Computer_Homework3

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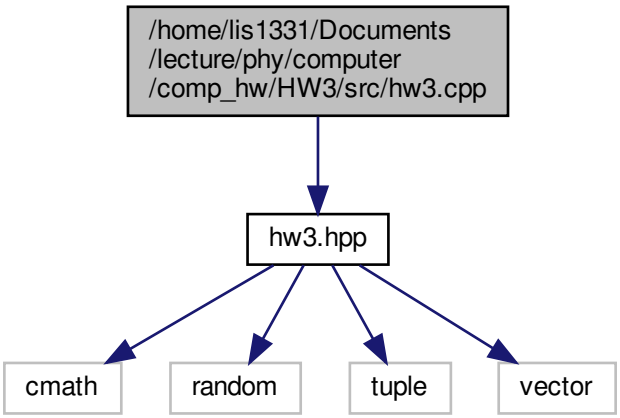
File Documentation

2.1 /home/lis1331/Documents/lecture/phy/computer/comp_hw/HW3/src/hw3.cpp File Reference

code for homework3 of Computer1 class in Yonsei University Minimize the action by Markov Chain Monte Carlo Method to solve Kepler problem

```
#include "hw3.hpp"
```

Include dependency graph for hw3.cpp:



Functions

- tuple< double, vector< double >, vector< double >, vector< double > > **HW3** (double zeta_min, double t0, int n, int num_sine, int num_iter, double step, mt19937 &gen, uniform_real_distribution< double > &dist)

2.1.1 Detailed Description

code for homework3 of Computer1 class in Yonsei University Minimize the action by Markov Chain Monte Carlo Method to solve Kepler problem

Author

pistack (Junho Lee)

Date

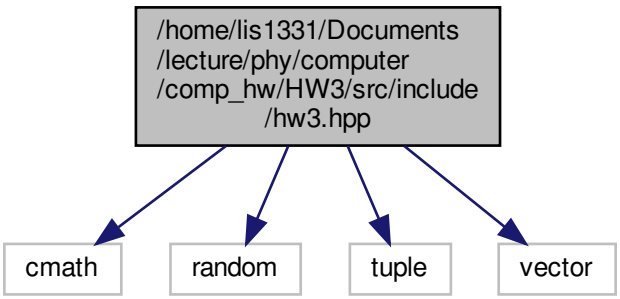
2021. 10. 10.

2.2 /home/lis1331/Documents/lecture/phy/computer/comp_hw/HW3/src/include/hw3.hpp File Reference

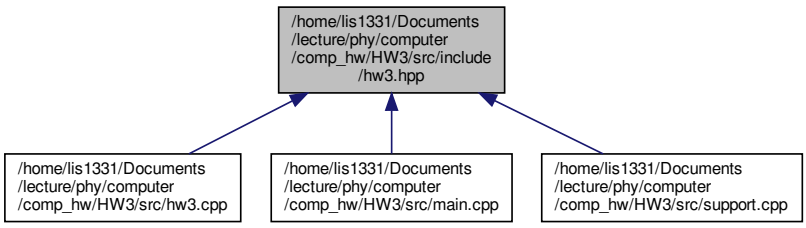
headerfile for homework3 of Computer1 class in Yonsei University Minimize the action by Markov Chain Monte Carlo Method to solve Kepler problem

```
#include <cmath>
#include <random>
#include <tuple>
#include <vector>
```

Include dependency graph for hw3.hpp:



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



Functions

- std::vector< double > scale_and_add_vector (std::vector< double > &v, double scale, double add)

  scale vector by scaler and add vector by adder
- std::tuple< std::vector< double >, std::vector< double > > sum_of_sine (std::vector< double > &t, std::vector< double > c, int num_sine)

  evaluates sum of sine function with period 4∗(t_max-t_min) weighted by coefficents and its derivative at given time t.
- std::vector< double > move_step (std::vector< double > &init_guess, double step, std::mt19937 &gen, std::uniform_real_distribution< double > &dist)

  randomly move initial guess by step
- double eval_action (std::vector< double > &t, std::vector< double > zeta, std::vector< double > deriv_zeta, std::vector< double > theta, std::vector< double > deriv_theta)

  evaluates the action of given path
- std::tuple< double, std::vector< double >, std::vector< double >, std::vector< double > > HW3 (double zeta_min, double t0, int n, int num_sine, int num_iter, double step, std::mt19937 &gen, std::uniform_real_distribution< double > &dist)

  HW3: Solve Kepler problem via Markov Chain Monte Carlo Method see HW3.pdf for further detail.

Variables

- const double **pi** = 3.141592653589793

2.2.1 Detailed Description

headerfile for homework3 of Computer1 class in Yonsei University Minimize the action by Markov Chain Monte Carlo Method to solve Kepler problem

Author

pistack (Junho Lee)

Date

2021. 10. 10.

2.2.2 Function Documentation

2.2.2.1 eval_action()

```
double eval_action (
            std::vector< double > & t,
            std::vector< double > zeta,
            std::vector< double > deriv_zeta,
            std::vector< double > theta,
            std::vector< double > deriv_theta )
```

evaluates the action of given path

Parameters

t	time
zeta	zeta part of path
deriv_zeta	derivative of path, zeta part
theta	theta part of path
deriv_theta	derivative of path, theta part

Returns

the action of given path

2.2.2.2 HW3()

```
std::tuple<double,std::vector<double>,std::vector<double>,std::vector<double> > HW3 (
            double zeta_min,
            double t0,
            int n,
            int num_sine,
            int num_iter,
            double step,
            std::mt19937 & gen,
            std::uniform_real_distribution< double > & dist )
```

HW3: Solve Kepler problem via Markov Chain Monte Carlo Method see HW3.pdf for further detail.

Parameters

zeta_min	minimum value of zeta, for constraint motion 0.5 $<$ zeta_min $<$ 1
t0	initial time
n	number of points to evaluate
num_sine	number of sine functions to guess
num_iter	number of iteration
step	step size
gen	random number generator (assume mt19937)
dist	distribution

Returns

tuple of minimum action, time and path(zeta, theta)

2.2.2.3 move_step()

```
std::vector<double> move_step (
            std::vector< double > & init_guess,
```

```
            double step,
            std::mt19937 & gen,
            std::uniform_real_distribution< double > & dist )
```

randomly move initial guess by step

Parameters

init_guess	initial guess
step	step size\
gen	random number generator (assume mt19937)
dist	distribution

Returns

moved initial guess by step

2.2.2.4 scale_and_add_vector()

```
std::vector<double> scale_and_add_vector (
            std::vector< double > & v,
            double scale,
            double add )
```

scale vector by scaler and add vector by adder

Parameters

v	vector to scale and add
scale	scaler
add	adder

Returns

scale and added vector (scale∗v+add)

2.2.2.5 sum_of_sine()

```
std::tuple<std::vector<double>, std::vector<double> > sum_of_sine (
            std::vector< double > & t,
            std::vector< double > c,
            int num_sine )
```

evaluates sum of sine function with period 4∗(t_max-t_min) weighted by coefficents and its derivative at given time t.

Parameters

t	time
c	coefficiets
num_sine	number of sine function to add

Returns

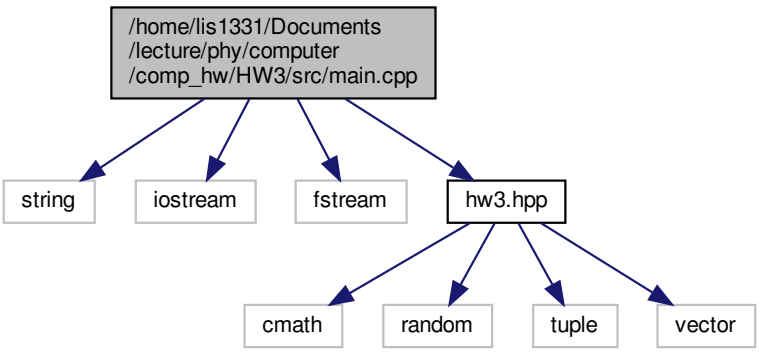
tuple of value and derivatives of the sum of sine function

2.3 /home/lis1331/Documents/lecture/phy/computer/comp_hw/HW3/src/main.cpp File Reference

main program for homework3 of Computer1 class in Yonsei University Interactively reads inital condition, number of sine function used for guess, number of gird points to evaluate, number of interation, step size and output file name then computes and saves solution.

```
#include <string>
#include <iostream>
#include <fstream>
#include "hw3.hpp"
```

Include dependency graph for main.cpp:



Functions

- int **main** (void)

2.3.1 Detailed Description

main program for homework3 of Computer1 class in Yonsei University Interactively reads inital condition, number of sine function used for guess, number of gird points to evaluate, number of interation, step size and output file name then computes and saves solution.

Author

pistack (Junho Lee)

Date

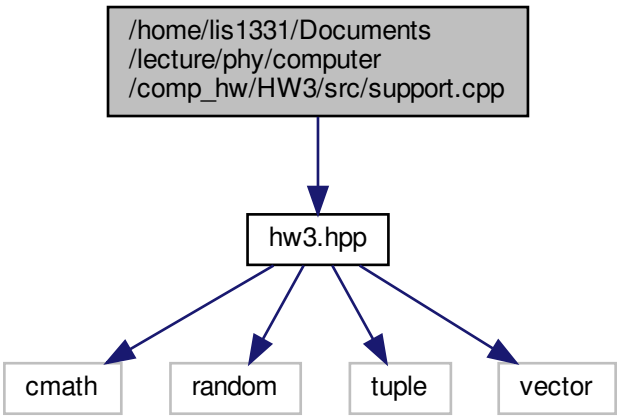
2021. 10. 10.

2.4 /home/lis1331/Documents/lecture/phy/computer/comp_hw/HW3/src/support.cpp File Reference

support functions for homework3 of Computer1 class in Yonsei University scale and add vector, evaluate sum and derivative of sine function, randomly move initial guess by step and evaluate the action of given path.

```
#include "hw3.hpp"
```

Include dependency graph for support.cpp:



Functions

- vector< double > **scale_and_add_vector** (vector< double > &v, double scale, double add)
- tuple< vector< double >, vector< double > > **sum_of_sine** (vector< double > &t, vector< double > c, int num_sine)
- vector< double > **move_step** (vector< double > &init_guess, double step, mt19937 &gen, uniform_real↩ _distribution< double > &dist)
- double **eval_action** (vector< double > &t, vector< double > zeta, vector< double > deriv_zeta, vector< double > theta, vector< double > deriv_theta)

2.4.1 Detailed Description

support functions for homework3 of Computer1 class in Yonsei University scale and add vector, evaluate sum and derivative of sine function, randomly move initial guess by step and evaluate the action of given path.

Author

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Date

2021. 10. 10.

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