

OpenFOAM Seminar for beginner 13th
Interim report

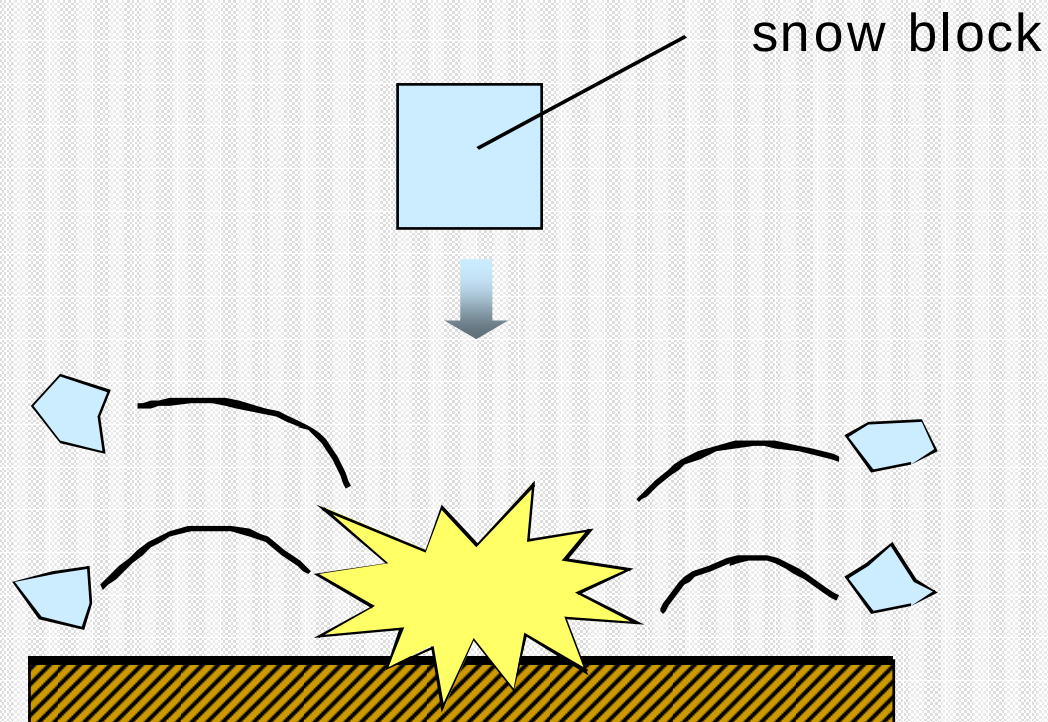
Destruction of solid with DEM

Takahiro Shibata

tshibata0811@gmail.com

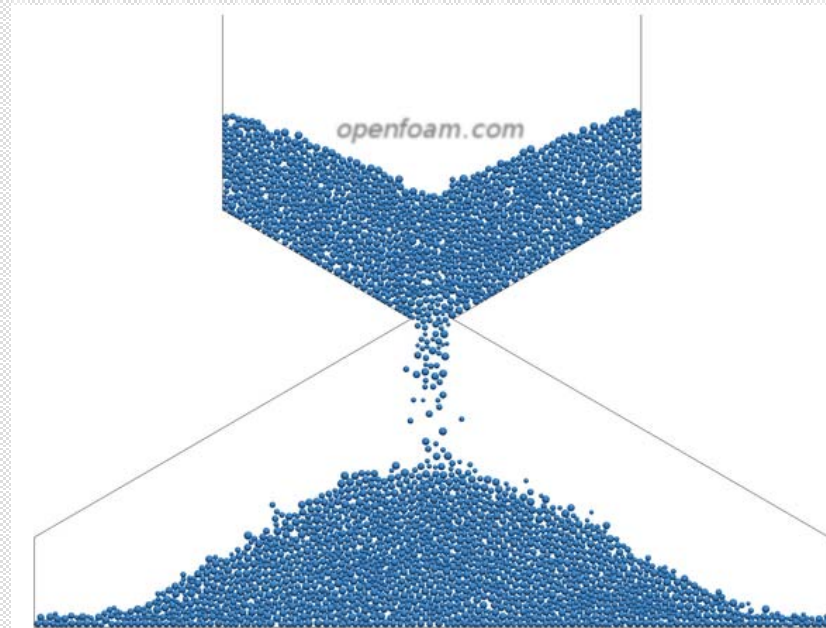
1, Introduction

I want to analyse destruction of solid(snow block) with DEM(Discrete Element Method).



2, DEM(Discrete Element Method)

DEM is numerical methods for computing the motion of a large number of particles of micrometre-scale size and above.



<http://www.openfoam.com/version2.0.0/lagrangian.php>

3, CaseFile

Referring to Mr. Kasuga's PENGUINITIS

DEM 解析

2011年6月25日

はじめに

OpenFOAM で DEM の計算を行う。

使用バージョン

OpenFOAM 2.0.0

ファイル

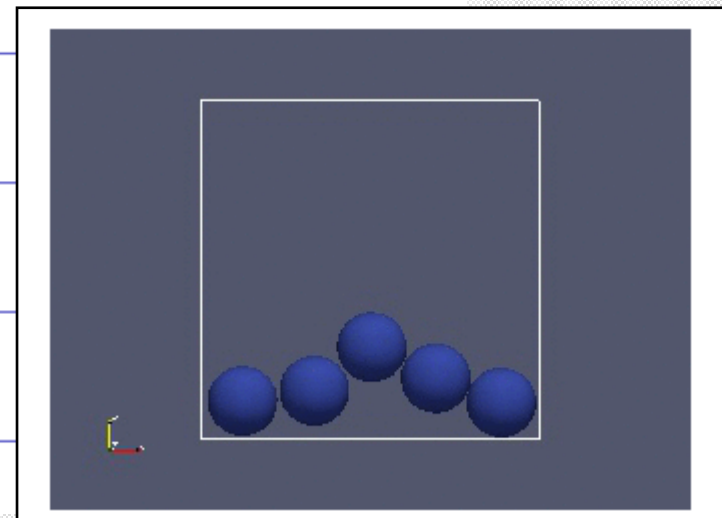
- [square.tar.gz](#)

DEM ソルバー

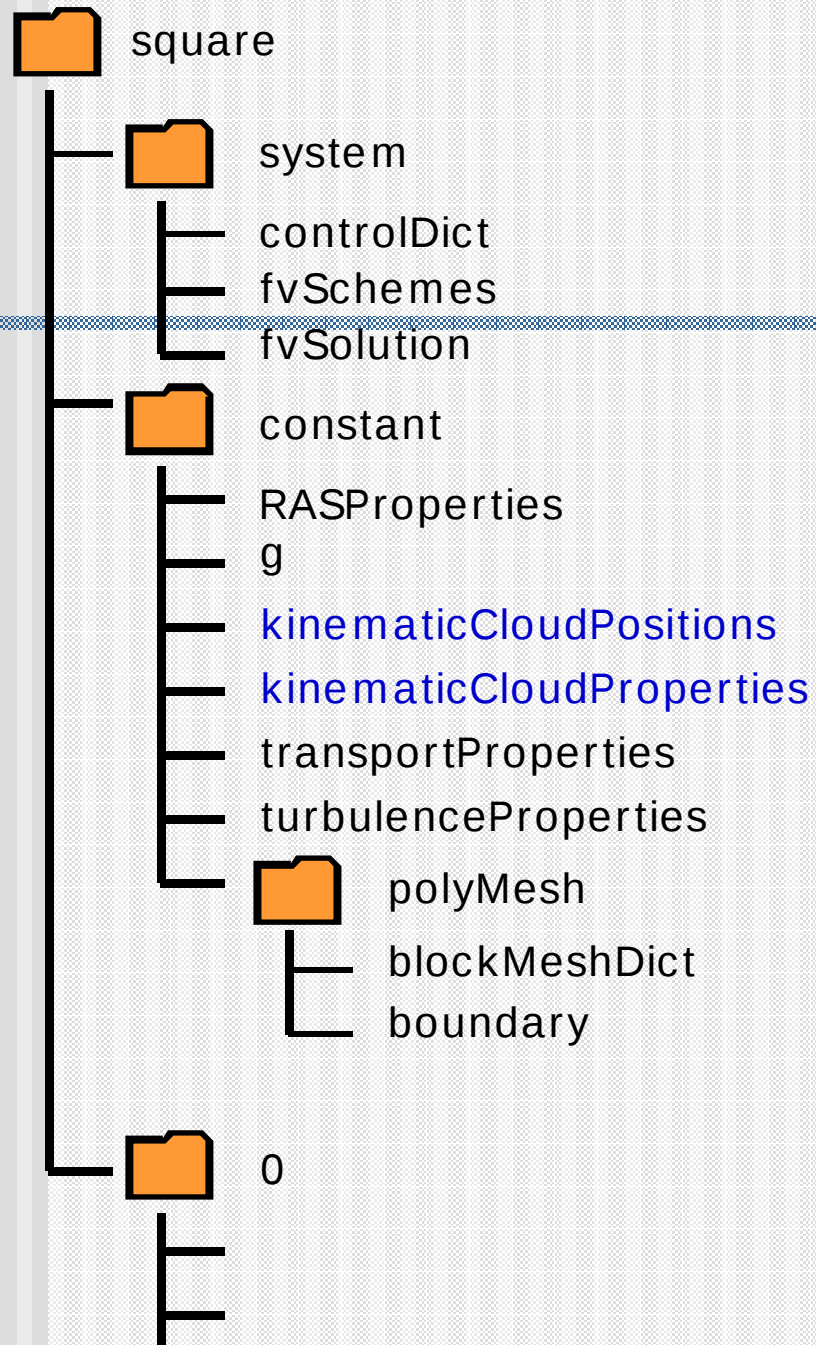
icoUncoupledKinematicParcelFoam

参考

`$FOAM_TUTORIALS/lagrangian/icoUncoupledKinematicParcelFoam/hopper`



<http://www.geocities.jp/penguinitis2002/study/OpenFOAM/dem/dem.html>



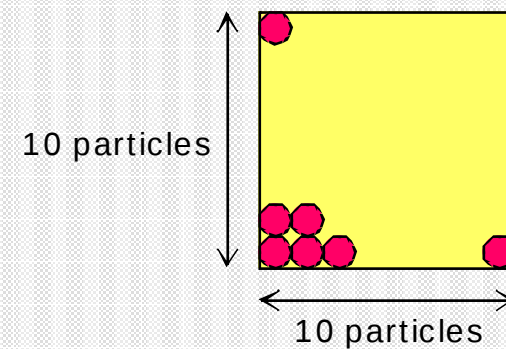
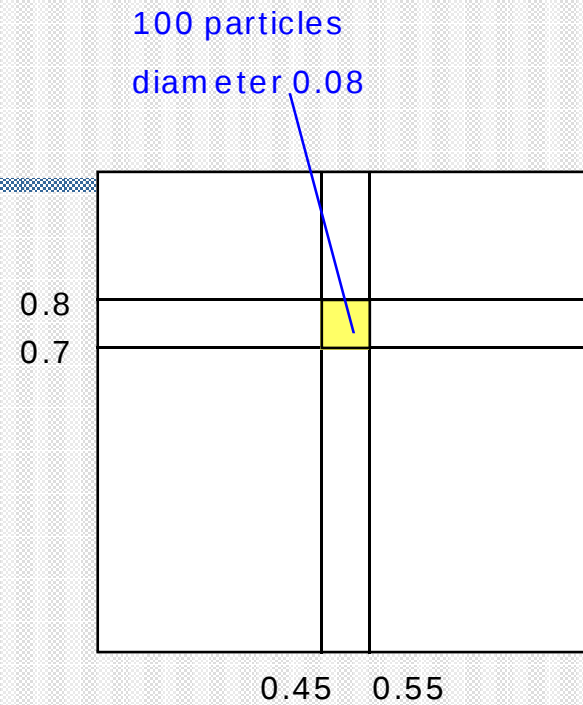
Initial condntions & size of particles

Parameter of DEM

kinematicCloudPositions

```
FoamFile
{
  version    2.0;
  format     ascii;
  class      vectorField;
  object     kinematicCloudPositions;
}
// * * * * *

(
  (0.04595 0.07097 0.0051)
  (0.04709 0.0709 0.00497)
  (0.04792 0.07099 0.00497)
  (0.04894 0.07094 0.00499)
  (0.05009 0.07105 0.005)
  (0.05098 0.07106 0.00508)
  (0.05204 0.07102 0.00494)
  .....
  (0.05506 0.07998 0.0049)
)
```



kinematicCloudProperties

```
FoamFile
{
  version      2.0;
  format       ascii;
  class        dictionary;
  location     "constant";
  object       reactingCloud1Properties;
}
// * * * * *
...

subModels
{
  ...

  manualInjectionCoeffs
  {
    ...
    sizeDistribution
    {
      type      fixedValue;
      fixedValueDistribution
      {
        value  0.0008;
      }
    }
  }
}
```

Size of particles

```
pairCollisionCoeffs
{
  // Maximum possible particle diameter expected at any time
  maxInteractionDistance 0.0008;
  writeReferredParticleCloud no;

  pairModel pairSpringSliderDashpot;

  pairSpringSliderDashpotCoeffs
  {
    useEquivalentSize no;
    alpha      0.12;
    b          1.5;
    mu         0.52;
    cohesionEnergyDensity 0;
    collisionResolutionSteps 12;
  };

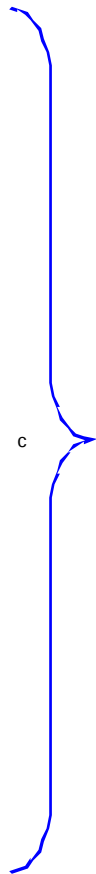
  wallModel wallLocalSpringSliderDashpot;
```

Parameter of DEM

```

wallLocalSpringSliderDashpotCoeffs
{
    useEquivalentSize no;
    collisionResolutionSteps 12;
    movingWall
    {
        youngsModulus 1e10;
        poissonsRatio 0.23;
        alpha 0.12;
        b 1.5;
        mu 0.43;
    }
    fixedWalls
    {
        youngsModulus 1e10;
        poissonsRatio 0.23;
        alpha 0.12;
        b 1.5;
        mu 0.43;
    }
    frontAndBack
    {
        youngsModulus 1e10;
        poissonsRatio 0.23;
        alpha 0.12;
        b 1.5;
        mu 0.1;
    }
};

```



Parameter of DEM

```

standardWallInteractionCoeffs
{
    type rebound;
}

```

```

cloudFunctions
{}

```

4, Calculation

Mesh generation

```
$ blockMesh
```

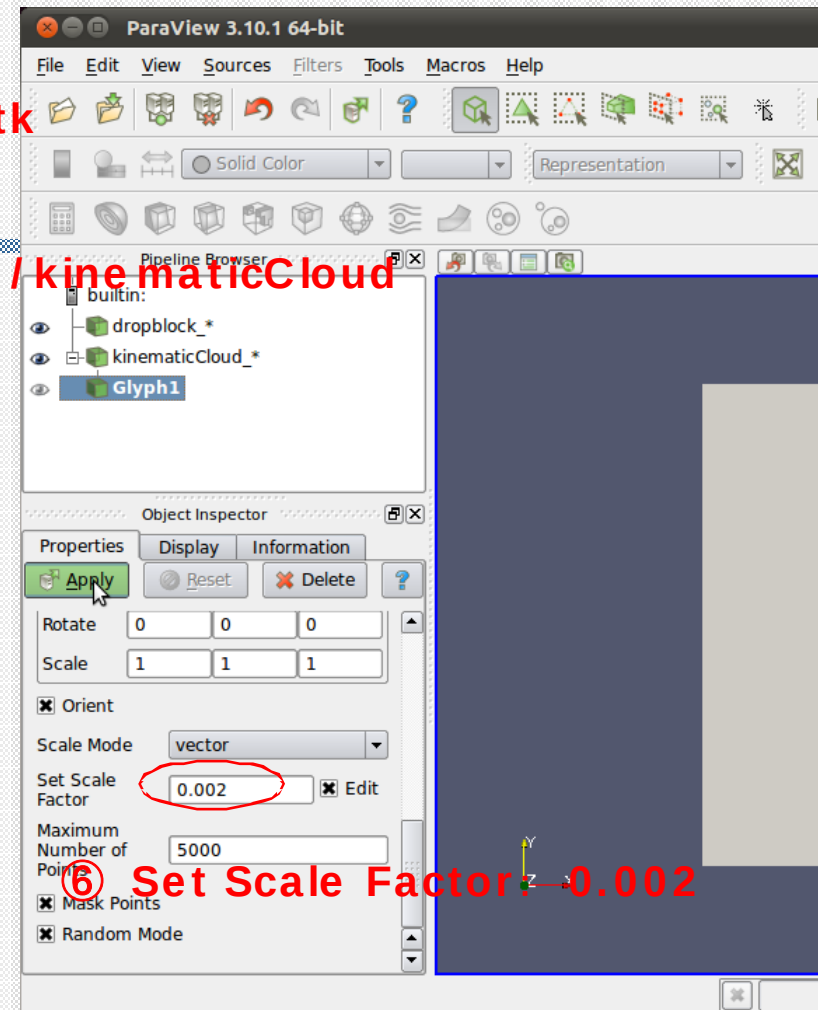
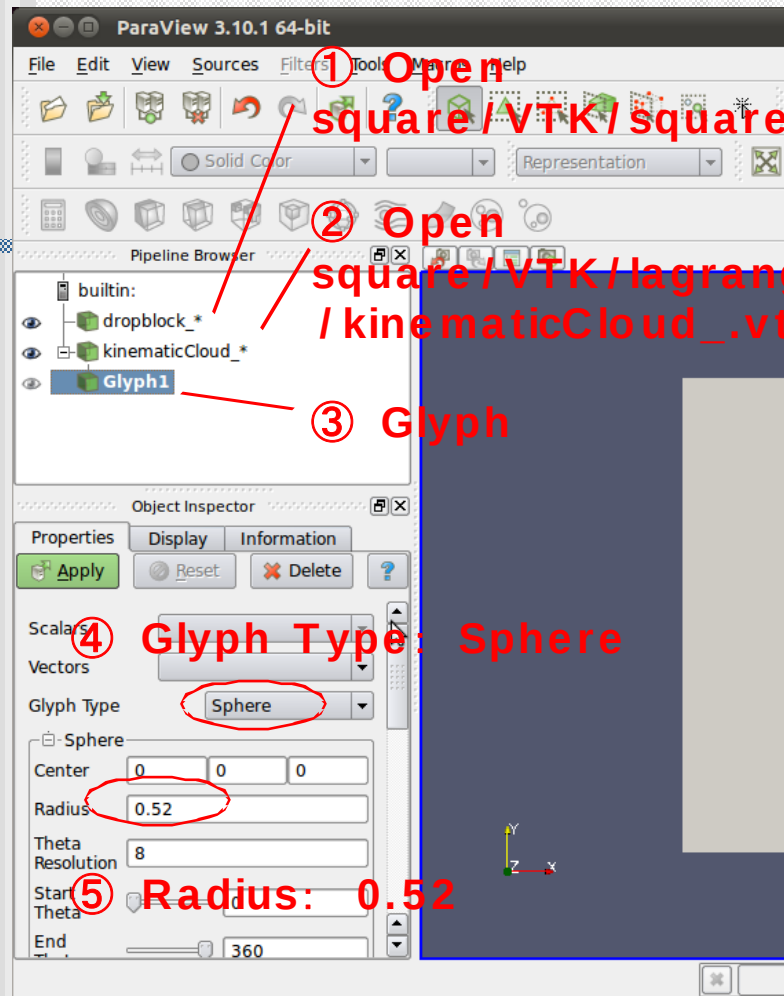
Running the code

```
$ icoUncoupledKinematicParcelFoam
```

Post-processing

```
$ foamToVTK
```

```
$ paraview
```



Case1 Regular arrangement
Case2 Irregular arrangement