; 5.58845726812 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 84 |
| position | -6.0 ; 6.16580753731 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 85 |
| position | -5.0 ; 5.58845726812 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 86 |
| position | -6.0 ; 6.16580753731 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 87 |
| position | -5.0 ; 5.58845726812 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 88 |
| position | -4.0 ; -7.69059892324 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 89 |
| position | -3.0 ; -8.26794919243 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 90 |
| position | -4.0 ; -7.69059892324 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 91 |
| position | -3.0 ; -5.95854811567 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 92 |
| position | -4.0 ; -6.53589838486 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 93 |
| position | -3.0 ; -5.95854811567 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 94 |
| position | -4.0 ; -6.53589838486 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 95 |
| position | -3.0 ; -5.95854811567 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 96 |
| position | -4.0 ; -6.53589838486 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 97 |
| position | -3.0 ; -5.95854811567 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 98 |
| position | -3.0 ; -4.80384757729 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 99 |
| position | -4.0 ; -4.2264973081 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 100 |
| position | -3.0 ; -4.80384757729 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 101 |
| position | -4.0 ; -4.2264973081 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 102 |
| position | -3.0 ; -4.80384757729 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 103 |
| position | -4.0 ; -4.2264973081 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 104 |
| position | -3.0 ; -4.80384757729 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 105 |
| position | -4.0 ; -4.2264973081 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 106 |
| position | -3.0 ; -4.80384757729 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 107 |
| position | -4.0 ; -3.07179676972 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 108 |
| position | -3.0 ; -2.49444650053 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 109 |
| position | -4.0 ; -3.07179676972 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 110 |
| position | -3.0 ; -2.49444650053 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 111 |
| position | -4.0 ; -3.07179676972 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 112 |
| position | -3.0 ; -2.49444650053 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 113 |
| position | -4.0 ; -3.07179676972 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 114 |
| position | -3.0 ; -2.49444650053 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 115 |
| position | -4.0 ; -3.07179676972 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 116 |
| position | -3.0 ; -2.49444650053 ; 7.96292478041 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 117 |
| position | -3.0 ; -1.33974596216 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 118 |
| position | -4.0 ; -0.762395692966 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 119 |
| position | -3.0 ; -1.33974596216 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 120 |
| position | -4.0 ; -0.762395692966 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 121 |
| position | -3.0 ; -1.33974596216 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 122 |
| position | -4.0 ; -0.762395692966 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 123 |
| position | -3.0 ; -1.33974596216 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 124 |
| position | -4.0 ; -0.762395692966 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 125 |
| position | -3.0 ; -1.33974596216 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 126 |
| position | -4.0 ; -0.762395692966 ; 7.96292478041 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 127 |
| position | -3.0 ; 0.969655114603 ; -8.36700683814 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 128 |
| position | -4.0 ; 0.392304845413 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 129 |
| position | -3.0 ; 0.969655114603 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 130 |
| position | -4.0 ; 0.392304845413 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 131 |
| position | -3.0 ; 0.969655114603 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 132 |
| position | -4.0 ; 0.392304845413 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 133 |
| position | -3.0 ; 0.969655114603 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 134 |
| position | -4.0 ; 0.392304845413 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 135 |
| position | -3.0 ; 0.969655114603 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 136 |
| position | -4.0 ; 0.392304845413 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 137 |
| position | -3.0 ; 0.969655114603 ; 7.96292478041 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 138 |
| position | -3.0 ; 2.12435565298 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 139 |
| position | -4.0 ; 2.70170592217 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 140 |
| position | -3.0 ; 2.12435565298 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 141 |
| position | -4.0 ; 2.70170592217 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 142 |
| position | -3.0 ; 2.12435565298 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 143 |
| position | -4.0 ; 2.70170592217 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 144 |
| position | -3.0 ; 2.12435565298 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 145 |
| position | -4.0 ; 2.70170592217 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 146 |
| position | -3.0 ; 2.12435565298 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 147 |
| position | -4.0 ; 3.85640646055 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 148 |
| position | -3.0 ; 4.43375672974 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 149 |
| position | -4.0 ; 3.85640646055 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 150 |
| position | -3.0 ; 4.43375672974 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 151 |
| position | -4.0 ; 3.85640646055 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 152 |
| position | -3.0 ; 4.43375672974 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 153 |
| position | -4.0 ; 3.85640646055 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 154 |
| position | -3.0 ; 4.43375672974 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 155 |
| position | -4.0 ; 3.85640646055 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 156 |
| position | -4.0 ; 6.16580753731 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 157 |
| position | -3.0 ; 5.58845726812 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 158 |
| position | -4.0 ; 6.16580753731 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 159 |
| position | -3.0 ; 5.58845726812 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 160 |
| position | -4.0 ; 6.16580753731 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 161 |
| position | -3.0 ; 5.58845726812 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 162 |
| position | -4.0 ; 6.16580753731 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 163 |
| position | -3.0 ; 5.58845726812 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 164 |
| position | -4.0 ; 7.32050807569 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 165 |
| position | -3.0 ; 7.89785834488 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 166 |
| position | -4.0 ; 7.32050807569 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 167 |
| position | -3.0 ; 7.89785834488 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 168 |
| position | -4.0 ; 7.32050807569 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 169 |
| position | -1.0 ; -8.26794919243 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 170 |
| position | -2.0 ; -7.69059892324 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 171 |
| position | -1.0 ; -8.26794919243 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 172 |
| position | -2.0 ; -7.69059892324 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 173 |
| position | -1.0 ; -8.26794919243 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 174 |
| position | -1.0 ; -5.95854811567 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 175 |
| position | -2.0 ; -6.53589838486 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 176 |
| position | -1.0 ; -5.95854811567 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 177 |
| position | -2.0 ; -6.53589838486 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 178 |
| position | -1.0 ; -5.95854811567 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 179 |
| position | -2.0 ; -6.53589838486 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 180 |
| position | -1.0 ; -5.95854811567 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 181 |
| position | -1.0 ; -4.80384757729 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 182 |
| position | -2.0 ; -4.2264973081 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 183 |
| position | -1.0 ; -4.80384757729 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 184 |
| position | -2.0 ; -4.2264973081 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 185 |
| position | -1.0 ; -4.80384757729 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 186 |
| position | -2.0 ; -4.2264973081 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 187 |
| position | -1.0 ; -4.80384757729 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 188 |
| position | -2.0 ; -4.2264973081 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 189 |
| position | -1.0 ; -4.80384757729 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 190 |
| position | -1.0 ; -2.49444650053 ; -8.36700683814 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 191 |
| position | -2.0 ; -3.07179676972 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 192 |
| position | -1.0 ; -2.49444650053 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 193 |
| position | -2.0 ; -3.07179676972 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 194 |
| position | -1.0 ; -2.49444650053 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 195 |
| position | -2.0 ; -3.07179676972 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 196 |
| position | -1.0 ; -2.49444650053 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 197 |
| position | -2.0 ; -3.07179676972 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 198 |
| position | -1.0 ; -2.49444650053 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 199 |
| position | -2.0 ; -3.07179676972 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 200 |
| position | -1.0 ; -2.49444650053 ; 7.96292478041 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 201 |
| position | -2.0 ; -0.762395692966 ; -8.36700683814 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 202 |
| position | -1.0 ; -1.33974596216 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 203 |
| position | -2.0 ; -0.762395692966 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 204 |
| position | -1.0 ; -1.33974596216 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 205 |
| position | -2.0 ; -0.762395692966 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 206 |
| position | -1.0 ; -1.33974596216 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 207 |
| position | -2.0 ; -0.762395692966 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 208 |
| position | -1.0 ; -1.33974596216 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 209 |
| position | -2.0 ; -0.762395692966 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 210 |
| position | -1.0 ; -1.33974596216 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 211 |
| position | -2.0 ; -0.762395692966 ; 7.96292478041 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 212 |
| position | -1.0 ; 0.969655114603 ; -8.36700683814 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 213 |
| position | -2.0 ; 0.392304845413 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 214 |
| position | -1.0 ; 0.969655114603 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 215 |
| position | -2.0 ; 0.392304845413 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 216 |
| position | -1.0 ; 0.969655114603 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 217 |
| position | -2.0 ; 0.392304845413 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 218 |
| position | -1.0 ; 0.969655114603 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 219 |
| position | -2.0 ; 0.392304845413 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 220 |
| position | -1.0 ; 0.969655114603 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 221 |
| position | -2.0 ; 0.392304845413 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 222 |
| position | -1.0 ; 0.969655114603 ; 7.96292478041 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 223 |
| position | -2.0 ; 2.70170592217 ; -8.36700683814 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 224 |
| position | -1.0 ; 2.12435565298 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 225 |
| position | -2.0 ; 2.70170592217 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 226 |
| position | -1.0 ; 2.12435565298 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 227 |
| position | -2.0 ; 2.70170592217 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 228 |
| position | -1.0 ; 2.12435565298 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 229 |
| position | -2.0 ; 2.70170592217 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 230 |
| position | -1.0 ; 2.12435565298 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 231 |
| position | -2.0 ; 2.70170592217 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 232 |
| position | -1.0 ; 2.12435565298 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 233 |
| position | -2.0 ; 2.70170592217 ; 7.96292478041 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 234 |
| position | -2.0 ; 3.85640646055 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 235 |
| position | -1.0 ; 4.43375672974 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 236 |
| position | -2.0 ; 3.85640646055 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 237 |
| position | -1.0 ; 4.43375672974 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 238 |
| position | -2.0 ; 3.85640646055 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 239 |
| position | -1.0 ; 4.43375672974 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 240 |
| position | -2.0 ; 3.85640646055 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 241 |
| position | -1.0 ; 4.43375672974 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 242 |
| position | -2.0 ; 3.85640646055 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 243 |
| position | -1.0 ; 5.58845726812 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 244 |
| position | -2.0 ; 6.16580753731 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 245 |
| position | -1.0 ; 5.58845726812 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 246 |
| position | -2.0 ; 6.16580753731 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 247 |
| position | -1.0 ; 5.58845726812 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 248 |
| position | -2.0 ; 6.16580753731 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 249 |
| position | -1.0 ; 5.58845726812 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 250 |
| position | -2.0 ; 6.16580753731 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 251 |
| position | -1.0 ; 5.58845726812 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 252 |
| position | -2.0 ; 7.32050807569 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 253 |
| position | -1.0 ; 7.89785834488 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 254 |
| position | -2.0 ; 7.32050807569 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 255 |
| position | -1.0 ; 7.89785834488 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 256 |
| position | -2.0 ; 7.32050807569 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 257 |
| position | 1.0 ; -8.26794919243 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 258 |
| position | 0.0 ; -7.69059892324 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 259 |
| position | 1.0 ; -8.26794919243 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 260 |
| position | 0.0 ; -7.69059892324 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 261 |
| position | 1.0 ; -8.26794919243 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 262 |
| position | 0.0 ; -7.69059892324 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 263 |
| position | 1.0 ; -5.95854811567 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 264 |
| position | 0.0 ; -6.53589838486 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 265 |
| position | 1.0 ; -5.95854811567 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 266 |
| position | 0.0 ; -6.53589838486 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 267 |
| position | 1.0 ; -5.95854811567 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 268 |
| position | 0.0 ; -6.53589838486 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 269 |
| position | 1.0 ; -5.95854811567 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 270 |
| position | 0.0 ; -6.53589838486 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 271 |
| position | 1.0 ; -4.80384757729 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 272 |
| position | 0.0 ; -4.2264973081 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 273 |
| position | 1.0 ; -4.80384757729 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 274 |
| position | 0.0 ; -4.2264973081 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 275 |
| position | 1.0 ; -4.80384757729 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 276 |
| position | 0.0 ; -4.2264973081 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 277 |
| position | 1.0 ; -4.80384757729 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 278 |
| position | 0.0 ; -4.2264973081 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 279 |
| position | 1.0 ; -4.80384757729 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 280 |
| position | 0.0 ; -4.2264973081 ; 7.96292478041 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 281 |
| position | 1.0 ; -2.49444650053 ; -8.36700683814 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 282 |
| position | 0.0 ; -3.07179676972 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 283 |
| position | 1.0 ; -2.49444650053 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 284 |
| position | 0.0 ; -3.07179676972 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 285 |
| position | 1.0 ; -2.49444650053 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 286 |
| position | 0.0 ; -3.07179676972 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 287 |
| position | 1.0 ; -2.49444650053 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 288 |
| position | 0.0 ; -3.07179676972 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 289 |
| position | 1.0 ; -2.49444650053 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 290 |
| position | 0.0 ; -3.07179676972 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 291 |
| position | 1.0 ; -2.49444650053 ; 7.96292478041 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 292 |
| position | 0.0 ; -0.762395692966 ; -8.36700683814 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 293 |
| position | 1.0 ; -1.33974596216 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 294 |
| position | 0.0 ; -0.762395692966 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 295 |
| position | 1.0 ; -1.33974596216 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 296 |
| position | 0.0 ; -0.762395692966 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 297 |
| position | 1.0 ; -1.33974596216 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 298 |
| position | 0.0 ; -0.762395692966 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 299 |
| position | 1.0 ; -1.33974596216 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 300 |
| position | 0.0 ; -0.762395692966 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 301 |
| position | 1.0 ; -1.33974596216 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 302 |
| position | 0.0 ; -0.762395692966 ; 7.96292478041 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 303 |
| position | 1.0 ; 0.969655114603 ; -8.36700683814 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 304 |
| position | 0.0 ; 0.392304845413 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 305 |
| position | 1.0 ; 0.969655114603 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 306 |
| position | 0.0 ; 0.392304845413 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 307 |
| position | 1.0 ; 0.969655114603 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 308 |
| position | 0.0 ; 0.392304845413 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 309 |
| position | 1.0 ; 0.969655114603 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 310 |
| position | 0.0 ; 0.392304845413 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 311 |
| position | 1.0 ; 0.969655114603 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 312 |
| position | 0.0 ; 0.392304845413 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 313 |
| position | 1.0 ; 0.969655114603 ; 7.96292478041 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 314 |
| position | 0.0 ; 2.70170592217 ; -8.36700683814 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 315 |
| position | 1.0 ; 2.12435565298 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 316 |
| position | 0.0 ; 2.70170592217 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 317 |
| position | 1.0 ; 2.12435565298 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 318 |
| position | 0.0 ; 2.70170592217 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 319 |
| position | 1.0 ; 2.12435565298 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 320 |
| position | 0.0 ; 2.70170592217 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 321 |
| position | 1.0 ; 2.12435565298 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 322 |
| position | 0.0 ; 2.70170592217 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 323 |
| position | 1.0 ; 2.12435565298 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 324 |
| position | 0.0 ; 2.70170592217 ; 7.96292478041 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 325 |
| position | 0.0 ; 3.85640646055 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 326 |
| position | 1.0 ; 4.43375672974 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 327 |
| position | 0.0 ; 3.85640646055 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 328 |
| position | 1.0 ; 4.43375672974 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 329 |
| position | 0.0 ; 3.85640646055 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 330 |
| position | 1.0 ; 4.43375672974 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 331 |
| position | 0.0 ; 3.85640646055 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 332 |
| position | 1.0 ; 4.43375672974 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 333 |
| position | 0.0 ; 3.85640646055 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 334 |
| position | 1.0 ; 5.58845726812 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 335 |
| position | 0.0 ; 6.16580753731 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 336 |
| position | 1.0 ; 5.58845726812 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 337 |
| position | 0.0 ; 6.16580753731 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 338 |
| position | 1.0 ; 5.58845726812 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 339 |
| position | 0.0 ; 6.16580753731 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 340 |
| position | 1.0 ; 5.58845726812 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 341 |
| position | 0.0 ; 6.16580753731 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 342 |
| position | 1.0 ; 5.58845726812 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 343 |
| position | 0.0 ; 7.32050807569 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 344 |
| position | 1.0 ; 7.89785834488 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 345 |
| position | 0.0 ; 7.32050807569 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 346 |
| position | 1.0 ; 7.89785834488 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 347 |
| position | 0.0 ; 7.32050807569 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 348 |
| position | 2.0 ; -7.69059892324 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 349 |
| position | 3.0 ; -8.26794919243 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 350 |
| position | 2.0 ; -7.69059892324 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 351 |
| position | 3.0 ; -5.95854811567 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 352 |
| position | 2.0 ; -6.53589838486 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 353 |
| position | 3.0 ; -5.95854811567 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 354 |
| position | 2.0 ; -6.53589838486 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 355 |
| position | 3.0 ; -5.95854811567 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 356 |
| position | 2.0 ; -6.53589838486 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 357 |
| position | 3.0 ; -5.95854811567 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 358 |
| position | 3.0 ; -4.80384757729 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 359 |
| position | 2.0 ; -4.2264973081 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 360 |
| position | 3.0 ; -4.80384757729 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 361 |
| position | 2.0 ; -4.2264973081 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 362 |
| position | 3.0 ; -4.80384757729 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 363 |
| position | 2.0 ; -4.2264973081 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 364 |
| position | 3.0 ; -4.80384757729 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 365 |
| position | 2.0 ; -4.2264973081 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 366 |
| position | 3.0 ; -4.80384757729 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 367 |
| position | 2.0 ; -3.07179676972 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 368 |
| position | 3.0 ; -2.49444650053 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 369 |
| position | 2.0 ; -3.07179676972 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 370 |
| position | 3.0 ; -2.49444650053 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 371 |
| position | 2.0 ; -3.07179676972 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 372 |
| position | 3.0 ; -2.49444650053 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 373 |
| position | 2.0 ; -3.07179676972 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 374 |
| position | 3.0 ; -2.49444650053 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 375 |
| position | 2.0 ; -3.07179676972 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 376 |
| position | 3.0 ; -2.49444650053 ; 7.96292478041 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 377 |
| position | 2.0 ; -0.762395692966 ; -8.36700683814 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 378 |
| position | 3.0 ; -1.33974596216 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 379 |
| position | 2.0 ; -0.762395692966 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 380 |
| position | 3.0 ; -1.33974596216 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 381 |
| position | 2.0 ; -0.762395692966 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 382 |
| position | 3.0 ; -1.33974596216 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 383 |
| position | 2.0 ; -0.762395692966 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 384 |
| position | 3.0 ; -1.33974596216 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 385 |
| position | 2.0 ; -0.762395692966 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 386 |
| position | 3.0 ; -1.33974596216 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 387 |
| position | 2.0 ; -0.762395692966 ; 7.96292478041 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 388 |
| position | 3.0 ; 0.969655114603 ; -8.36700683814 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 389 |
| position | 2.0 ; 0.392304845413 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 390 |
| position | 3.0 ; 0.969655114603 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 391 |
| position | 2.0 ; 0.392304845413 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 392 |
| position | 3.0 ; 0.969655114603 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 393 |
| position | 2.0 ; 0.392304845413 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 394 |
| position | 3.0 ; 0.969655114603 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 395 |
| position | 2.0 ; 0.392304845413 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 396 |
| position | 3.0 ; 0.969655114603 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 397 |
| position | 2.0 ; 0.392304845413 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 398 |
| position | 3.0 ; 0.969655114603 ; 7.96292478041 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 399 |
| position | 2.0 ; 2.70170592217 ; -8.36700683814 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 400 |
| position | 3.0 ; 2.12435565298 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 401 |
| position | 2.0 ; 2.70170592217 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 402 |
| position | 3.0 ; 2.12435565298 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 403 |
| position | 2.0 ; 2.70170592217 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 404 |
| position | 3.0 ; 2.12435565298 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 405 |
| position | 2.0 ; 2.70170592217 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 406 |
| position | 3.0 ; 2.12435565298 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 407 |
| position | 2.0 ; 2.70170592217 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 408 |
| position | 3.0 ; 2.12435565298 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 409 |
| position | 2.0 ; 2.70170592217 ; 7.96292478041 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 410 |
| position | 2.0 ; 3.85640646055 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 411 |
| position | 3.0 ; 4.43375672974 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 412 |
| position | 2.0 ; 3.85640646055 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 413 |
| position | 3.0 ; 4.43375672974 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 414 |
| position | 2.0 ; 3.85640646055 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 415 |
| position | 3.0 ; 4.43375672974 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 416 |
| position | 2.0 ; 3.85640646055 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 417 |
| position | 3.0 ; 4.43375672974 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 418 |
| position | 2.0 ; 3.85640646055 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 419 |
| position | 2.0 ; 6.16580753731 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 420 |
| position | 3.0 ; 5.58845726812 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 421 |
| position | 2.0 ; 6.16580753731 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 422 |
| position | 3.0 ; 5.58845726812 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 423 |
| position | 2.0 ; 6.16580753731 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 424 |
| position | 3.0 ; 5.58845726812 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 425 |
| position | 2.0 ; 6.16580753731 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 426 |
| position | 3.0 ; 5.58845726812 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 427 |
| position | 2.0 ; 7.32050807569 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 428 |
| position | 3.0 ; 7.89785834488 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 429 |
| position | 2.0 ; 7.32050807569 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 430 |
| position | 3.0 ; 7.89785834488 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 431 |
| position | 2.0 ; 7.32050807569 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 432 |
| position | 4.0 ; -7.69059892324 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 433 |
| position | 4.0 ; -7.69059892324 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 434 |
| position | 5.0 ; -5.95854811567 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 435 |
| position | 4.0 ; -6.53589838486 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 436 |
| position | 5.0 ; -5.95854811567 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 437 |
| position | 4.0 ; -6.53589838486 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 438 |
| position | 5.0 ; -5.95854811567 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 439 |
| position | 4.0 ; -6.53589838486 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 440 |
| position | 5.0 ; -5.95854811567 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 441 |
| position | 4.0 ; -4.2264973081 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 442 |
| position | 5.0 ; -4.80384757729 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 443 |
| position | 4.0 ; -4.2264973081 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 444 |
| position | 5.0 ; -4.80384757729 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 445 |
| position | 4.0 ; -4.2264973081 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 446 |
| position | 5.0 ; -4.80384757729 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 447 |
| position | 4.0 ; -4.2264973081 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 448 |
| position | 4.0 ; -3.07179676972 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 449 |
| position | 5.0 ; -2.49444650053 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 450 |
| position | 4.0 ; -3.07179676972 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 451 |
| position | 5.0 ; -2.49444650053 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 452 |
| position | 4.0 ; -3.07179676972 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 453 |
| position | 5.0 ; -2.49444650053 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 454 |
| position | 4.0 ; -3.07179676972 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 455 |
| position | 5.0 ; -2.49444650053 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 456 |
| position | 4.0 ; -3.07179676972 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 457 |
| position | 5.0 ; -1.33974596216 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 458 |
| position | 4.0 ; -0.762395692966 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 459 |
| position | 5.0 ; -1.33974596216 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 460 |
| position | 4.0 ; -0.762395692966 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 461 |
| position | 5.0 ; -1.33974596216 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 462 |
| position | 4.0 ; -0.762395692966 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 463 |
| position | 5.0 ; -1.33974596216 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 464 |
| position | 4.0 ; -0.762395692966 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 465 |
| position | 5.0 ; -1.33974596216 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 466 |
| position | 4.0 ; -0.762395692966 ; 7.96292478041 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 467 |
| position | 4.0 ; 0.392304845413 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 468 |
| position | 5.0 ; 0.969655114603 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 469 |
| position | 4.0 ; 0.392304845413 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 470 |
| position | 5.0 ; 0.969655114603 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 471 |
| position | 4.0 ; 0.392304845413 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 472 |
| position | 5.0 ; 0.969655114603 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 473 |
| position | 4.0 ; 0.392304845413 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 474 |
| position | 5.0 ; 0.969655114603 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 475 |
| position | 4.0 ; 0.392304845413 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 476 |
| position | 5.0 ; 2.12435565298 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 477 |
| position | 4.0 ; 2.70170592217 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 478 |
| position | 5.0 ; 2.12435565298 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 479 |
| position | 4.0 ; 2.70170592217 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 480 |
| position | 5.0 ; 2.12435565298 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 481 |
| position | 4.0 ; 2.70170592217 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 482 |
| position | 5.0 ; 2.12435565298 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 483 |
| position | 4.0 ; 2.70170592217 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 484 |
| position | 5.0 ; 2.12435565298 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 485 |
| position | 4.0 ; 3.85640646055 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 486 |
| position | 5.0 ; 4.43375672974 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 487 |
| position | 4.0 ; 3.85640646055 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 488 |
| position | 5.0 ; 4.43375672974 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 489 |
| position | 4.0 ; 3.85640646055 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 490 |
| position | 5.0 ; 4.43375672974 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 491 |
| position | 4.0 ; 3.85640646055 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 492 |
| position | 5.0 ; 4.43375672974 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 493 |
| position | 4.0 ; 3.85640646055 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 494 |
| position | 4.0 ; 6.16580753731 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 495 |
| position | 5.0 ; 5.58845726812 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 496 |
| position | 4.0 ; 6.16580753731 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 497 |
| position | 5.0 ; 5.58845726812 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 498 |
| position | 4.0 ; 6.16580753731 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 499 |
| position | 5.0 ; 5.58845726812 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 500 |
| position | 4.0 ; 6.16580753731 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 501 |
| position | 4.0 ; 7.32050807569 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 502 |
| position | 4.0 ; 7.32050807569 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 503 |
| position | 4.0 ; 7.32050807569 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 504 |
| position | 6.0 ; -6.53589838486 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 505 |
| position | 6.0 ; -4.2264973081 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 506 |
| position | 7.0 ; -4.80384757729 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 507 |
| position | 6.0 ; -4.2264973081 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 508 |
| position | 7.0 ; -4.80384757729 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 509 |
| position | 6.0 ; -4.2264973081 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 510 |
| position | 7.0 ; -4.80384757729 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 511 |
| position | 6.0 ; -4.2264973081 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 512 |
| position | 7.0 ; -2.49444650053 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 513 |
| position | 6.0 ; -3.07179676972 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 514 |
| position | 7.0 ; -2.49444650053 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 515 |
| position | 6.0 ; -3.07179676972 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 516 |
| position | 7.0 ; -2.49444650053 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 517 |
| position | 6.0 ; -3.07179676972 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 518 |
| position | 7.0 ; -2.49444650053 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 519 |
| position | 6.0 ; -3.07179676972 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 520 |
| position | 6.0 ; -0.762395692966 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 521 |
| position | 7.0 ; -1.33974596216 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 522 |
| position | 6.0 ; -0.762395692966 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 523 |
| position | 7.0 ; -1.33974596216 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 524 |
| position | 6.0 ; -0.762395692966 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 525 |
| position | 7.0 ; -1.33974596216 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 526 |
| position | 6.0 ; -0.762395692966 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 527 |
| position | 6.0 ; 0.392304845413 ; -6.73401367629 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 528 |
| position | 7.0 ; 0.969655114603 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 529 |
| position | 6.0 ; 0.392304845413 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 530 |
| position | 7.0 ; 0.969655114603 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 531 |
| position | 6.0 ; 0.392304845413 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 532 |
| position | 7.0 ; 0.969655114603 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 533 |
| position | 6.0 ; 0.392304845413 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 534 |
| position | 7.0 ; 0.969655114603 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 535 |
| position | 6.0 ; 0.392304845413 ; 6.32993161855 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 536 |
| position | 6.0 ; 2.70170592217 ; -5.10102051443 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 537 |
| position | 7.0 ; 2.12435565298 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 538 |
| position | 6.0 ; 2.70170592217 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 539 |
| position | 7.0 ; 2.12435565298 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 540 |
| position | 6.0 ; 2.70170592217 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 541 |
| position | 7.0 ; 2.12435565298 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 542 |
| position | 6.0 ; 2.70170592217 ; 4.6969384567 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 543 |
| position | 6.0 ; 3.85640646055 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 544 |
| position | 7.0 ; 4.43375672974 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 545 |
| position | 6.0 ; 3.85640646055 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 546 |
| position | 7.0 ; 4.43375672974 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 547 |
| position | 6.0 ; 3.85640646055 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 548 |
| position | 6.0 ; 6.16580753731 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 549 |
| position | 7.0 ; 5.58845726812 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 550 |
| position | 6.0 ; 6.16580753731 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 551 |
| position | 8.0 ; -3.07179676972 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 552 |
| position | 8.0 ; -3.07179676972 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 553 |
| position | 8.0 ; -0.762395692966 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 554 |
| position | 8.0 ; -0.762395692966 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 555 |
| position | 8.0 ; 0.392304845413 ; -3.46802735258 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 556 |
| position | 8.0 ; 0.392304845413 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 557 |
| position | 8.0 ; 0.392304845413 ; 3.06394529484 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 558 |
| position | 8.0 ; 2.70170592217 ; -1.83503419072 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 559 |
| position | 8.0 ; 2.70170592217 ; 1.43095213299 |
| radius | 1.0 |
| mass | 4.1887902047863905 |
| id | 560 |
| position | 8.0 ; 3.85640646055 ; -0.202041028867 |
| radius | 1.0 |
| mass | 4.1887902047863905 |

**Material properties**

|  |  |
| --- | --- |
| poisson | 0.35 |
| frictionAngle | 0.6 |
| density | 1.0 |
| young | 500.0 |
| id | 0 |
| label | concrete |

**Interaction Loop**

|  |  |
| --- | --- |
| lawDispatcher | <LawDispatcher instance at 0x2e5efe0> |
| geomDispatcher | <IGeomDispatcher instance at 0x2e5ee40> |
| dead | False |
| label |  |
| eraseIntsInLoop | False |
| callbacks | [] |
| ompThreads | -1 |
| physDispatcher | <IPhysDispatcher instance at 0x2e5ef10> |

**Geometry Dispatcher**

|  |  |  |
| --- | --- | --- |
| functors | "[<Ig2\_Sphere\_Sphere\_ScGeom instance at 0x26012d0> | <Ig2\_Facet\_Sphere\_ScGeom instance at 0x2601330>]" |
| ompThreads | -1 |  |
| dead | False |  |
| label |  |  |

**Geometry functors**

|  |  |
| --- | --- |
| Ig2\_Sphere\_Sphere\_ScGeom | |
| avoidGranularRatcheting | True |
| interactionDetectionFactor | 1.0 |
| label |  |
| Ig2\_Facet\_Sphere\_ScGeom | |
| shrinkFactor | 0.0 |
| label |  |

**Law Dispatcher**

|  |  |
| --- | --- |
| functors | [<Law2\_ScGeom\_FrictPhys\_CundallStrack instance at 0x2805610>] |
| ompThreads | -1 |
| dead | False |
| label |  |

**Law Dispatcher Functor: Law2\_ScGeom\_FrictPhys\_CundallStrack**

|  |  |
| --- | --- |
| traceEnergy | False |
| neverErase | False |
| sphericalBodies | True |
| label |  |

**Physics Dispatcher**

|  |  |
| --- | --- |
| functors | [<Ip2\_FrictMat\_FrictMat\_FrictPhys instance at 0x2daa960>] |
| ompThreads | -1 |
| dead | False |
| label |  |

**Physics Dispatcher Functor: Ip2\_FrictMat\_FrictMat\_FrictPhys**

|  |  |
| --- | --- |
| label |  |
| frictAngle |  |

**Newton Integrator**

|  |  |
| --- | --- |
| prevVelGrad | "Matrix3(0;0;0; 0;0;0; 0;0;0)" |
| maxVelocitySq | nan |
| mask | -1 |
| exactAsphericalRot | True |
| gravity | "Vector3(0;0;0)" |
| kinSplit | False |
| label |  |
| warnNoForceReset | True |
| damping | 0.1 |
| ompThreads | -1 |
| dead | False |