# Fluid Simuation

Generated by Doxygen 1.8.17

# Chapter 1

# Hierarchical Index

## 1.1 Class Hierarchy

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

# Chapter 2

# Class Index

## 2.1 Class List

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

# Chapter 3

# File Index

## 3.1 File List

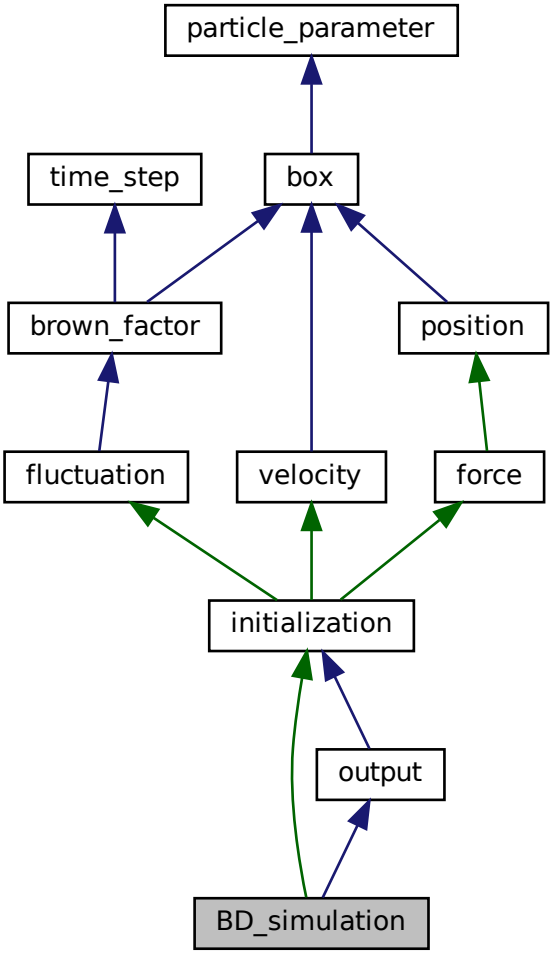
Here is a list of all documented files with brief descriptions:

# Chapter 4

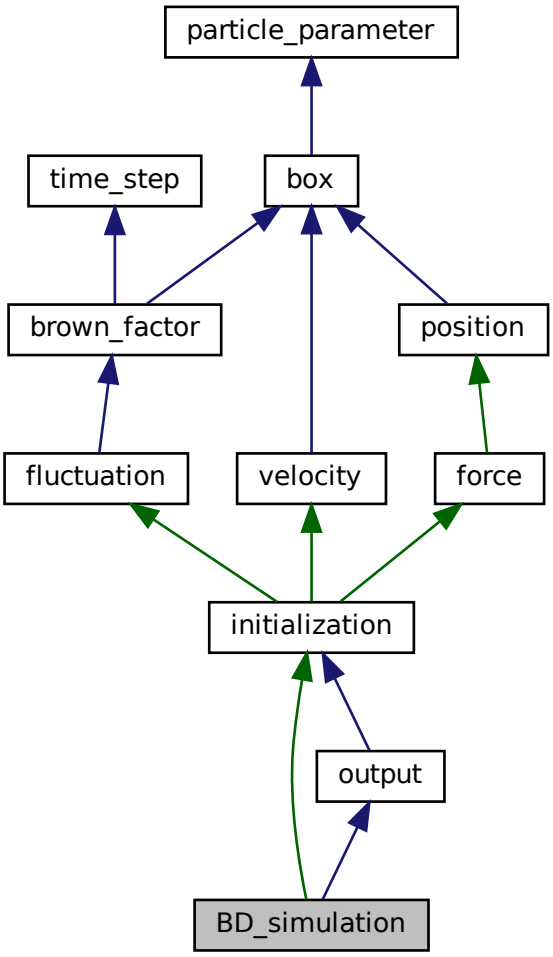
# Class Documentation

## 4.1 BD_simulation Class Reference

Inheritance diagram for BD_simulation:



Collaboration diagram for BD_simulation:




## Public Member Functions

- void **BD_relaxation** ()
- void **BD_implementation** ()

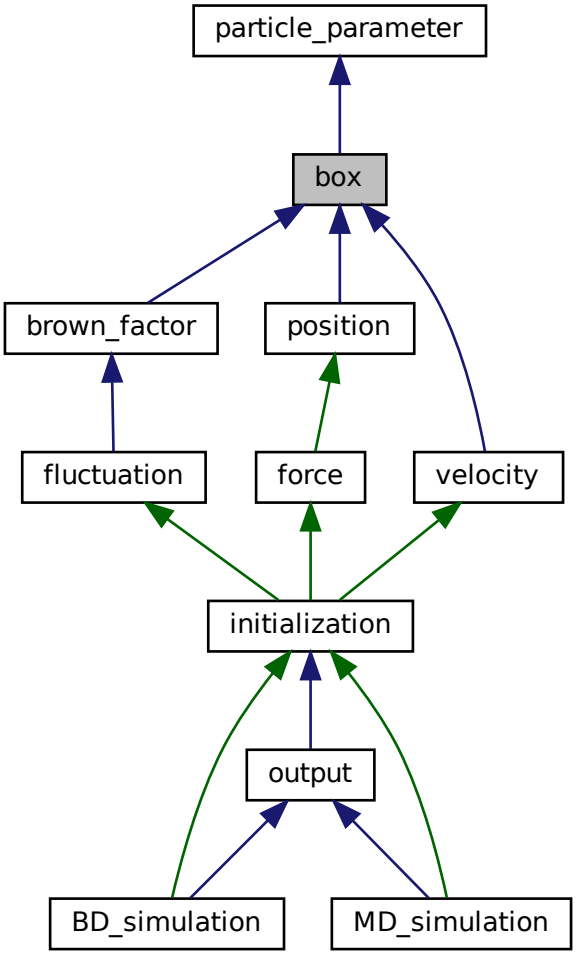
## Additional Inherited Members

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

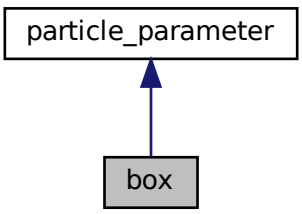
- include/implementation/BD_simulation.hpp
- src/implementation/BD_simulation.cpp

## 4.2 box Class Reference

Inheritance diagram for box:




Collaboration diagram for box:



## Public Member Functions

- void **kT** (const double input)
- double **kT** () const
- void l_b (const int ax, const double input)

  *set the periodic boundary condition*
- std::array< double, 3 > **l_b** () const
- std::array< double, 3 > **half_l_b** () const
- std::array< double, 3 > **inv_l_b** () const
- void **Nm** (const uint64_t input)
- void **density** (const double input)
- uint64_t **Nm** () const
- void **calc_Nm** ()
- void **calc_density** ()
- double **density** () const

### 4.2.1 Member Function Documentation

#### 4.2.1.1 l_b()

```
void box::l_b (
            const int ax,
            const double input )
```

set the periodic boundary condition

**Parameters**

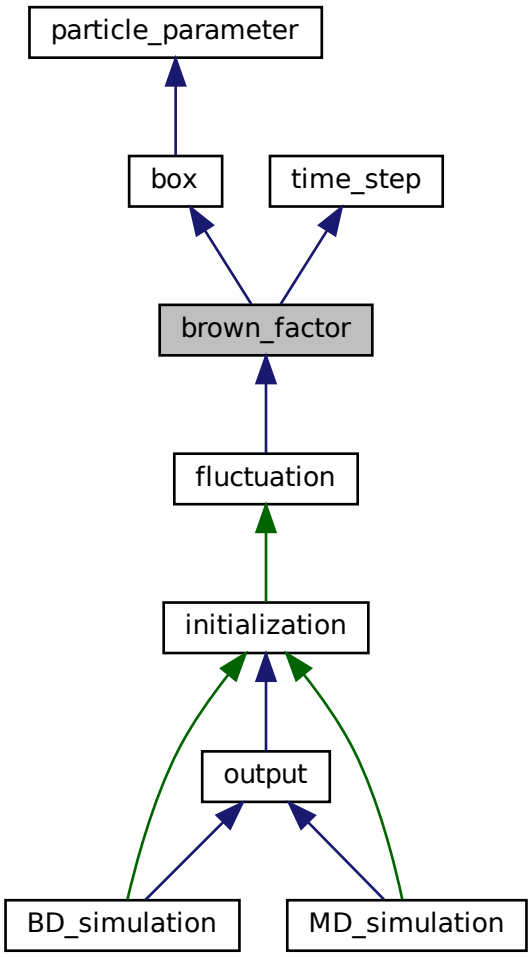
| | |
|---|---|
| *l_b↩ _x* | |
| *l_b↩ _y* | |
| *l_b↩ _z* | |

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

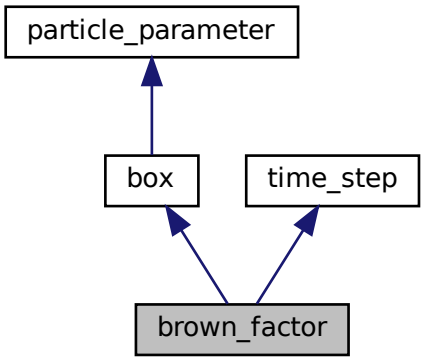
- include/initialization/box.hpp
- src/initialization/box.cpp

## 4.3 brown_factor Class Reference

Inheritance diagram for brown_factor:



Collaboration diagram for brown_factor:




## Public Member Functions

- void **calc_BD_factor** ()
- double **BD_r_1** () const
- double **BD_r_2** () const
- double **BD_v_1** () const
- double **BD_v_2** () const
- double **BD_v_3** () const
- double **BD_g0_1** () const
- double **BD_g1_1** () const
- double **BD_g1_2** () const

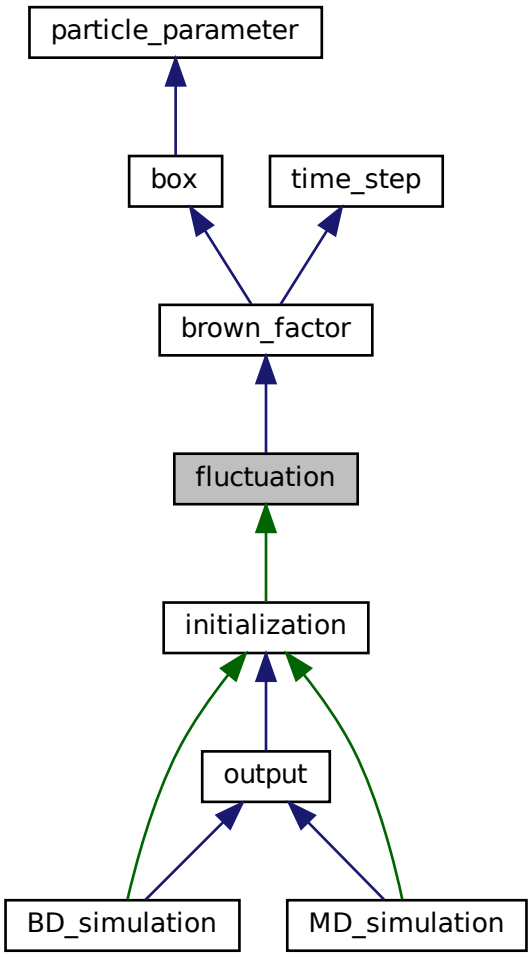
## Additional Inherited Members

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

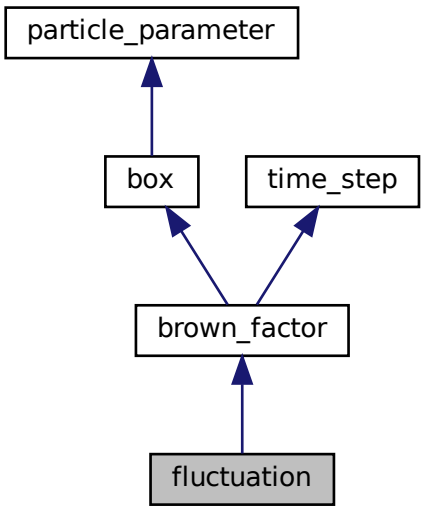
- include/initialization/brown_factor.hpp
- src/initialization/brown_factor.cpp

## 4.4 fluctuation Class Reference

Inheritance diagram for fluctuation:



Collaboration diagram for fluctuation:




## Public Member Functions

- void **init_fluctuation** ()
- void **generate_Gamma** ()

## Protected Attributes

- std::vector< std::array< double, 3 > > **g0**
- std::vector< std::array< double, 3 > > **g1**

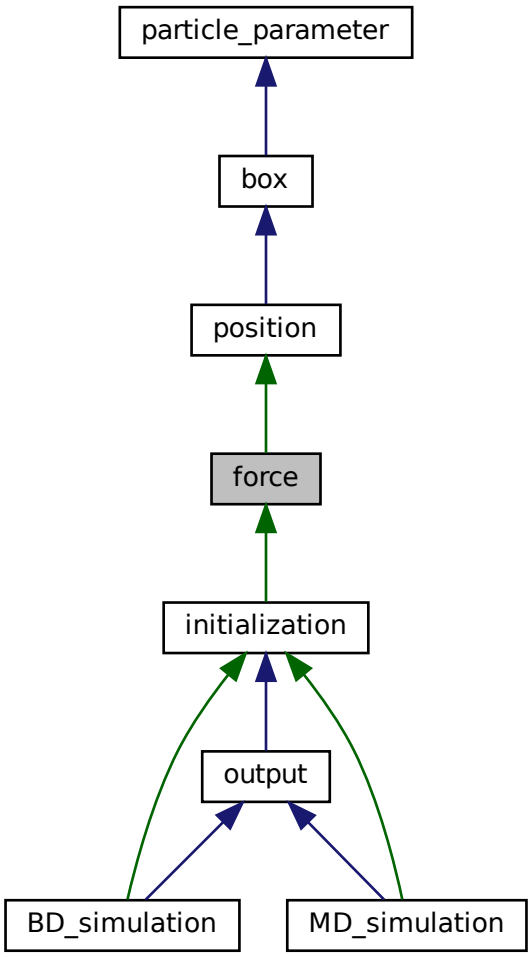
## Additional Inherited Members

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

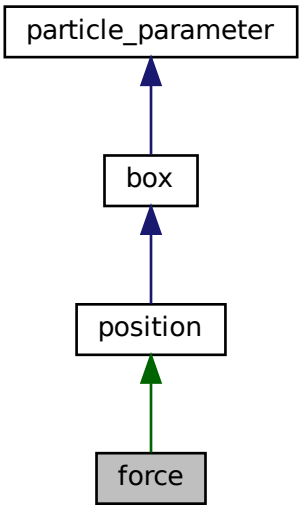
- include/implementation/fluctuation.hpp
- src/implementation/fluctuation.cpp

## 4.5 force Class Reference

Inheritance diagram for force:



Collaboration diagram for force:




## Public Member Functions

- void **init_force** ()
- void **calc_force** ()
- double **E_pot** () const

## Protected Attributes

- std::vector< std::array< double, 3 > > **f0**
- std::vector< std::array< double, 3 > > **f1**

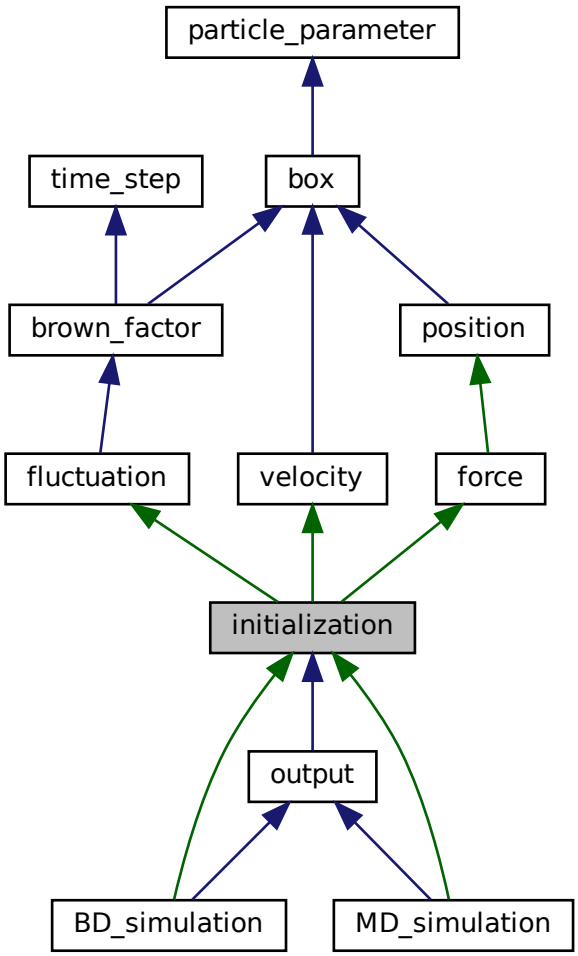
## Additional Inherited Members

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

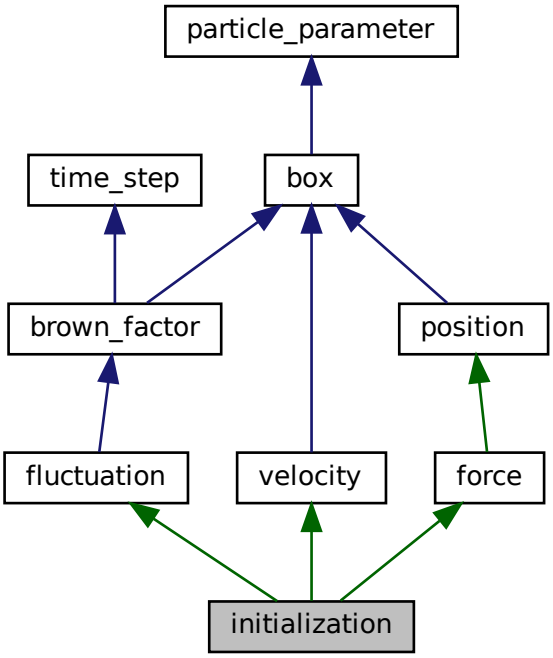
- include/implementation/force.hpp
- src/implementation/force.cpp

## 4.6 initialization Class Reference

Inheritance diagram for initialization:



Collaboration diagram for initialization:




## Public Member Functions

- void **init** (const int argc, const char ∗∗argv)
- void **read_arg** (const int argc, const char ∗∗argv)
- void **read_config** ()

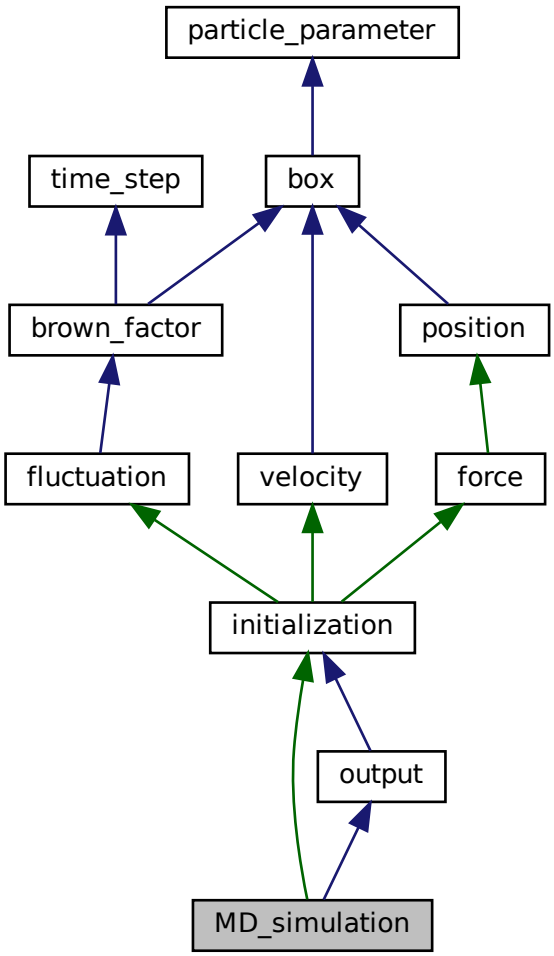
## Additional Inherited Members

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

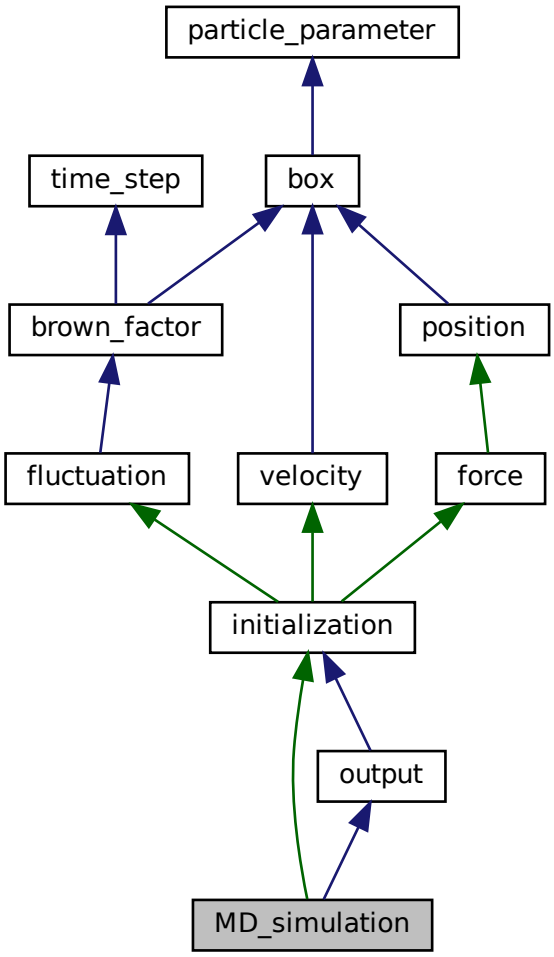
- include/initialization/initialization.hpp
- src/initialization/initialization.cpp

## 4.7 MD_simulation Class Reference

Inheritance diagram for MD_simulation:



Collaboration diagram for MD_simulation:




## Public Member Functions

- void **MD_relaxation** ()
- void **MD_implementation** ()

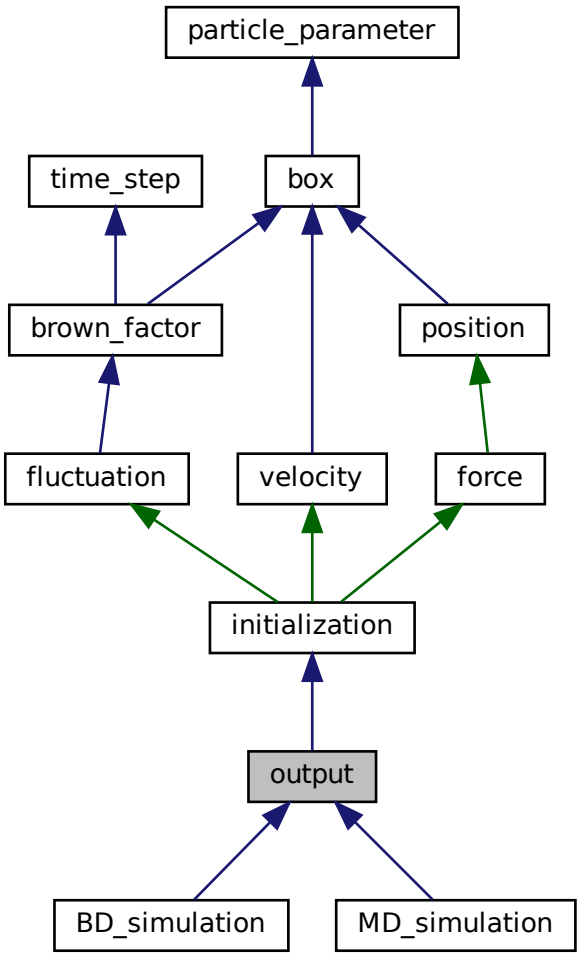
## Additional Inherited Members

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

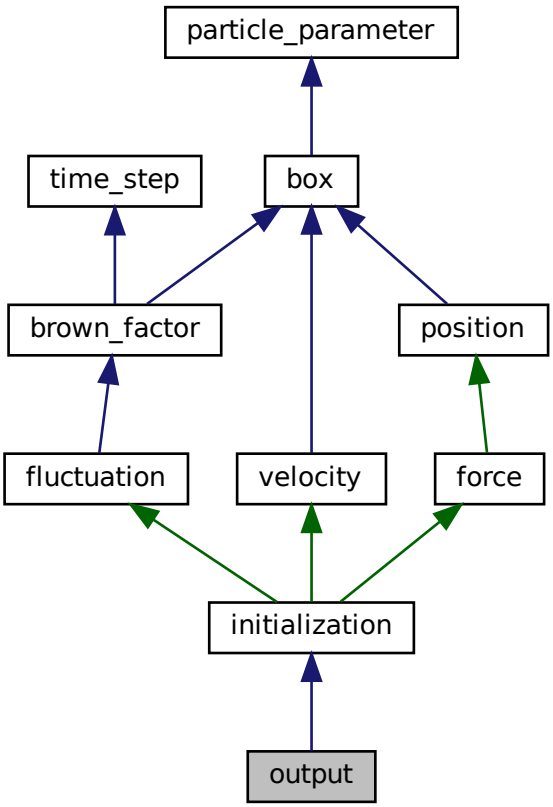
- include/implementation/MD_simulation.hpp
- src/implementation/MD_simulation.cpp

## 4.8 output Class Reference

Inheritance diagram for output:



Collaboration diagram for output:




## Public Member Functions

- void **print_energy** ()
- void **write_cfg** ()
- void **write_energy** ()
- void **write_last_cfg** ()

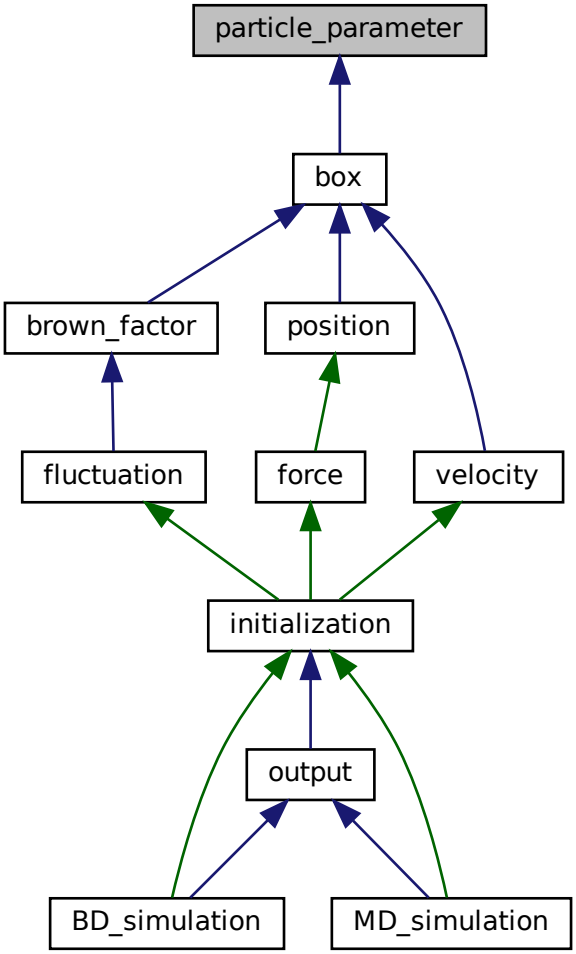
## Additional Inherited Members

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

- include/output/output.hpp
- src/output/output.cpp

## 4.9 particle_parameter Class Reference

Inheritance diagram for particle_parameter:




### Public Member Functions

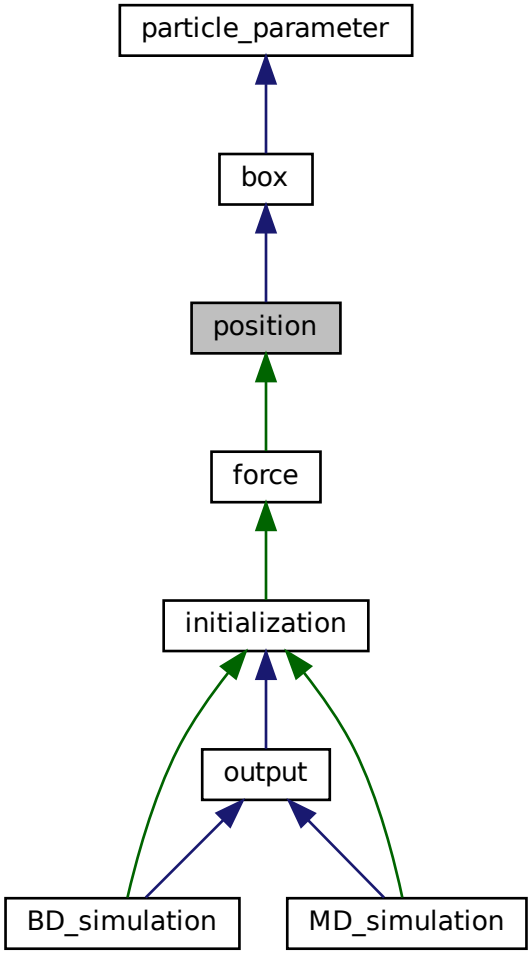
- void **m** (const double input)
- double **m** () const
- void **gamma** (const double input)
- double **gamma** () const
- void **epsilon** (const double input)
- double **epsilon** () const
- void **sigma** (const double input)
- double **sigma** () const
- double **r2_cut** () const
- double **sig2** () const

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

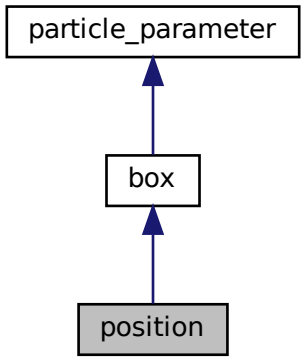
- include/initialization/particle_parameter.hpp
- src/initialization/particle_parameter.cpp

## 4.10 position Class Reference

Inheritance diagram for position:



Collaboration diagram for position:




## Public Member Functions

- void **init_position** ()
- double **minium_image** (const uint64_t &i, const uint64_t &j, const int &ax)

## Protected Attributes

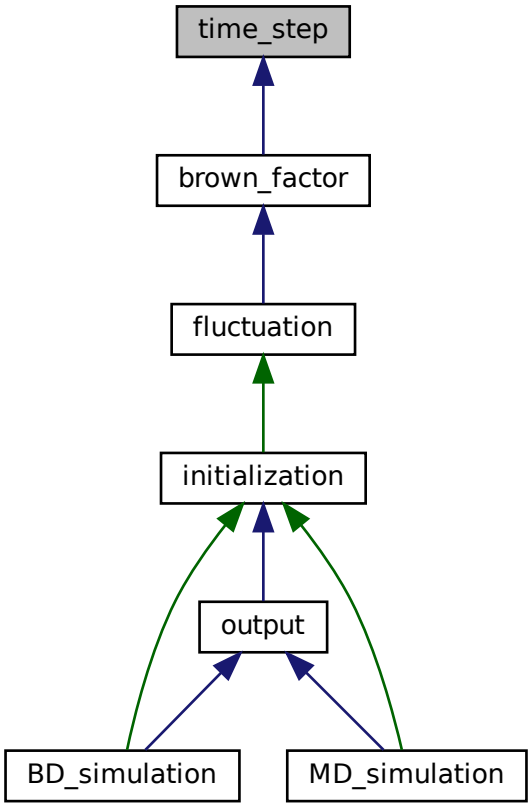
- std::vector< std::array< double, 3 > > **r**
- std::vector< std::array< double, 3 > > **dr**

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

- include/implementation/position.hpp
- src/implementation/position.cpp

## 4.11 time_step Class Reference

Inheritance diagram for time_step:




### Public Member Functions

- void **MD_Steps** (const double input)
- void **Relax_time** (const uint64_t input)
- void **MD_time** (const double input)
- void **h** (const double input)
- uint64_t **MD_Steps** () const
- uint64_t **Relax_Steps** () const
- double **MD_time** () const
- double **step_time** () const
- double h () const

  *out put time step h*
- double half_h () const

  *out put half time step*
- double **half_h2** () const
- uint64_t **time_0001** () const
- uint64_t **time_001** () const

- uint64_t **time_01** () const
- uint64_t **time_1** () const
- uint64_t **time_10** () const
- uint64_t **time_100** () const
- uint64_t **time_1000** () const

## Public Attributes

- uint64_t **step**

### 4.11.1 Member Function Documentation

#### 4.11.1.1 h()

```
double time_step::h ( ) const
```

out put time step h

**Returns**

double

#### 4.11.1.2 half_h()

```
double time_step::half_h ( ) const
```

out put half time step

**Returns**

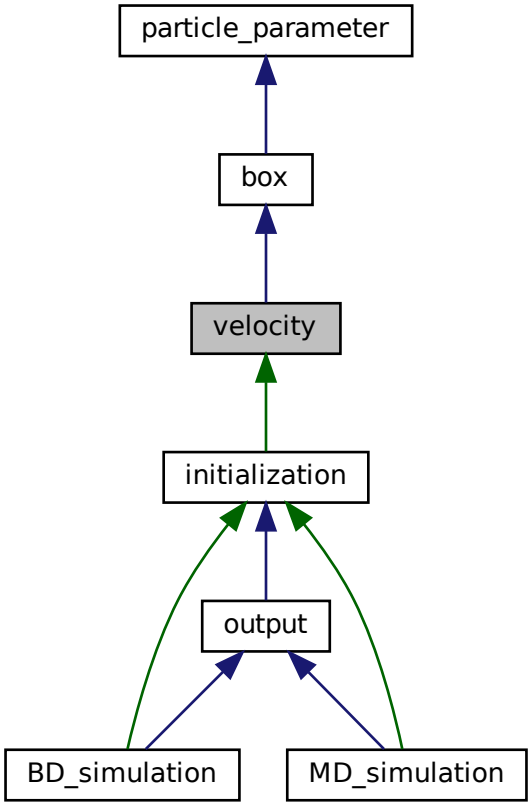
double

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

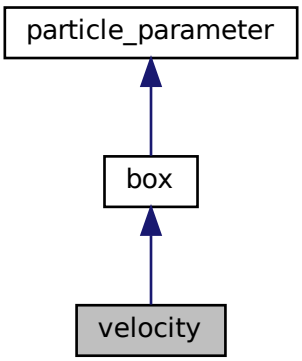
- include/initialization/time_step.hpp
- src/initialization/time_step.cpp

## 4.12 velocity Class Reference

Inheritance diagram for velocity:




Collaboration diagram for velocity:



## Public Member Functions

- void **init_velocity** ()
- void **vel_correcter** ()
- void **calc_E_kin** ()
- double **E_kin** () const

## Protected Attributes

- std::vector< std::array< double, 3 > > **v**

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

- include/implementation/velocity.hpp
- src/implementation/velocity.cpp

# Chapter 5

# File Documentation

## 5.1 include/implementation/cell_list.hpp File Reference

### 5.1.1 Detailed Description

**Author**

Haoran Chen ( chen950302@live.com)

**Version**

0.1

**Date**

2021-12-26

**Copyright**

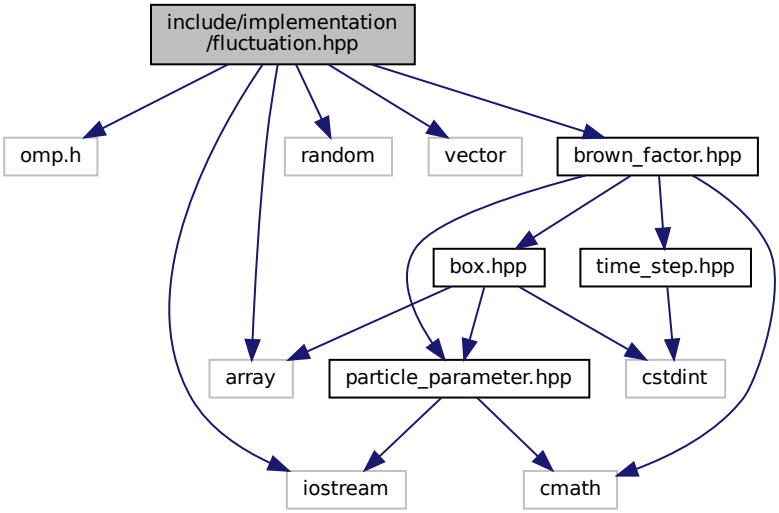
Copyright (c) 2021

## 5.2 include/implementation/fluctuation.hpp File Reference

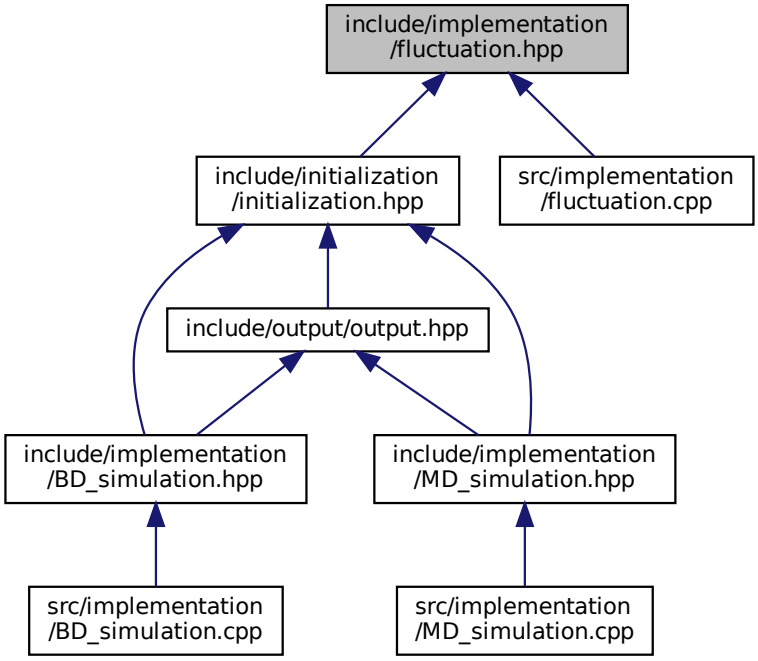
```
#include <omp.h>
#include <array>
#include <iostream>
#include <random>
#include <vector>
```

```
#include "brown_factor.hpp"
```

Include dependency graph for fluctuation.hpp:




This graph shows which files directly or indirectly include this file:



### Classes

- class fluctuation

### 5.2.1 Detailed Description

**Author**

Haoran Chen ( chen950302@live.com)

**Version**

0.1

**Date**

2021-12-23

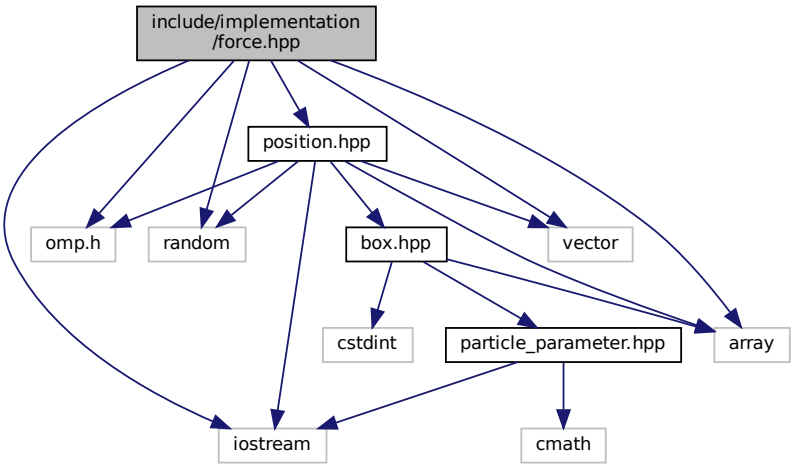
**Copyright**

Copyright (c) 2021

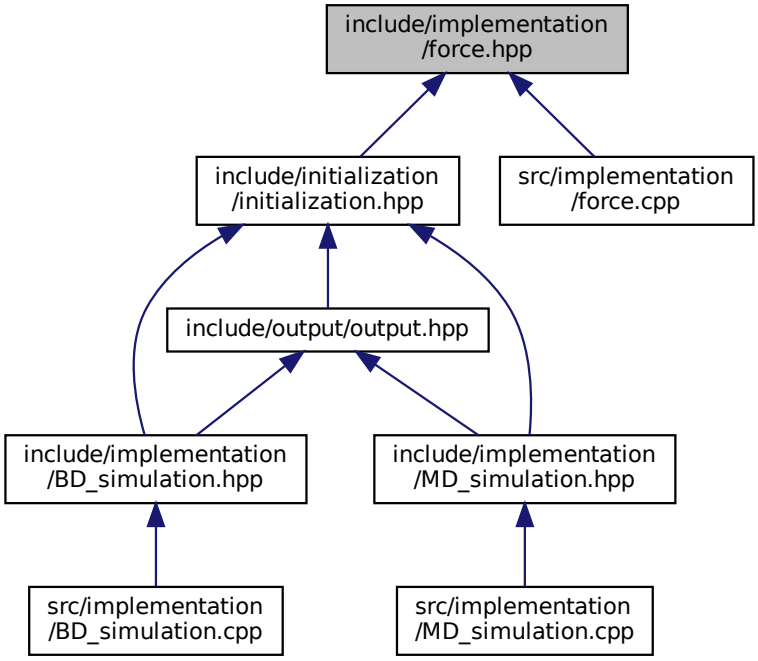
## 5.3 include/implementation/force.hpp File Reference

```
#include <omp.h>
#include <array>
#include <iostream>
#include <random>
#include <vector>
#include "position.hpp"
```

Include dependency graph for force.hpp:



This graph shows which files directly or indirectly include this file:




## Classes

- class force

### 5.3.1 Detailed Description

**Author**

Haoran Chen ( chen950302@live.com)

**Version**

0.1

**Date**

2021-12-23

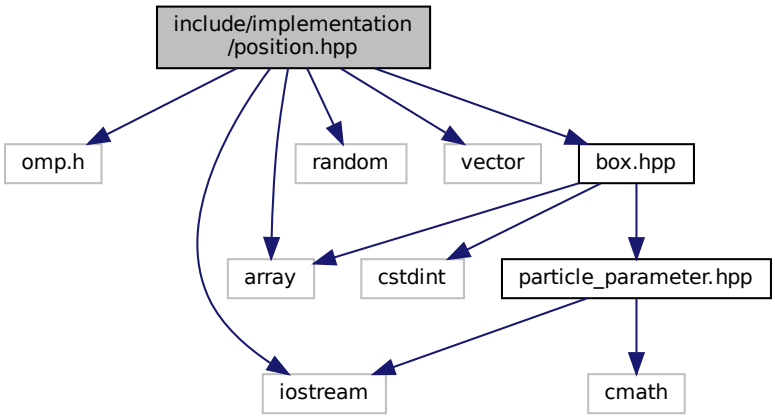
**Copyright**

Copyright (c) 2021

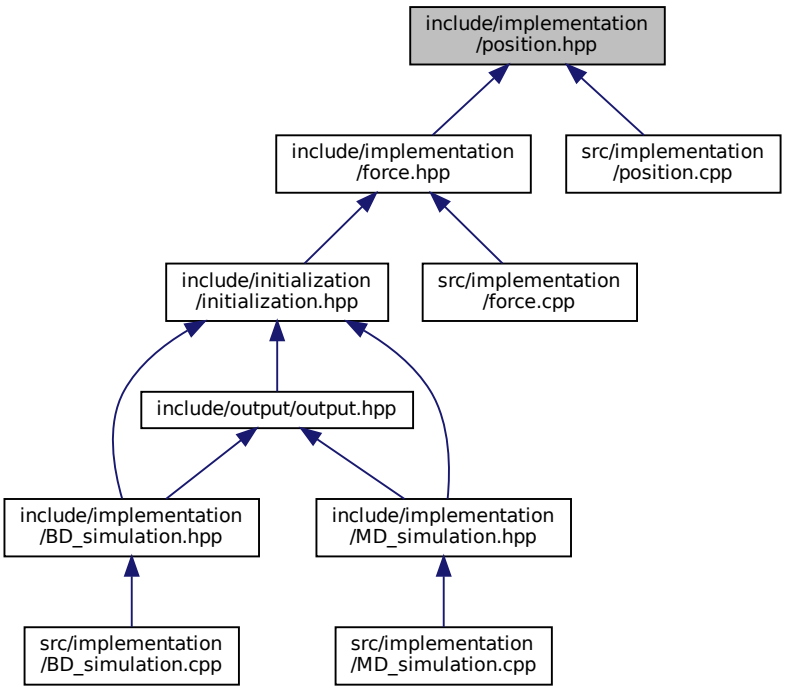
## 5.4 include/implementation/position.hpp File Reference

```
#include <omp.h>
#include <array>
#include <iostream>
#include <random>
#include <vector>
#include "box.hpp"
```

Include dependency graph for position.hpp:



This graph shows which files directly or indirectly include this file:




## Classes

- class position

### 5.4.1 Detailed Description

**Author**

Haoran Chen ( chen950302@live.com)

**Version**

0.1

**Date**

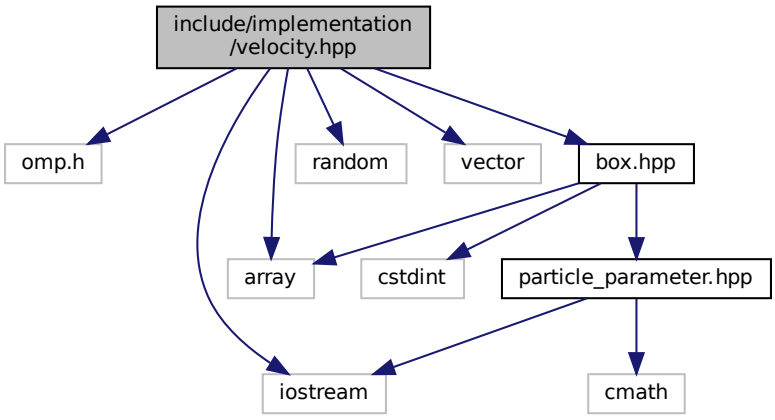
2021-12-23

**Copyright**

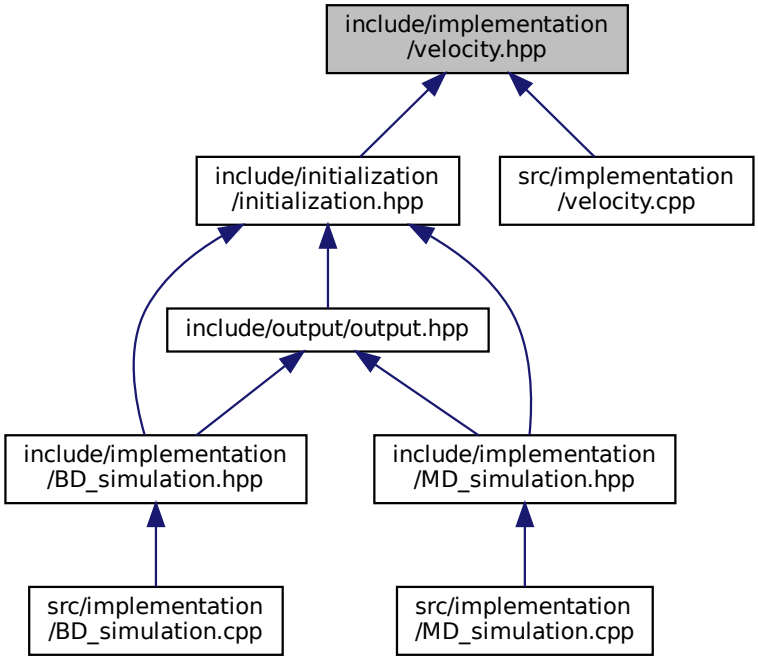
## 5.5 include/implementation/velocity.hpp File Reference

```
#include <omp.h>
#include <array>
#include <iostream>
#include <random>
#include <vector>
#include "box.hpp"
```

Include dependency graph for velocity.hpp:



This graph shows which files directly or indirectly include this file:




## Classes

- class velocity

### 5.5.1 Detailed Description

**Author**

Haoran Chen ( chen950302@live.com)

**Version**

0.1

**Date**

2021-12-23

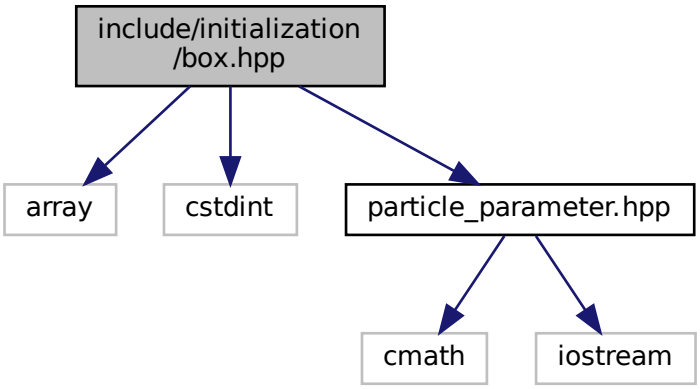
**Copyright**

Copyright (c) 2021

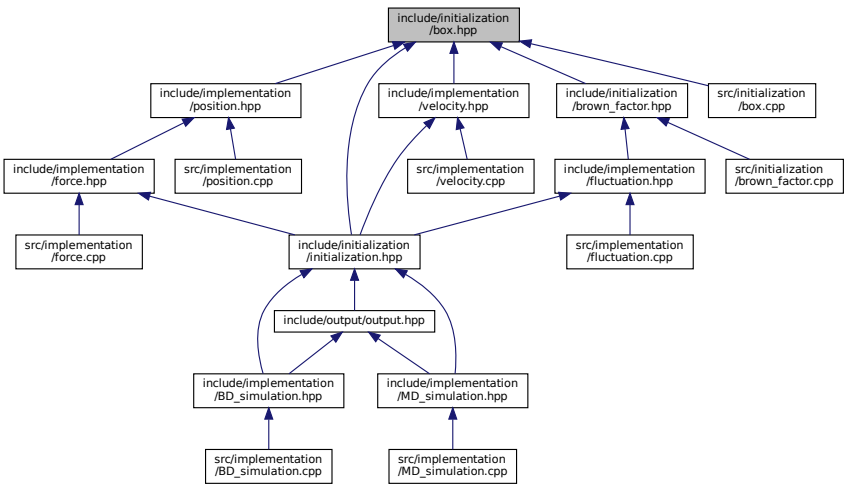
## 5.6 include/initialization/box.hpp File Reference

```
#include <array>
#include <cstdint>
#include "particle_parameter.hpp"
```

Include dependency graph for box.hpp:




This graph shows which files directly or indirectly include this file:




### Classes

- class box

### 5.6.1 Detailed Description

**Author**

Haoran Chen ( chen950302@live.com)

**Version**

0.1

**Date**

2021-12-06

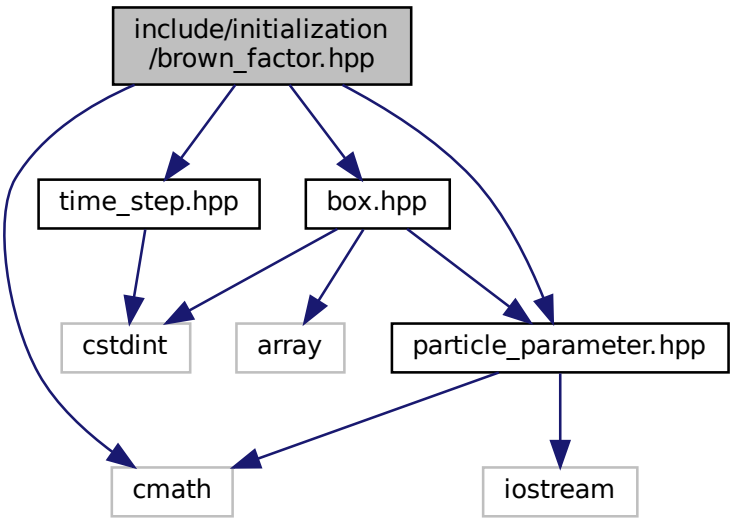
**Copyright**



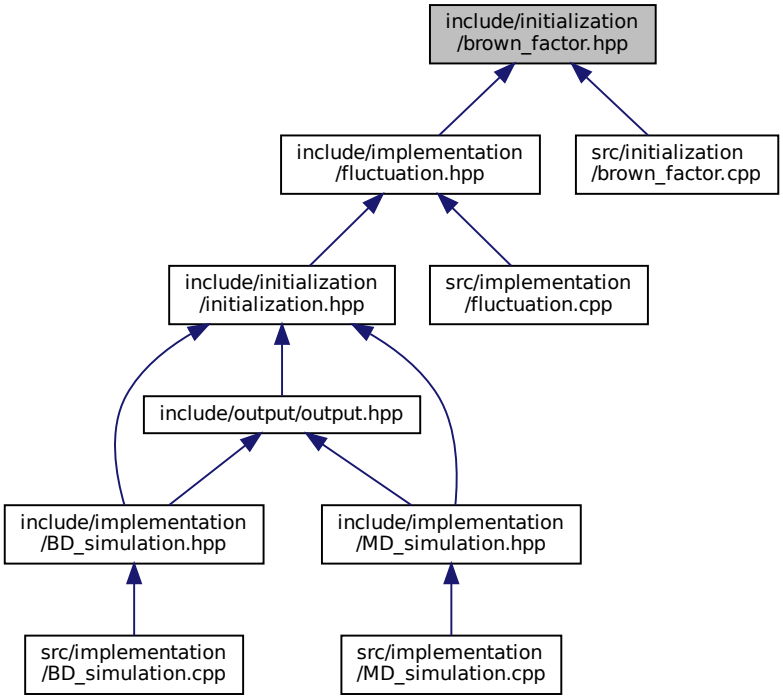
## 5.7 include/initialization/brown_factor.hpp File Reference

```
#include <cmath>
#include "box.hpp"
#include "particle_parameter.hpp"
#include "time_step.hpp"
```

Include dependency graph for brown_factor.hpp:



This graph shows which files directly or indirectly include this file:




## Classes

- class brown_factor

### 5.7.1 Detailed Description

**Author**

Haoran Chen ( chen950302@live.com)

**Version**

0.1

**Date**

2021-12-05

**Copyright**

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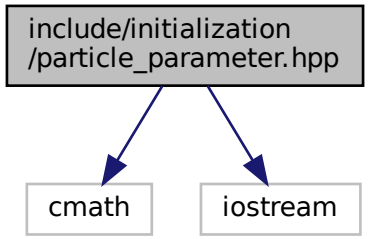
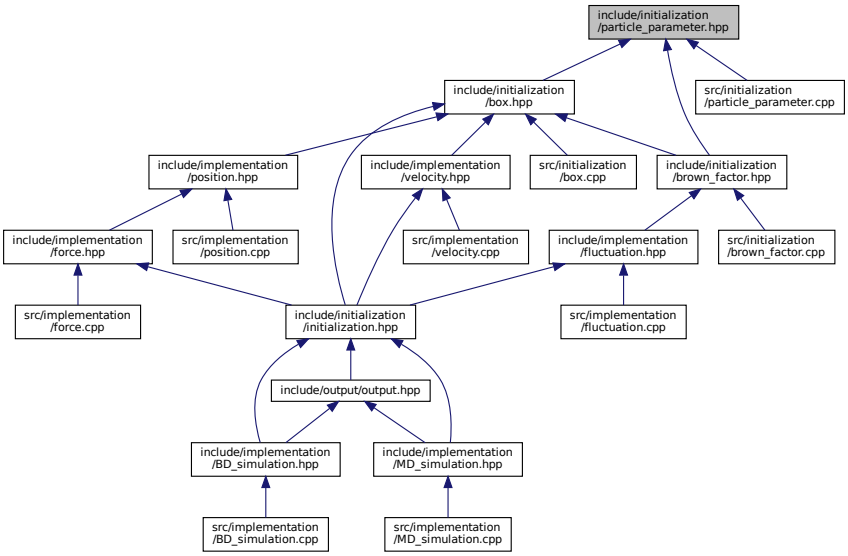
## 5.8 include/initialization/particle_parameter.hpp File Reference

```
#include <cmath>
#include <iostream>
```

Include dependency graph for particle_parameter.hpp:




This graph shows which files directly or indirectly include this file:




### Classes

- class particle_parameter

### 5.8.1 Detailed Description

**Author**

Haoran Chen ( chen950302@live.com)

**Version**

0.1

**Date**

2021-12-05

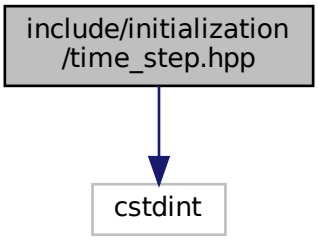
**Copyright**



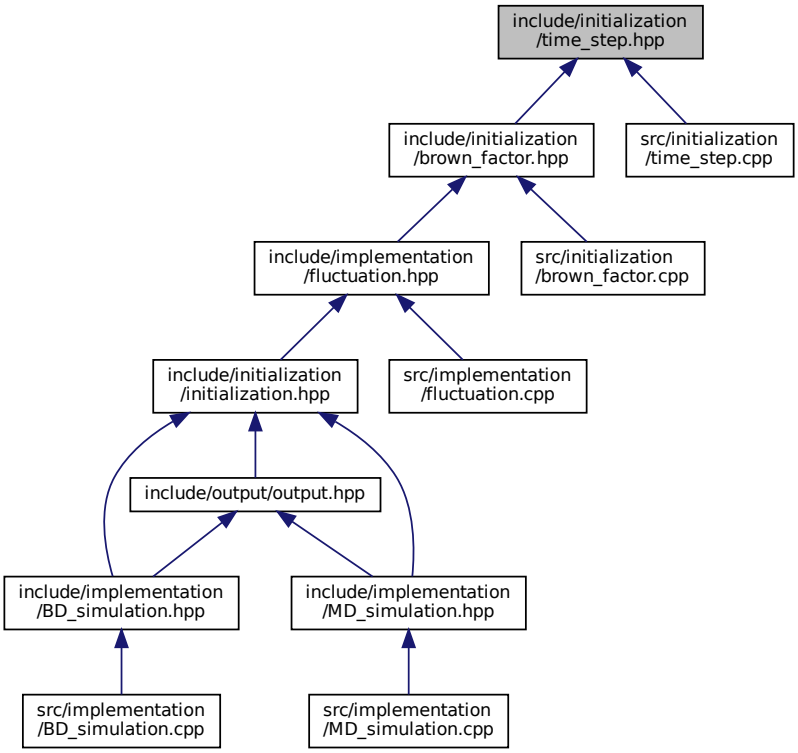
## 5.9 include/initialization/time_step.hpp File Reference

```
#include <cstdint>
```

Include dependency graph for time_step.hpp:



This graph shows which files directly or indirectly include this file:




## Classes

- class time_step

### 5.9.1 Detailed Description

**Author**

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**Version**

0.1

**Date**

2021-12-05

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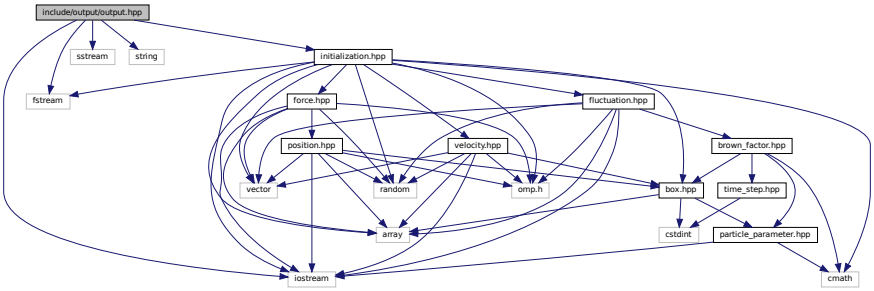
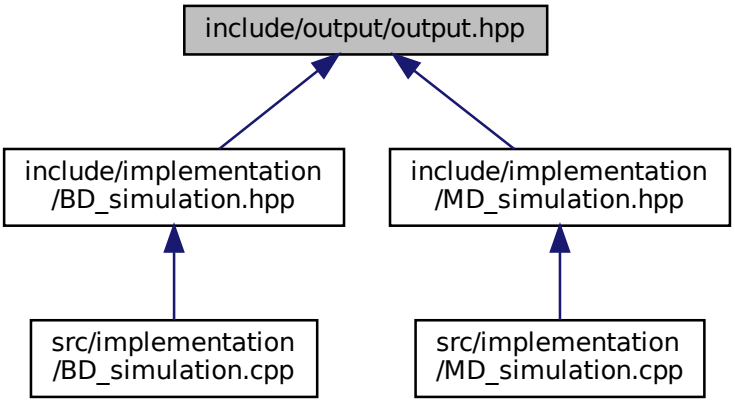
## 5.10 include/output/output.hpp File Reference

```
#include <fstream>
#include <iostream>
#include <sstream>
#include <string>
#include "initialization.hpp"
```

Include dependency graph for output.hpp:




This graph shows which files directly or indirectly include this file:




### Classes

- class output

### 5.10.1 Detailed Description

**Author**

Haoran Chen ( chen950302@live.com)

**Version**

0.1

**Date**

2021-12-26

**Copyright**

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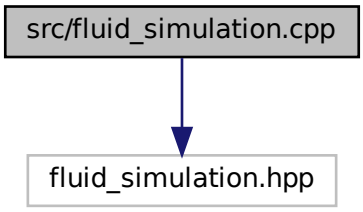
## 5.11 src/fluid_simulation.cpp File Reference

```
#include "fluid_simulation.hpp"
```

Include dependency graph for fluid_simulation.cpp:




### 5.11.1 Detailed Description

**Author**

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**Version**

0.1

**Date**

2021-12-26

**Copyright**

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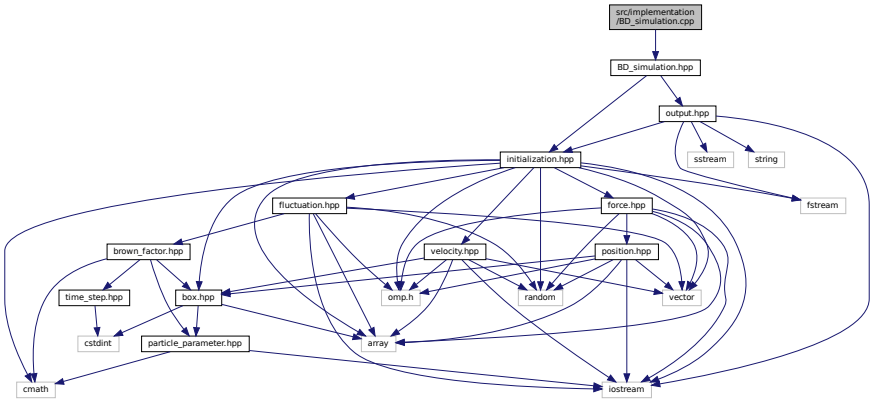
## 5.12 src/implementation/BD_simulation.cpp File Reference

```
#include "BD_simulation.hpp"
```
Include dependency graph for BD_simulation.cpp:




### 5.12.1 Detailed Description

**Author**

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0.1

**Date**

2021-12-26

**Copyright**



## 5.13 src/implementation/cell_list.cpp File Reference

### 5.13.1 Detailed Description

**Author**

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**Version**

0.1

**Date**

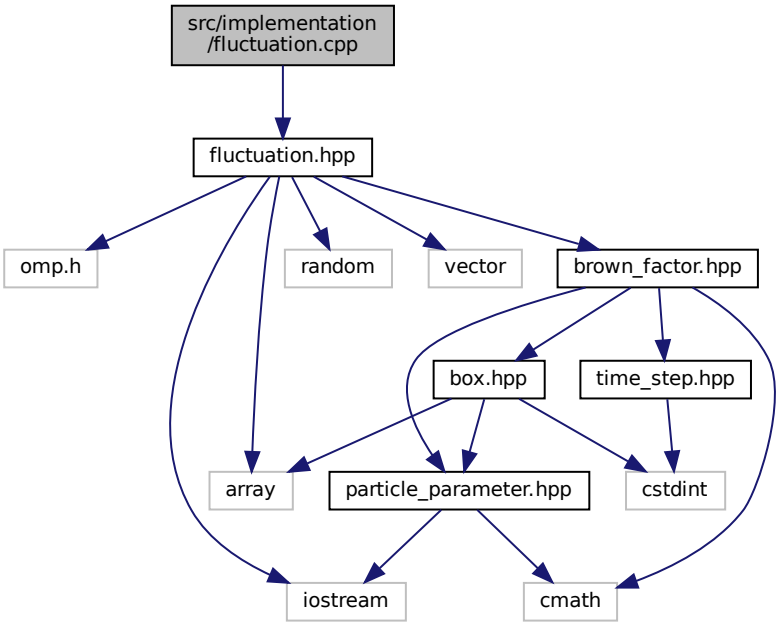
2021-12-26

**Copyright**

## 5.14 src/implementation/fluctuation.cpp File Reference

```
#include "fluctuation.hpp"
```

Include dependency graph for fluctuation.cpp:




### 5.14.1 Detailed Description

**Author**

Haoran Chen ( chen950302@live.com)

**Version**

0.1

**Date**

2021-12-23

**Copyright**

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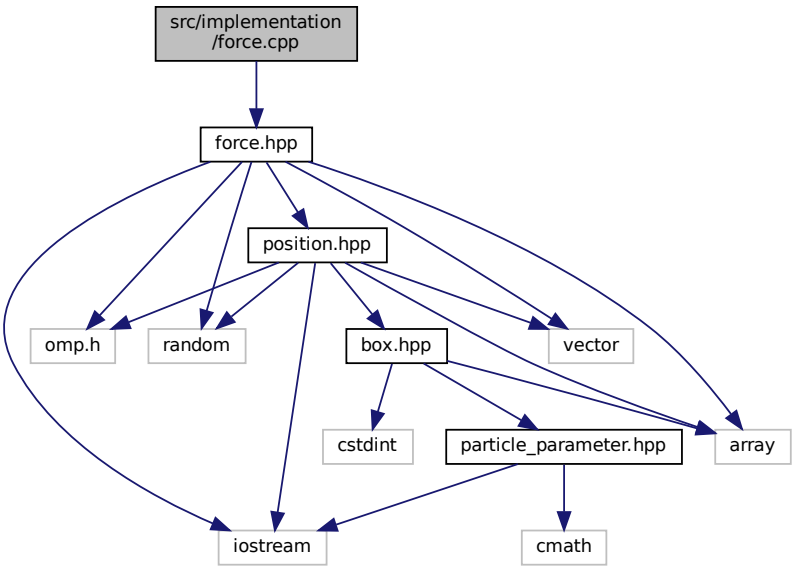
## 5.15 src/implementation/force.cpp File Reference

```
#include "force.hpp"
```

Include dependency graph for force.cpp:




### 5.15.1 Detailed Description

**Author**

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**Version**

0.1

**Date**

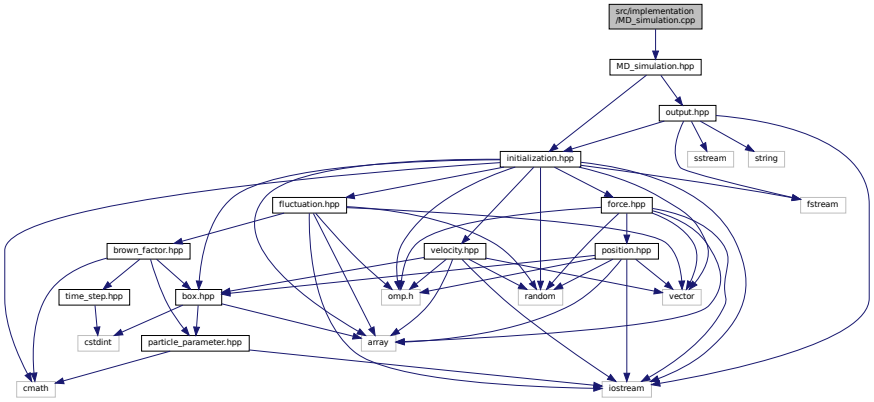
2021-12-23

**Copyright**

## 5.16 src/implementation/MD_simulation.cpp File Reference

```
#include "MD_simulation.hpp"
```

Include dependency graph for MD_simulation.cpp:




### 5.16.1 Detailed Description

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**Version**

0.1

**Date**

2021-12-26

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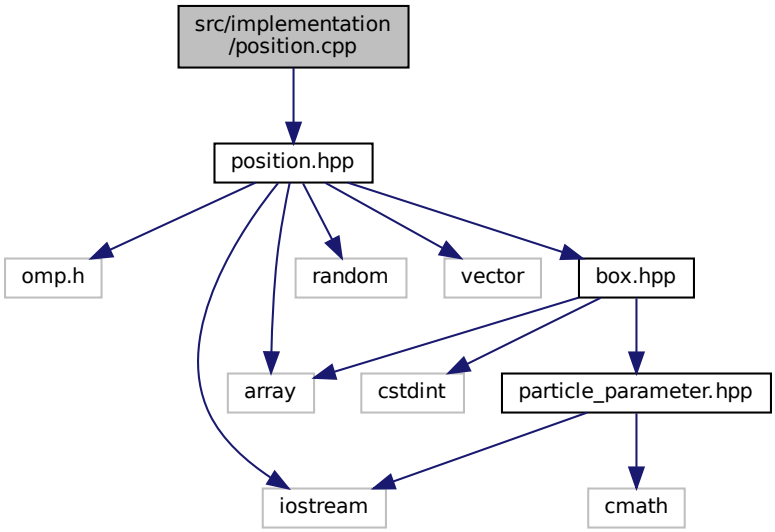
## 5.17 src/implementation/position.cpp File Reference

```
#include "position.hpp"
```

Include dependency graph for position.cpp:




### 5.17.1 Detailed Description

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**Version**

0.1

**Date**

2021-12-23

**Copyright**

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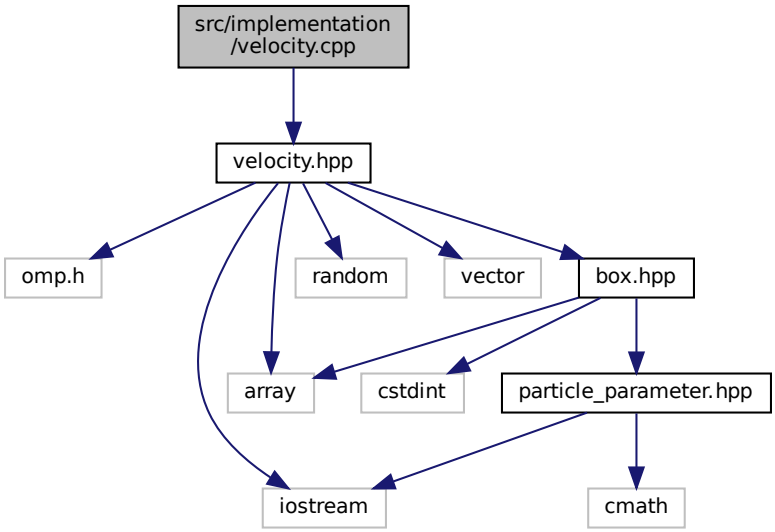
## 5.18 src/implementation/velocity.cpp File Reference

```
#include "velocity.hpp"
```

Include dependency graph for velocity.cpp:




### 5.18.1 Detailed Description

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**Version**

0.1

**Date**

2021-12-23

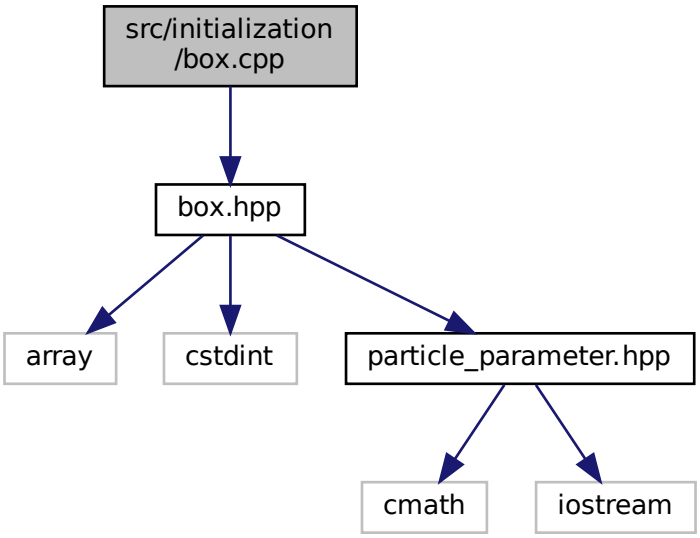
**Copyright**



## 5.19 src/initialization/box.cpp File Reference

```
#include "box.hpp"
```

Include dependency graph for box.cpp:




### 5.19.1 Detailed Description

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**Version**

0.1

**Date**

2021-12-06

**Copyright**

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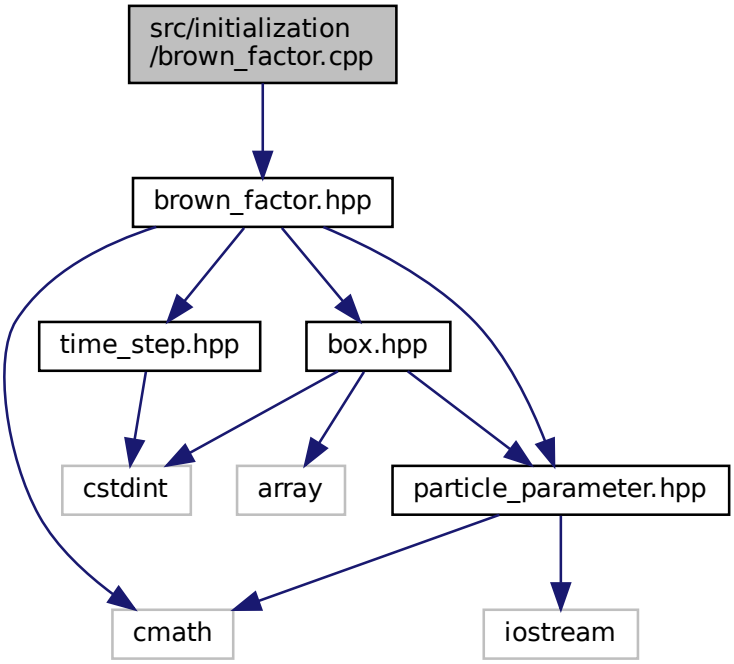
## 5.20 src/initialization/brown_factor.cpp File Reference

```
#include "brown_factor.hpp"
```

Include dependency graph for brown_factor.cpp:




### 5.20.1 Detailed Description

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**Version**

0.1

**Date**

2021-12-05

**Copyright**

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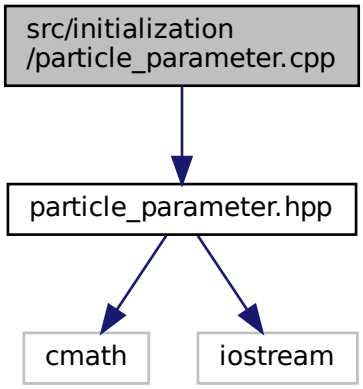
## 5.21 src/initialization/particle_parameter.cpp File Reference

```
#include "particle_parameter.hpp"
```

Include dependency graph for particle_parameter.cpp:




### 5.21.1 Detailed Description

**Author**

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**Version**

0.1

**Date**

2021-12-05

**Copyright**

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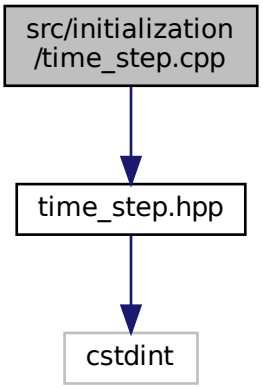
## 5.22 src/initialization/time_step.cpp File Reference

```
#include "time_step.hpp"
```

Include dependency graph for time_step.cpp:




### 5.22.1 Detailed Description

**Author**

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**Version**

0.1

**Date**

2021-12-05

**Copyright**

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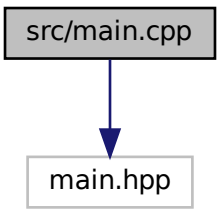
## 5.23 src/main.cpp File Reference

```
#include "main.hpp"
```

Include dependency graph for main.cpp:




### Functions

- int **main** (const int argc, const char ∗argv[ ])

### 5.23.1 Detailed Description

**Author**

Haoran Chen ( chen950302@live.com)

**Version**

0.1

**Date**

2021-09-16

**Copyright**

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# Index