Computational-Physics

v1.0

Chapter 1

Namespace Index

1.1 Namespace List

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Chapter 2

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2.1 File List

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

Chapter 3

Namespace Documentation

3.1 comph Namespace Reference

Namespace containing computational helper functions.

Functions

- constexpr double f (double x)

    A sample mathematical function to be used in differentiation.
- double Derivate (double x, double(∗f)(double), int n)

    Numerically calculates the n-th derivative of a given function at a point.
- double C (int n, int k)

    Calculates the binomial coefficient C(n, k).
- std::deque< bool > decimalToBinary (int decimalNumber)

    Converts a decimal integer to its binary representation.

3.1.1 Detailed Description

Namespace containing computational helper functions.

3.1.2 Function Documentation

3.1.2.1 C()

```
double comph::C (
            int n,
            int k)
```

Calculates the binomial coefficient C(n, k).

Computes the binomial coefficient, often read as "n choose k", which represents the number of ways to choose k elements from a set of n elements.

Parameters

n	The total number of items.
k	The number of items to choose.

Returns

The binomial coefficient as a double.

3.1.2.2 decimalToBinary()

```
std::deque< bool > comph::decimalToBinary (
            int decimalNumber)
```

Converts a decimal integer to its binary representation.

This function takes an integer in decimal format and returns its binary representation as a deque of boolean values, where each boolean represents a binary digit (0 or 1).

The least significant bit (LSB) is stored as the first element in the deque, and the most significant bit (MSB) is at the last element of the deque.

Parameters

decimalNumber	The integer to be converted to binary.

Returns

A deque of boolean values representing the binary form of the input.

Note

The function is intended for non-negative integers.

3.1.2.3 Derivate()

```
double comph::Derivate (
            double x,
            double(* f )(double),
            int n)
```

Numerically calculates the n-th derivative of a given function at a point.

This function uses finite difference methods to approximate the n-th derivative of a specified mathematical function `f` at a point `x`.

Parameters

x	The point at which to calculate the derivative.
f	A pointer to the function to differentiate.
n	The order of the derivative (e.g., 1 for the first derivative).

Returns

The approximated value of the n-th derivative at point `x`.

Note

For `n = 0`, the function simply returns `f(x)`.

3.1.2.4 f()

```
double comph::f (
            double x)  [constexpr]
```

A sample mathematical function to be used in differentiation.

This function is defined as `f(x) = 2 * x * x`.

Parameters

x	The input value for the function.

Returns

The computed result of the function `f(x)`.

3.1.2.4 f()

Chapter 4

File Documentation

4.1 Include/DerivativeCalculator.hpp File Reference

Header file for calculating higher order derivatives.

Namespaces

- namespace comph

  Namespace containing computational helper functions.

Functions

- constexpr double comph::f (double x)

  A sample mathematical function to be used in differentiation.
- double comph::Derivate (double x, double(∗f)(double), int n)

  Numerically calculates the n-th derivative of a given function at a point.

4.1.1 Detailed Description

Header file for calculating higher order derivatives.

Author

Arsenii Kvachan

Date

2024

Version

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4.2 DerivativeCalculator.hpp

```
00001
00010 #pragma once
00011
00012 namespace comph {
00013
00022 constexpr double f(double x);
00023
00038 double Derivate(double x, double (*f)(double), int n);
00039
00040 } // namespace comph
```

4.3 Include/MathUtils.hpp File Reference

Header file for simple math functions and methods.

Namespaces

- namespace comph

    Namespace containing computational helper functions.

Functions

- double comph::C (int n, int k)

    Calculates the binomial coefficient C(n, k).

4.3.1 Detailed Description

Header file for simple math functions and methods.

Date

   2024

Version

   1.0 @encoding UTF-8

4.4 MathUtils.hpp

```
00001
00009 #pragma once
00010
00011 namespace comph {
00012
00024 double C(int n, int k);
00025
00026 } // namespace comph
```

4.5 Include/UnitConverter.hpp File Reference

Functions to convert between unit of measurements / representations.

```
#include <deque>
```

Namespaces

- namespace comph

  Namespace containing computational helper functions.

Functions

- std::deque< bool > comph::decimalToBinary (int decimalNumber)

  Converts a decimal integer to its binary representation.

4.5.1 Detailed Description

Functions to convert between unit of measurements / representations.

Author

Arsenii Kvachan

Date

2024

Version

1.0 @encoding UTF-8

4.6 UnitConverter.hpp

Go to the documentation of this file.
```
00001
00010 #pragma once
00011
00012 #include <deque>
00013
00015 namespace comph {
00016
00032 std::deque<bool> decimalToBinary(int decimalNumber);
00033
00034 } // namespace comph
```

4.7 Utils/DerivativeCalculator.cpp File Reference

Implementation of numerical differentiation functions.

```
#include "DerivativeCalculator.hpp"
#include "MathUtils.hpp"
#include <cmath>
```

Namespaces

- namespace comph

    Namespace containing computational helper functions.

Functions

- constexpr double comph::f (double x)

    A sample mathematical function to be used in differentiation.
- double comph::Derivate (double x, double(∗f)(double), int n)

    Numerically calculates the n-th derivative of a given function at a point.

4.7.1 Detailed Description

Implementation of numerical differentiation functions.

Author

Arsenii Kvachan

Date

2024

Version

1.0 @encoding UTF-8

4.8 Utils/MathUtils.cpp File Reference

Implementation of mathematical functions.

```
#include "MathUtils.hpp"
```

Namespaces

- namespace comph

    Namespace containing computational helper functions.

Functions

- double comph::C (int n, int k)

    Calculates the binomial coefficient C(n, k).

4.8.1 Detailed Description

Implementation of mathematical functions.

Author

Arsenii Kvachan

Date

2024

Version

1.0 @encoding UTF-8

4.9 Utils/UnitConverter.cpp File Reference

Implementation of unit conversion functions, such as decimal to binary conversion.

```
#include "UnitConverter.hpp"
#include <deque>
```

Namespaces

- namespace comph

    Namespace containing computational helper functions.

Functions

- std::deque< bool > comph::decimalToBinary (int decimalNumber)

    Converts a decimal integer to its binary representation.

4.9.1 Detailed Description

Implementation of unit conversion functions, such as decimal to binary conversion.

Author

Arsenii Kvachan

Date

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This file contains implementations for converting data types or units, such as converting a decimal integer to its binary representation.

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