phasefield-accelerator-benchmarks

pre-alpha

Generated by Doxygen 1.8.8

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Contents

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1.1 Class List

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

2 File Index

2.1 File List

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

3 Class Documentation

3.1 ResidualSumOfSquares2D Class Reference

Public Member Functions

- **ResidualSumOfSquares2D** (fp_t ∗∗conc_new, int nx, int ny, fp_t dx, fp_t dy, int nm, fp_t elapsed, fp_t D, fp_t c)
- **ResidualSumOfSquares2D** (ResidualSumOfSquares2D &a, tbb::split)
- void **operator()** (const tbb::blocked_range2d< int > &r)
- void **join** (const ResidualSumOfSquares2D &a)

Public Attributes

- fp_t **my_rss**

3.1.1 Detailed Description

Definition at line 131 of file discretization.cpp.

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

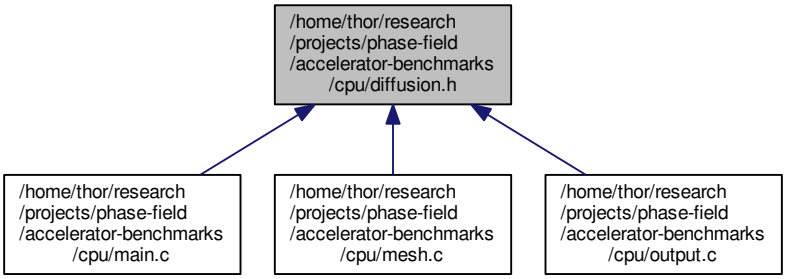
- /home/thor/research/projects/phase-field/accelerator-benchmarks/cpu/tbb/discretization.cpp

4 File Documentation

4.1 /home/thor/research/projects/phase-field/accelerator-benchmarks/cpu/diffusion.h File Reference

Declaration of diffusion equation function prototypes for CPU benchmarks.

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



Typedefs

- typedef double **fp_t**

Functions

- void **make_arrays** (fp_t ***conc_old, fp_t ***conc_new, fp_t ***conc_lap, fp_t ***mask_lap, int nx, int ny, int nm)
- void **free_arrays** (fp_t **conc_old, fp_t **conc_new, fp_t **conc_lap, fp_t **mask_lap)
- void **swap_pointers** (fp_t ***conc_old, fp_t ***conc_new)
- void **set_boundaries** (fp_t bc[2][2])
- void **apply_initial_conditions** (fp_t **conc_old, int nx, int ny, int nm, fp_t bc[2][2])
- void **apply_boundary_conditions** (fp_t **conc_old, int nx, int ny, int nm, fp_t bc[2][2])
- void **set_threads** (int n)
- void **set_mask** (fp_t dx, fp_t dy, int nm, fp_t **mask_lap)
- void **compute_convolution** (fp_t **conc_old, fp_t **conc_lap, fp_t **mask_lap, int nx, int ny, int nm)
- void **solve_diffusion_equation** (fp_t **conc_old, fp_t **conc_new, fp_t **conc_lap, int nx, int ny, int nm, fp_t D, fp_t dt, fp_t *elapsed)
- void **analytical_value** (fp_t x, fp_t t, fp_t D, fp_t bc[2][2], fp_t *c)

- void **check_solution** (fp_t **conc_new, int nx, int ny, fp_t dx, fp_t dy, int nm, fp_t elapsed, fp_t D, fp_t bc[2][2], fp_t *rss)
- void **print_progress** (const int step, const int steps)
- void **write_csv** (fp_t **conc, int nx, int ny, fp_t dx, fp_t dy, int step)
- void **write_png** (fp_t **conc, int nx, int ny, int step)
- void **StartTimer** ()
- double **GetTimer** ()

4.1.1 Detailed Description

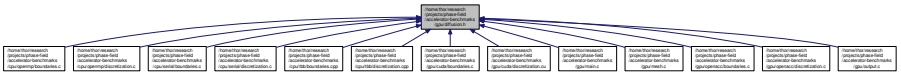
Declaration of diffusion equation function prototypes for CPU benchmarks.

Definition in file diffusion.h.

4.2 /home/thor/research/projects/phase-field/accelerator-benchmarks/gpu/diffusion.h File Reference

Declaration of diffusion equation function prototypes for CPU benchmarks.

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



Typedefs

- typedef double **fp_t**

Functions

- void **make_arrays** (fp_t ***conc_old, fp_t ***conc_new, fp_t ***conc_lap, fp_t ***mask_lap, int nx, int ny, int nm)
- void **free_arrays** (fp_t **conc_old, fp_t **conc_new, fp_t **conc_lap, fp_t **mask_lap)
- void **swap_pointers** (fp_t ***conc_old, fp_t ***conc_new)
- void **set_boundaries** (fp_t bc[2][2])
- void **apply_initial_conditions** (fp_t **conc_old, int nx, int ny, int nm, fp_t bc[2][2])
- void **apply_boundary_conditions** (fp_t **conc_old, int nx, int ny, int nm, fp_t bc[2][2])
- void **set_threads** (int n)
- void **set_mask** (fp_t dx, fp_t dy, int nm, fp_t **mask_lap)
- void **compute_convolution** (fp_t **conc_old, fp_t **conc_lap, fp_t **mask_lap, int nx, int ny, int nm, int bs)
- void **solve_diffusion_equation** (fp_t **conc_old, fp_t **conc_new, fp_t **conc_lap, int nx, int ny, int nm, int bs, fp_t D, fp_t dt, fp_t *elapsed)
- void **analytical_value** (fp_t x, fp_t t, fp_t D, fp_t bc[2][2], fp_t *c)
- void **check_solution** (fp_t **conc_new, int nx, int ny, fp_t dx, fp_t dy, int nm, int bs, fp_t elapsed, fp_t D, fp_t bc[2][2], fp_t *rss)
- void **print_progress** (const int step, const int steps)
- void **write_csv** (fp_t **conc, int nx, int ny, fp_t dx, fp_t dy, int step)
- void **write_png** (fp_t **conc, int nx, int ny, int step)
- void **StartTimer** ()
- double **GetTimer** ()

4.2.1 Detailed Description

Declaration of diffusion equation function prototypes for CPU benchmarks.

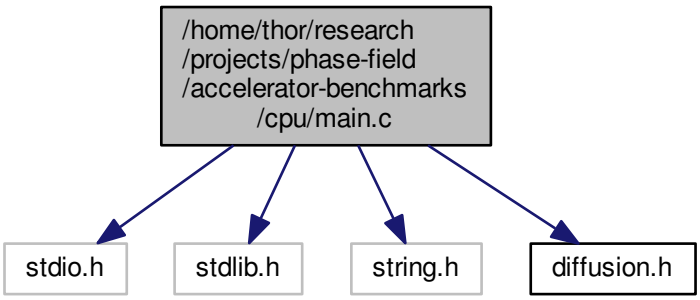
Definition in file diffusion.h.

4.3 /home/thor/research/projects/phase-field/accelerator-benchmarks/cpu/main.c File Reference

Implementation of semi-infinite diffusion equation.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include "diffusion.h"
```

Include dependency graph for main.c:



Functions

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

4.3.1 Detailed Description

Implementation of semi-infinite diffusion equation.

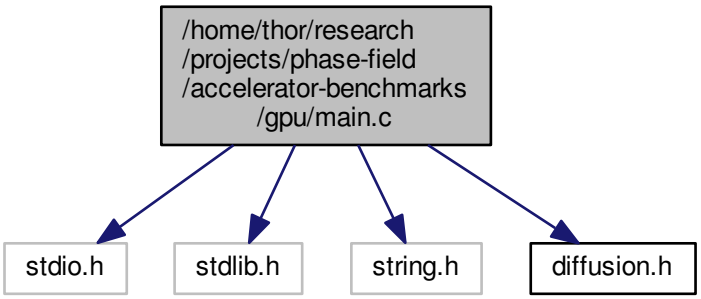
Definition in file main.c.

4.4 /home/thor/research/projects/phase-field/accelerator-benchmarks/gpu/main.c File Reference

Implementation of semi-infinite diffusion equation.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include "diffusion.h"
```

Include dependency graph for main.c:



Functions

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

4.4.1 Detailed Description

Implementation of semi-infinite diffusion equation.

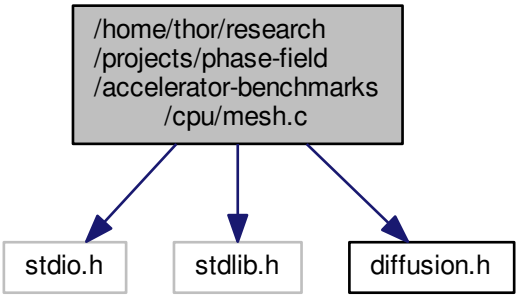
Definition in file main.c.

4.5 /home/thor/research/projects/phase-field/accelerator-benchmarks/cpu/mesh.c File Reference

Implemenatation of mesh handling functions.

```
#include <stdio.h>
#include <stdlib.h>
#include "diffusion.h"
```

Include dependency graph for mesh.c:



Functions

- void **make_arrays** (fp_t ***conc_old, fp_t ***conc_new, fp_t ***conc_lap, fp_t ***mask_lap, int nx, int ny, int nm)
- void **free_arrays** (fp_t **conc_old, fp_t **conc_new, fp_t **conc_lap, fp_t **mask_lap)
- void **swap_pointers** (fp_t ***conc_old, fp_t ***conc_new)

4.5.1 Detailed Description

Implemenatation of mesh handling functions.

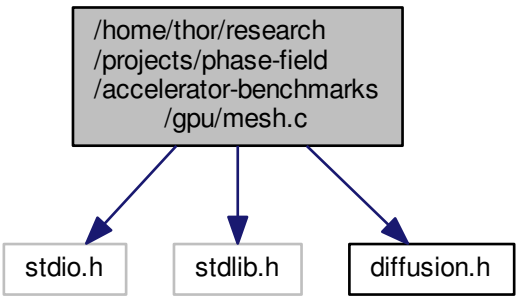
Definition in file mesh.c.

4.6 /home/thor/research/projects/phase-field/accelerator-benchmarks/gpu/mesh.c File Reference

Implemenatation of mesh handling functions.

```
#include <stdio.h>
#include <stdlib.h>
#include "diffusion.h"
```

Include dependency graph for mesh.c:



Functions

- void **make_arrays** (fp_t ***conc_old, fp_t ***conc_new, fp_t ***conc_lap, fp_t ***mask_lap, int nx, int ny, int nm)
- void **free_arrays** (fp_t **conc_old, fp_t **conc_new, fp_t **conc_lap, fp_t **mask_lap)
- void **swap_pointers** (fp_t ***conc_old, fp_t ***conc_new)

4.6.1 Detailed Description

Implemenatation of mesh handling functions.

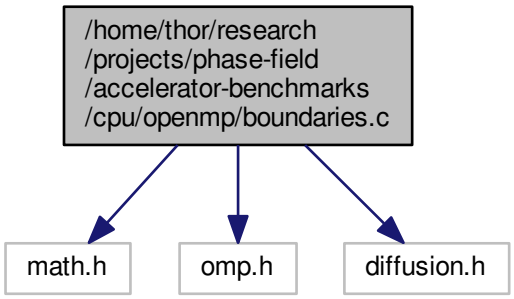
Definition in file mesh.c.

4.7 /home/thor/research/projects/phase-field/accelerator-benchmarks/cpu/openmp/boundaries.c File Reference

Implementation of boundary condition functions with OpenMP threading.

```
#include <math.h>
#include <omp.h>
#include "diffusion.h"
```

Include dependency graph for boundaries.c:



Functions

- void **set_boundaries** (fp_t bc[2][2])
- void **apply_initial_conditions** (fp_t ∗∗conc, int nx, int ny, int nm, fp_t bc[2][2])
- void **apply_boundary_conditions** (fp_t ∗∗conc, int nx, int ny, int nm, fp_t bc[2][2])

4.7.1 Detailed Description

Implementation of boundary condition functions with OpenMP threading.

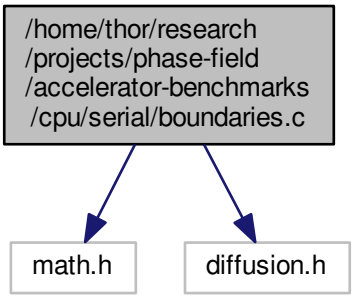
Definition in file boundaries.c.

4.8 /home/thor/research/projects/phase-field/accelerator-benchmarks/cpu/serial/boundaries.c File Reference

Implementation of boundary condition functions without threading.

```
#include <math.h>
#include "diffusion.h"
```

Include dependency graph for boundaries.c:



Functions

- void **set_boundaries** (fp_t bc[2][2])
- void **apply_initial_conditions** (fp_t ∗∗conc, int nx, int ny, int nm, fp_t bc[2][2])
- void **apply_boundary_conditions** (fp_t ∗∗conc, int nx, int ny, int nm, fp_t bc[2][2])

4.8.1 Detailed Description

Implementation of boundary condition functions without threading.

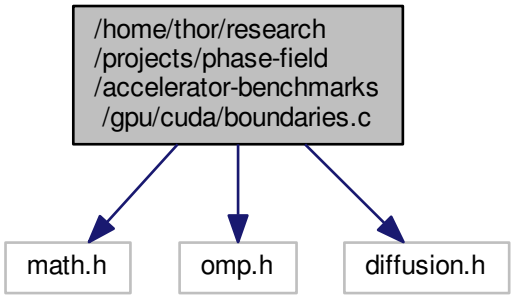
Definition in file boundaries.c.

4.9 /home/thor/research/projects/phase-field/accelerator-benchmarks/gpu/cuda/boundaries.c File Reference

Implementation of boundary condition functions with OpenMP threading.

```
#include <math.h>
#include <omp.h>
#include "diffusion.h"
```

Include dependency graph for boundaries.c:



Functions

- void **set_boundaries** (fp_t bc[2][2])
- void **apply_initial_conditions** (fp_t **conc, int nx, int ny, int nm, fp_t bc[2][2])
- void **apply_boundary_conditions** (fp_t **conc, int nx, int ny, int nm, fp_t bc[2][2])

4.9.1 Detailed Description

Implementation of boundary condition functions with OpenMP threading.

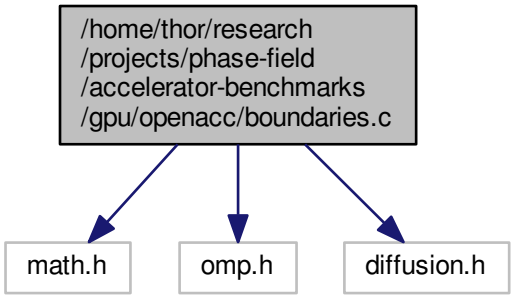
Definition in file boundaries.c.

4.10 /home/thor/research/projects/phase-field/accelerator-benchmarks/gpu/openacc/boundaries.c File Reference

Implementation of boundary condition functions with OpenMP threading.

```
#include <math.h>
#include <omp.h>
#include "diffusion.h"
```

Include dependency graph for boundaries.c:



Functions

- void **set_boundaries** (fp_t bc[2][2])
- void **apply_initial_conditions** (fp_t ∗∗conc, int nx, int ny, int nm, fp_t bc[2][2])
- void **apply_boundary_conditions** (fp_t ∗∗conc, int nx, int ny, int nm, fp_t bc[2][2])

4.10.1 Detailed Description

Implementation of boundary condition functions with OpenMP threading.

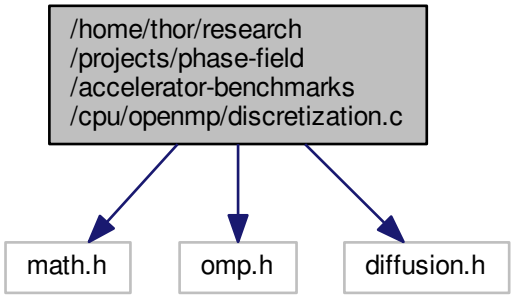
Definition in file boundaries.c.

4.11 /home/thor/research/projects/phase-field/accelerator-benchmarks/cpu/openmp/discretization.c File Reference

Implementation of boundary condition functions with OpenMP threading.

```
#include <math.h>
#include <omp.h>
#include "diffusion.h"
```

Include dependency graph for discretization.c:



Functions

- void **set_threads** (int n)
- void **five_point_Laplacian_stencil** (fp_t dx, fp_t dy, fp_t **mask_lap)
- void **nine_point_Laplacian_stencil** (fp_t dx, fp_t dy, fp_t **mask_lap)
- void **slow_nine_point_Laplacian_stencil** (fp_t dx, fp_t dy, fp_t **mask_lap)
- void **set_mask** (fp_t dx, fp_t dy, int nm, fp_t **mask_lap)
- void **compute_convolution** (fp_t **conc_old, fp_t **conc_lap, fp_t **mask_lap, int nx, int ny, int nm)
- void **solve_diffusion_equation** (fp_t **conc_old, fp_t **conc_new, fp_t **conc_lap, int nx, int ny, int nm, fp_t D, fp_t dt, fp_t *elapsed)
- void **analytical_value** (fp_t x, fp_t t, fp_t D, fp_t bc[2][2], fp_t *c)
- void **check_solution** (fp_t **conc_new, int nx, int ny, fp_t dx, fp_t dy, int nm, fp_t elapsed, fp_t D, fp_t bc[2][2], fp_t *rss)

4.11.1 Detailed Description

Implementation of boundary condition functions with OpenMP threading.

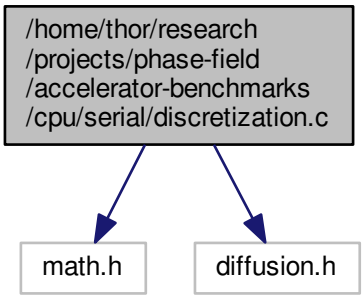
Definition in file discretization.c.

4.12 /home/thor/research/projects/phase-field/accelerator-benchmarks/cpu/serial/discretization.c File Reference

Implementation of boundary condition functions without threading.

```
#include <math.h>
#include "diffusion.h"
```

Include dependency graph for discretization.c:



Functions

- void **set_threads** (int n)
- void **five_point_Laplacian_stencil** (fp_t dx, fp_t dy, fp_t **mask_lap)
- void **nine_point_Laplacian_stencil** (fp_t dx, fp_t dy, fp_t **mask_lap)
- void **slow_nine_point_Laplacian_stencil** (fp_t dx, fp_t dy, fp_t **mask_lap)
- void **set_mask** (fp_t dx, fp_t dy, int nm, fp_t **mask_lap)
- void **compute_convolution** (fp_t **conc_old, fp_t **conc_lap, fp_t **mask_lap, int nx, int ny, int nm)
- void **solve_diffusion_equation** (fp_t **conc_old, fp_t **conc_new, fp_t **conc_lap, int nx, int ny, int nm, fp_t D, fp_t dt, fp_t *elapsed)
- void **analytical_value** (fp_t x, fp_t t, fp_t D, fp_t bc[2][2], fp_t *c)
- void **check_solution** (fp_t **conc_new, int nx, int ny, fp_t dx, fp_t dy, int nm, fp_t elapsed, fp_t D, fp_t bc[2][2], fp_t *rss)

4.12.1 Detailed Description

Implementation of boundary condition functions without threading.

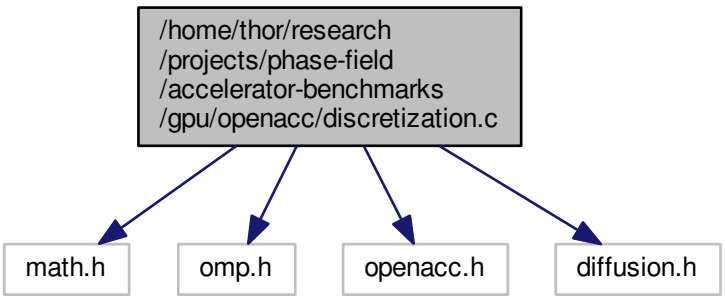
Definition in file discretization.c.

4.13 /home/thor/research/projects/phase-field/accelerator-benchmarks/gpu/openacc/discretization.c File Reference

Implementation of boundary condition functions with OpenACC threading.

```
#include <math.h>
#include <omp.h>
#include <openacc.h>
#include "diffusion.h"
```

Include dependency graph for discretization.c:



Functions

- void **set_threads** (int n)
- void **five_point_Laplacian_stencil** (fp_t dx, fp_t dy, fp_t **mask_lap)
- void **nine_point_Laplacian_stencil** (fp_t dx, fp_t dy, fp_t **mask_lap)
- void **slow_nine_point_Laplacian_stencil** (fp_t dx, fp_t dy, fp_t **mask_lap)
- void **set_mask** (fp_t dx, fp_t dy, int nm, fp_t **mask_lap)
- void **compute_convolution** (fp_t **conc_old, fp_t **conc_lap, fp_t **mask_lap, int nx, int ny, int nm, int bs)
- void **solve_diffusion_equation** (fp_t **conc_old, fp_t **conc_new, fp_t **conc_lap, int nx, int ny, int nm, int bs, fp_t D, fp_t dt, fp_t *elapsed)
- void **check_solution** (fp_t **conc_new, int nx, int ny, fp_t dx, fp_t dy, int nm, int bs, fp_t elapsed, fp_t D, fp_t bc[2][2], fp_t *rss)

4.13.1 Detailed Description

Implementation of boundary condition functions with OpenACC threading.

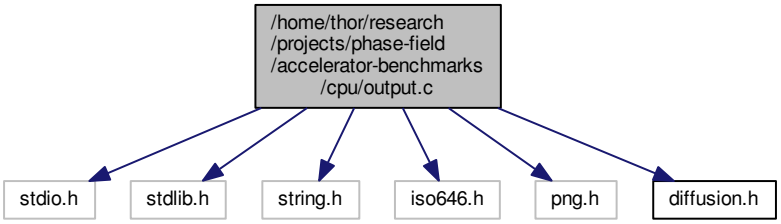
Definition in file discretization.c.

4.14 /home/thor/research/projects/phase-field/accelerator-benchmarks/cpu/output.c File Reference

Implementation of file output functions.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <iso646.h>
#include <png.h>
#include "diffusion.h"
```

Include dependency graph for output.c:



Functions

- void **print_progress** (const int step, const int steps)
- void **write_csv** (fp_t ∗∗conc, int nx, int ny, fp_t dx, fp_t dy, int step)
- void **write_png** (fp_t ∗∗conc, int nx, int ny, int step)

4.14.1 Detailed Description

Implementation of file output functions.

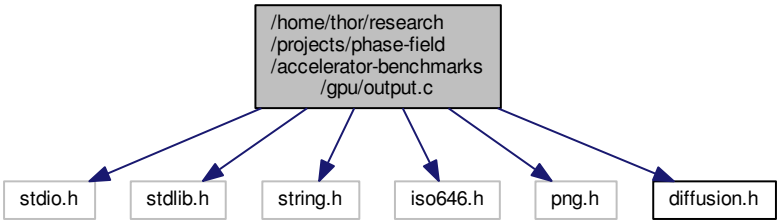
Definition in file output.c.

4.15 /home/thor/research/projects/phase-field/accelerator-benchmarks/gpu/output.c File Reference

Implementation of file output functions.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <iso646.h>
#include <png.h>
#include "diffusion.h"
```

Include dependency graph for output.c:



Functions

- void **print_progress** (const int step, const int steps)

- void **write_csv** (fp_t **conc, int nx, int ny, fp_t dx, fp_t dy, int step)
- void **write_png** (fp_t **conc, int nx, int ny, int step)

4.15.1 Detailed Description

Implementation of file output functions.

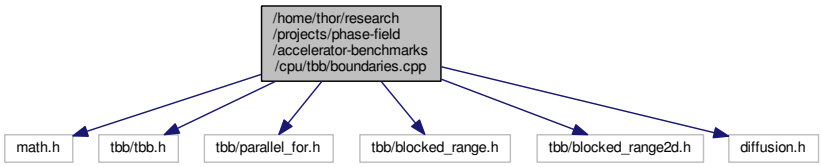
Definition in file output.c.

4.16 /home/thor/research/projects/phase-field/accelerator-benchmarks/cpu/tbb/boundaries.cpp File Reference

Implementation of boundary condition functions with TBB threading.

```
#include <math.h>
#include <tbb/tbb.h>
#include <tbb/parallel_for.h>
#include <tbb/blocked_range.h>
#include <tbb/blocked_range2d.h>
#include "diffusion.h"
```

Include dependency graph for boundaries.cpp:



Functions

- void **set_boundaries** (fp_t bc[2][2])
- void **apply_initial_conditions** (fp_t **conc, int nx, int ny, int nm, fp_t bc[2][2])
- void **apply_boundary_conditions** (fp_t **conc, int nx, int ny, int nm, fp_t bc[2][2])

4.16.1 Detailed Description

Implementation of boundary condition functions with TBB threading.

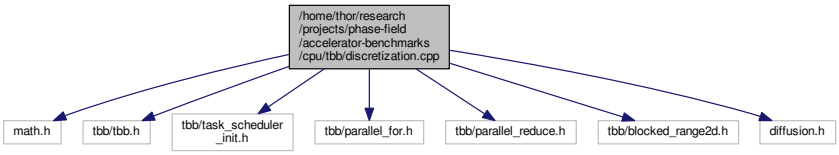
Definition in file boundaries.cpp.

4.17 /home/thor/research/projects/phase-field/accelerator-benchmarks/cpu/tbb/discretization.cpp File Reference

Implementation of boundary condition functions with TBB threading.

```
#include <math.h>
#include <tbb/tbb.h>
#include <tbb/task_scheduler_init.h>
#include <tbb/parallel_for.h>
#include <tbb/parallel_reduce.h>
#include <tbb/blocked_range2d.h>
#include "diffusion.h"
```

Include dependency graph for discretization.cpp:



Classes

- class ResidualSumOfSquares2D

Functions

- void **set_threads** (int n)
- void **five_point_Laplacian_stencil** (fp_t dx, fp_t dy, fp_t **mask_lap)
- void **nine_point_Laplacian_stencil** (fp_t dx, fp_t dy, fp_t **mask_lap)
- void **slow_nine_point_Laplacian_stencil** (fp_t dx, fp_t dy, fp_t **mask_lap)
- void **set_mask** (fp_t dx, fp_t dy, int nm, fp_t **mask_lap)
- void **compute_convolution** (fp_t **conc_old, fp_t **conc_lap, fp_t **mask_lap, int nx, int ny, int nm)
- void **solve_diffusion_equation** (fp_t **conc_old, fp_t **B, fp_t **conc_lap, int nx, int ny, int nm, fp_t D, fp_t dt, fp_t *elapsed)
- void **analytical_value** (fp_t x, fp_t t, fp_t D, fp_t chi, fp_t *c)
- void **check_solution** (fp_t **conc_new, int nx, int ny, fp_t dx, fp_t dy, int nm, fp_t elapsed, fp_t D, fp_t bc[2][2], fp_t *rss)

4.17.1 Detailed Description

Implementation of boundary condition functions with TBB threading.

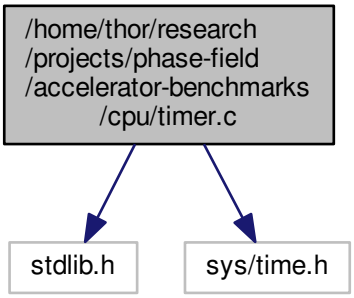
Definition in file discretization.cpp.

4.18 /home/thor/research/projects/phase-field/accelerator-benchmarks/cpu/timer.c File Reference

High-resolution cross-platform machine time reader.

```
#include <stdlib.h>
#include <sys/time.h>
```

Include dependency graph for timer.c:



Functions

- void **StartTimer** ()
- double **GetTimer** ()

Variables

- struct timeval **timerStart**

4.18.1 Detailed Description

High-resolution cross-platform machine time reader.

Author

NVIDIA

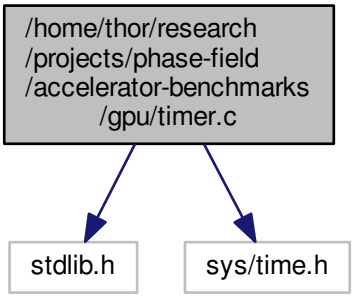
Definition in file timer.c.

4.19 /home/thor/research/projects/phase-field/accelerator-benchmarks/gpu/timer.c File Reference

High-resolution cross-platform machine time reader.

```
#include <stdlib.h>
#include <sys/time.h>
```

Include dependency graph for timer.c:



Functions

- void **StartTimer** ()
- double **GetTimer** ()

Variables

- struct timeval **timerStart**

4.19.1 Detailed Description

High-resolution cross-platform machine time reader.

Author

NVIDIA

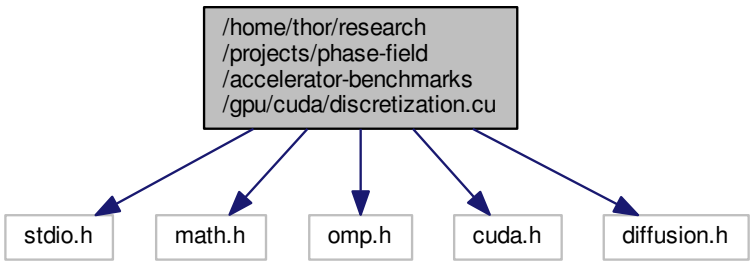
Definition in file timer.c.

4.20 /home/thor/research/projects/phase-field/accelerator-benchmarks/gpu/cuda/discretization.cu File Reference

Implementation of boundary condition functions with CUDA acceleration.

```
#include <stdio.h>
#include <math.h>
#include <omp.h>
#include <cuda.h>
#include "diffusion.h"
```

Include dependency graph for discretization.cu:



Macros

- #define **MAX_TILE_W** 32
- #define **MAX_TILE_H** 32
- #define **MAX_MASK_W** 3
- #define **MAX_MASK_SIZE** (MAX_MASK_W ∗ MAX_MASK_W)

Functions

- void **set_threads** (int n)
- void **five_point_Laplacian_stencil** (fp_t dx, fp_t dy, fp_t ∗∗mask_lap)
- void **nine_point_Laplacian_stencil** (fp_t dx, fp_t dy, fp_t ∗∗mask_lap)
- void **slow_nine_point_Laplacian_stencil** (fp_t dx, fp_t dy, fp_t ∗∗mask_lap)
- void **set_mask** (fp_t dx, fp_t dy, int nm, fp_t ∗∗mask_lap)
- __global__ void **convolution_kernel** (fp_t ∗conc_old, fp_t ∗conc_lap, int nx, int ny, int nm)
- void **compute_convolution** (fp_t ∗∗conc_old, fp_t ∗∗conc_lap, fp_t ∗∗mask_lap, int nx, int ny, int nm, int bs)
- __global__ void **diffusion_kernel** (fp_t ∗conc_old, fp_t ∗conc_new, fp_t ∗conc_lap, int nx, int ny, int nm, fp_t D, fp_t dt)
- void **solve_diffusion_equation** (fp_t ∗∗conc_old, fp_t ∗∗conc_new, fp_t ∗∗conc_lap, int nx, int ny, int nm, int bs, fp_t D, fp_t dt, fp_t ∗elapsed)
- void **analytical_value** (fp_t x, fp_t t, fp_t D, fp_t bc[2][2], fp_t ∗c)
- void **check_solution** (fp_t ∗∗conc_new, int nx, int ny, fp_t dx, fp_t dy, int nm, int bs, fp_t elapsed, fp_t D, fp_t bc[2][2], fp_t ∗rss)

Variables

- __constant__ fp_t **Mc** [MAX_MASK_SIZE]

4.20.1 Detailed Description

Implementation of boundary condition functions with CUDA acceleration.

Definition in file discretization.cu.