APC_524

Generated by Doxygen 1.8.12

Contents

1	Hiera	archical Index	1
	1.1	Class Hierarchy	1
2	Clas	s Index	3
	2.1	Class List	3
3	Clas	s Documentation	5
	3.1	Boris Class Reference	5
	3.2	Domain Class Reference	6
	3.3	Field_part Struct Reference	6
	3.4	Grid Class Reference	6
		3.4.1 Detailed Description	8
		3.4.2 Member Function Documentation	8
		3.4.2.1 evolveFields()	8
		3.4.2.2 getCellID()	8
		3.4.2.3 getFieldInterpolatorVec()	9
		3.4.2.4 getStepSize()	9
	3.5	Input_Info_t Struct Reference	9
	3.6	Interpolator Class Reference	10
	3.7	Particle Struct Reference	10
	3.8	Particle_Compare Class Reference	11
	3.9	Particle_Field_List Class Reference	11
	3.10	Pusher Class Reference	11

Chapter 1

Hierarchical Index

1.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

nain	6
d_part	6
L	6
ut_Info_t	ç
rpolator	10
iicle	10
icle_Compare	11
icle_Field_List	11
her	11
Boris	Ę

2 Hierarchical Index

Chapter 2

Class Index

2.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

ris						5
main						6
ld_part						6
d						
Class representing grid on which E and B fields and currents are defined						6
ut_Info_t						9
erpolator						
rticle						
rticle_Compare						11
rticle_Field_List						11
sher						- 11

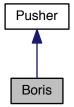
4 Class Index

Chapter 3

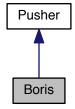
Class Documentation

3.1 Boris Class Reference

Inheritance diagram for Boris:



Collaboration diagram for Boris:



Public Member Functions

• int Step (Particle *part, Field_part *field, double dt)

The documentation for this class was generated from the following files:

- src/pusher/boris.hpp
- · src/pusher/boris.cpp

3.2 Domain Class Reference

Public Member Functions

- **Domain** (int size, int rank, Input_Info_t *input_info)
- int getnGhosts (void)
- int * getnxyz (void)
- double * getxyz0 (void)
- double * getLxyz (void)

The documentation for this class was generated from the following files:

- src/domain/domain.hpp
- src/domain/domain.cpp

3.3 Field_part Struct Reference

Public Attributes

- double e1
- double e2
- double e3
- double b1
- double b2
- double b3

The documentation for this struct was generated from the following file:

• src/particles/particle.hpp

3.4 Grid Class Reference

Class representing grid on which E and B fields and currents are defined.

#include <grid.hpp>

3.4 Grid Class Reference 7

Public Member Functions

- Grid (int *nxyz, int nGhosts, double *xyz0, double *Lxyz)
- int evolveFields (double dt)

Evolve Electric and Magnetic fields in time.

int getFieldInterpolatorVec (int cellID, double *InterpolatorVec)

Return vector for field interpolation.

• int getCellID (double x, double y, double z)

Get cell ID based on particle position.

• int getNumberOfCells ()

Get total number of cells.

• double getStepSize (int dimension)

Get number of cells along dimension in grid.

- void updateGhostCells ()
- int getGhostVecSize ()
- void **getGhostVec** (const int side, double *ghostVec)
- void getGhostVecAlt (const int side, double *ghostVec)
- void setGhostVec (const int side, const double *ghostVec)
- void setGhostVecAlt (const int side, const double *ghostVec)

Protected Member Functions

- double *** newField_()
- void deleteField_ (double ***fieldPt)
- int sideToIndex_ (const int side)
- void checkInput_()
- void **sliceMatToVec_** (double ***const mat, const int side)
- void **unsliceMatToVec_** (double ***mat, const int side)

Protected Attributes

- const int nx
- const int ny_
- const int nz
- const int nGhosts_
- const double x0_
- · const double y0_
- const double z0
- const double Lx
- const double Ly_
- const double Lz_
- const int iBeg_
- const int jBeg_
- const int kBeg_
- const int iEnd
- const int jEnd
- · const int kEnd_
- const double dx_
- const double dy_
- const double dz_
- const double idx_
- const double idy_

```
· const double idz_
```

- · const int nRealPtsYZPlane_
- · const int nFields_
- const int ghostVecSize_
- double *** Ex
- double *** Ey_
- double *** Ez
- double *** Bx_
- double *** By_
- double *** Bz
- double *** Bx_tm1_
- double *** By_tm1_
- double *** Bz_tm1_
- double *** Jx_
- double *** Jy_
- double *** Jz
- double * sliceTmp

3.4.1 Detailed Description

Class representing grid on which E and B fields and currents are defined.

Grid has ghost cells on each face. The ghost cell updating in y and z arises from periodic boundary conditions. x-direction ghost cells allow communication between MPI domains.

Following Yee (1966), electric fields and currents reside on edges, and magnetic fields on faces. Fields are updated using a set of finite-difference equations approximating Ampere's and Faraday's Laws.

A set of getters are available to allow particles to interpolate electric fields based on their position.

3.4.2 Member Function Documentation

3.4.2.1 evolveFields()

Evolve Electric and Magnetic fields in time.

Uses Yee algorithm to advance E and B fields.

3.4.2.2 getCellID()

```
int Grid::getCellID ( \label{eq:double x, double y, double z } \mbox{double } z \mbox{ )}
```

Get cell ID based on particle position.

Cell ID is uniquely given by (ny_*nz_)*ix + nz_*iy + iz. Returns -1 if particle is not on grid.

3.4.2.3 getFieldInterpolatorVec()

Return vector for field interpolation.

Based on cellID, return relevant edge E and face B fields and cell origin, in format [x, y, z, ... Ex(ix, iy, iz), Ex(ix, iy+1,iz), Ex(ix, iy+1,iz+1), Ex(ix, iy, iz+1), ... Ey(ix, iy, iz), Ey(ix, iy, iz+1), Ey(ix+1, iy, iz+1), Ey(ix+1, iy, iz), ... Ez(ix, iy, iz), Ez(ix+1, iy, iz), Ez(ix+1, iy+1, iz), Ez(ix, iy+1, iz), ... Bx(ix, iy, iz), Bx(ix+1, iy, iz), ... By(ix, iy, iz), By(ix, iy+1, iz), ... Bz(ix, iy, iz), Bz(ix, iy, iz+1), ...] where ix, iy, and iz are the row indices for each of the three dimensions (calculated from the cellID)

3.4.2.4 getStepSize()

Get number of cells along dimension in grid.

Returns number of cells along dimension according to; dimension = 0: x dimension = 1: y dimension = 2: z Returns -1 if invalid dimension.

The documentation for this class was generated from the following files:

- src/grid/grid.hpp
- · src/grid/grid.cpp
- · src/grid/oGrid.cpp
- src/grid/spookyGrid.cpp

3.5 Input_Info_t Struct Reference

Public Attributes

- int nx
- long np
- int **nt**
- · int restart
- · double dens
- double temp

The documentation for this struct was generated from the following file:

• src/IO/IO.hpp

3.6 Interpolator Class Reference

Public Member Functions

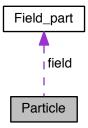
• void interpolate_fields (double *pos, double *lcell, double *cellvars, Field_part *field)

The documentation for this class was generated from the following files:

- · src/particles/interpolate.hpp
- src/particles/interpolate.cpp

3.7 Particle Struct Reference

Collaboration diagram for Particle:



Public Attributes

- double x1
- double x2
- double x3
- double v1
- double v2
- double v3
- double q
- double **m**
- int my_id
- short isGhost
- Field_part * field

The documentation for this struct was generated from the following file:

· src/particles/particle.hpp

3.8 Particle_Compare Class Reference

Public Member Functions

- Particle Compare (Grid *grid)
- bool operator() (Particle const *a, Particle const *b) const

The documentation for this class was generated from the following file:

· src/particles/particle utils.hpp

3.9 Particle_Field_List Class Reference

Public Member Functions

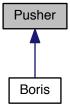
- Particle_Field_List (long np)
- void Load ()
- void Push (double dt)
- · void Pass ()
- long nParticles ()
- void SortParticles (Particle_Compare comp)
- void setPusher (Pusher *pusher)
- void InterpolateEB (Grid *grid)

The documentation for this class was generated from the following files:

- src/particles/particle_list.hpp
- src/particles/particle_list.cpp

3.10 Pusher Class Reference

Inheritance diagram for Pusher:



Public Member Functions

• virtual int Step (Particle *part, Field_part *field, double dt)=0

The documentation for this class was generated from the following file:

• src/pusher/pusher.hpp