My Project

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Chapter 1

Class Index

1.1 Class List

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

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Chapter 2

Class Documentation

2.1 DE_params Struct Reference

Public Attributes

- double **cr**
- double **F**
- double **lambda**
- double **l_b**
- double **u_b**
- int **dim**
- int **ns**
- int **t_max**

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

- DE.h

2.2 functions Class Reference

Public Member Functions

- double Schwefel (double *X, int dimension)

  Schwefel's function.
- double first_De_Jong (double *X, int dimension)

  1st De Jong's function
- double Rosenbrock (double *X, int dimension)

  Rosenbrock's function.
- double Rastrigin (double *X, int dimension)

  Rastrigin's function.
- double Greiwangk (double *X, int dimension)

  Greiwangk's function.
- double Sine_Envelope_Sine_Wave (double *X, int dimension)

  Sine Envelope Sine Wave's function.

- double Stretched_V_Sine_Wave (double *X, int dimension)

  Stretched V Sine Wave's function.
- double Ackley_One (double *X, int dimension)

  Ackley's One function.
- double Ackley_Two (double *X, int dimension)

  Ackley's Two function.
- double Egg_Holder (double *X, int dimension)

  Egg Holder's function.
- double Rana (double *X, int dimension)

  Rana's function.
- double Pathological (double *X, int dimension)

  Pathological's function.
- double Michalewicz (double *X, int dimension)

  Michalewicz's function.
- double Masters_Cosine_Wave (double *X, int dimension)

  Masters Cosine Wave's function.
- double Quartic (double *X, int dimension)

  Quartic's function.
- double Levy (double *X, int dimension)

  Levy's function.
- double Step (double *X, int dimension)

  Step's function.
- double Alpine (double *X, int dimension)

  Alpine's function.

2.2.1 Member Function Documentation

2.2.1.1 Ackley_One()

```
double functions::Ackley_One (
            double * X,
            int dimension )
```

Ackley's One function.

Parameters

X	the input space
dimension	the size of the input space

Returns

: result of Ackley's One function

2.2.1.2 Ackley_Two()

```
double functions::Ackley_Two (
            double * X,
            int dimension )
```

Ackley's Two function.

Parameters

X	the input space
dimension	the size of the input space

Returns

: result of Ackley's Twofunction

2.2.1.3 Alpine()

```
double functions::Alpine (
            double * X,
            int dimension )
```

Alpine's function.

Parameters

X	the input space
dimension	the size of the input space

Returns

: result of Alpine's function

2.2.1.4 Egg_Holder()

```
double functions::Egg_Holder (
            double * X,
            int dimension )
```

Egg Holder's function.

Parameters

X	the input space
dimension	the size of the input space

Returns

: result of Egg Holder's function

2.2.1.5 first_De_Jong()

```
double functions::first_De_Jong (
            double * X,
            int dimension )
```

1st De Jong's function

Parameters

X	the input space
dimension	the size of the input space

Returns

: result of 1st De Jong's function

2.2.1.6 Greiwangk()

```
double functions::Greiwangk (
            double * X,
            int dimension )
```

Greiwangk's function.

Parameters

X	the input space
dimension	the size of the input space

Returns

: result of Greiwangk's function

2.2.1.7 Levy()

```
double functions::Levy (
            double * X,
            int dimension )
```

Levy's function.

Parameters

X	the input space
dimension	the size of the input space

Returns

: result of Levy's function

2.2.1.8 Masters_Cosine_Wave()

```
double functions::Masters_Cosine_Wave (
            double * X,
            int dimension )
```

Masters Cosine Wave's function.

Parameters

X	the input space
dimension	the size of the input space

Returns

: Masters Cosine Wave's function

2.2.1.9 Michalewicz()

```
double functions::Michalewicz (
            double * X,
            int dimension )
```

Michalewicz's function.

Parameters

X	the input space
dimension	the size of the input space

Returns

: result of Michalewicz's function

2.2.1.10 Pathological()

```
double functions::Pathological (
            double * X,
            int dimension )
```

Pathological's function.

Parameters

X	the input space
dimension	the size of the input space

Returns

: result of Pathological's function

2.2.1.11 Quartic()

```
double functions::Quartic (
            double * X,
            int dimension )
```

Quartic's function.

Parameters

X	the input space
dimension	the size of the input space

Returns

: result of Quartic's function

2.2.1.12 Rana()

```
double functions::Rana (
            double * X,
            int dimension )
```

Rana's function.

Parameters

X	the input space
dimension	the size of the input space

Returns

: result of Rana's function

2.2.1.13 Rastrigin()

```
double functions::Rastrigin (
            double * X,
            int dimension )
```

Rastrigin's function.

Parameters

X	the input space
dimension	the size of the input space

Returns

: result of Rastrigin's function

2.2.1.14 Rosenbrock()

```
double functions::Rosenbrock (
            double * X,
            int dimension )
```

Rosenbrock's function.

Parameters

X	the input space
dimension	the size of the input space

Returns

: result of Rosenbrock's function

2.2.1.15 Schwefel()

```
double functions::Schwefel (
            double * X,
            int dimension )
```

Schwefel's function.

Parameters

X	the input space
dimension	the size of the input space

Returns

: result of Schwefel's function

2.2.1.16 Sine_Envelope_Sine_Wave()

```
double functions::Sine_Envelope_Sine_Wave (
            double * X,
            int dimension )
```

Sine Envelope Sine Wave's function.

Parameters

X	the input space
dimension	the size of the input space

Returns

: result of Sine Envelope Sine Wave's function

2.2.1.17 Step()

```
double functions::Step (
            double * X,
            int dimension )
```

Step's function.

Parameters

X	the input space
dimension	the size of the input space

Returns

: result of Step's function

2.2.1.18 Stretched_V_Sine_Wave()

```
double functions::Stretched_V_Sine_Wave (
            double * X,
            int dimension )
```

Stretched V Sine Wave's function.

Parameters

X	the input space
dimension	the size of the input space

Returns

: result of Stretched V Since Wave's function

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

- functions.h
- functions.cpp

2.3 GA_params Struct Reference

Public Attributes

- int **ns**
- int **dim**
- int **t_max**
- double **l_b**
- double **u_b**
- double **cr**
- double **er**
- M_data **M**

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

- GA.h

2.4 M_data Struct Reference

Public Attributes

- double **rate**
- double **range**
- double **precision**

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

- GA.h

2.5 matrix Class Reference

Public Member Functions

- matrix (int num_rows, int num_columns, int l_b, int h_b, mt19937 &mt_rand)

  generate an empty matrix and fill it up with randomly generated numbers within some range
- matrix (int num_rows, int num_columns)

  generate an empty matrix

Public Attributes

- const int **num_rows**
- const int **num_columns**
- const int **l_b**
- const int **h_b**
- mt19937 **mt_rand**
- double ** **mat**

2.5.1 Constructor & Destructor Documentation

2.5.1.1 matrix() [1/2]

```
matrix::matrix (
            int num_rows,
            int num_columns,
            int l_b,
            int h_b,
            mt19937 & mt_rand )
```

generate an empty matrix and fill it up with randomly generated numbers within some range

Parameters

num_rows	integer respresenting the number of rows in the matrix
dim	integer representing the dimension or number of columns in the matrix
l_b	double representing the lowest bound for the random generator
h_b	double representing the highest bound for the random generator

Returns

: a matrix of randomly generated numbers

2.5.1.2 matrix() [2/2]

```
matrix::matrix (
            int num_rows,
            int num_columns )
```

generate an empty matrix

Parameters

num_rows	integer respresenting the number of rows in the matrix
dim	integer representing the dimension or number of columns in the matrix

Returns

: an empty matrix

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

- matrix.h
- matrix.cpp

2.6 utilities Class Reference

Public Member Functions

- double ∗ str_to_tok (char ∗string, char ∗delim, int num_tokens)

  split a string into double tokens
- void write_to_file (matrix ∗mat, string file_name)

  write a 2d array to a csv file
- int **get_algorithm_id** ()
- int **get_selection_id** ()
- double **find_lowest** (const double ∗list, int len)
- void simulate (int dim, int ns, int num_functions, double ∗ranges, int algo_id, int select_id, int num_gen, int num_exp, int num_trnmt, double cr, double er, double m_range, double m_rate, double m_precision, double F, double lambda, mt19937 &mt_rand)

  simulate both the genetic algorithm and the differential evolution algorithm

2.6.1 Member Function Documentation

2.6.1.1 simulate()

```
void utilities::simulate (
            int dim,
            int ns,
            int num_functions,
            double * ranges,
            int algo_id,
            int select_id,
            int num_gen,
            int num_exp,
            int num_trnmt,
            double cr,
            double er,
            double m_range,
            double m_rate,
            double m_precision,
            double F,
            double lambda,
            mt19937 & mt_rand )
```

simulate both the genetic algorithm and the differential evolution algorithm

simulate both the genetic algoritm and the differencial evolution algorithm

Parameters

dim	: an integer for the dimension of the solutions
ns	: an integer the number of solutions
num_functions	: an integer for the number of objective functions to be simulated (the 18 functions)
ranges	an array of doubles containing the lower and upper bound for each of the objective functions
algo_id	an integer for the evolutionary algorithm to be simulated
select_id	an integer for the selection algorithm to be used
num_gen	: an integer for the number of generations for the evolutionary algorithms
num_exp	an integer for the number of experimentations to be run
num_trnmt	an integer for the number of tournaments for the tournameent selection algorithm
cr	a double for crossover rate
er	a double for the elitism rate for the genetic algorithm
m_range	a double for the mutation range for the genetic algorithm
m_rate	a double for the mutation rate for the genetic algorithm
m_precision	a double for the mutation precision for the genetic algorithm
F	a double
lambda	a double
mt_rand	a seeded random generator to generate random numbers (seeded once in main.cpp)

Returns

: None

2.6.1.2 str_to_tok()

```
double * utilities::str_to_tok (
             char * string,
             char * delim,
             int num_tokens )
```

split a string into double tokens

Parameters

string	the string to be splitted
delim	the character that separates the tokens in the string
num_tokens	number of tokens to expect

Returns

: an array of doubles

2.6.1.3 write_to_file()

```
void utilities::write_to_file (
             matrix * mat,
             string file_name )
```

write a 2d array to a csv file

Parameters

mat	a matrix containing the elements to write to the csv file
file_name	the name of the file where data will be saved

Returns

: None

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

- utilities.h
- utilities.cpp

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