

Package ‘muttest’

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Type Package

Title Mutation Testing

Version 0.1.0

Description Measure quality of your tests.

'muttest' introduces small changes (mutations) to your code
and runs your tests to check if they catch the changes.

If they do, your tests are good.

If not, your assertions are not specific enough.

'muttest' gives you percent score of how often your tests catch the changes.

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CopyStrategy	<i>CopyStrategy interface</i>
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Description

Extend this class to implement a custom copy strategy.

Methods

Public methods:

- [CopyStrategy\\$execute\(\)](#)
- [CopyStrategy\\$clone\(\)](#)

Method `execute()`: Copy project files according to the strategy

Usage:

`CopyStrategy$execute(original_dir)`

Arguments:

`original_dir` The original directory to copy from
`plan` The current test plan

Returns: The path to the temporary directory

Method `clone()`: The objects of this class are cloneable with this method.

Usage:

`CopyStrategy$clone(deep = FALSE)`

Arguments:

`deep` Whether to make a deep clone.

See Also

Other CopyStrategy: [PackageCopyStrategy](#), [default_copy_strategy\(\)](#)

default_copy_strategy *Create a default project copy strategy*

Description

Create a default project copy strategy

Usage

```
default_copy_strategy(...)
```

Arguments

... Arguments passed to the ?PackageCopyStrategy constructor.

Value

A ?CopyStrategy object

See Also

Other CopyStrategy: [CopyStrategy](#), [PackageCopyStrategy](#)

default_reporter *Create a default reporter*

Description

Create a default reporter

Usage

```
default_reporter(...)
```

Arguments

... Arguments passed to the ?ProgressMutationReporter constructor.

See Also

Other MutationReporter: [MutationReporter](#), [ProgressMutationReporter](#)

`default_test_strategy` *Create a default run strategy*

Description

Create a default run strategy

Usage

```
default_test_strategy(...)
```

Arguments

... Arguments passed to the `?FullTestStrategy` constructor.

Value

A `?TestStrategy` object

See Also

Other TestStrategy: [FileTestStrategy](#), [FullTestStrategy](#), [TestStrategy](#)

`FileTestStrategy` *Run tests matching the mutated source file name*

Description

This strategy tells if a mutant is caught by a test matching the source file name.

For example, if the source file name is `foo.R`, and there are test files named `test-foo.R` or `test-bar.R`, only `test-foo.R` will be run.

This strategy should give faster results than `?FullTestStrategy`, especially for big codebases, but the score might be less accurate.

Super class

```
muttest::TestStrategy -> FileTestStrategy
```

Methods

Public methods:

- [FileTestStrategy\\$new\(\)](#)
- [FileTestStrategy\\$execute\(\)](#)
- [FileTestStrategy\\$clone\(\)](#)

Method `new()`: Initialize the FileTestStrategy

Usage:

```
FileTestStrategy$new(  
  load_helpers = TRUE,  
  load_package = c("source", "none", "installed")  
)
```

Arguments:

`load_helpers` Whether to load test helpers

`load_package` The package loading strategy

Method `execute()`: Execute the test strategy

Usage:

```
FileTestStrategy$execute(path, plan, reporter)
```

Arguments:

`path` The path to the test directory

`plan` The current mutation plan. See `plan()`.

`reporter` The reporter to use for test results

Returns: The test results

Method `clone()`: The objects of this class are cloneable with this method.

Usage:

```
FileTestStrategy$clone(deep = FALSE)
```

Arguments:

`deep` Whether to make a deep clone.

See Also

Other TestStrategy: [FullTestStrategy](#), [TestStrategy](#), [default_test_strategy\(\)](#)

FullTestStrategy	<i>Run all tests for a mutant</i>
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Description

This test strategy tells if a mutant is caught by any test.

To get faster results, especially for big codebases, use ?FileTestStrategy instead.

Super class

```
muttest::TestStrategy -> FullTestStrategy
```

Methods

Public methods:

- `FullTestStrategy$new()`
- `FullTestStrategy$execute()`
- `FullTestStrategy$clone()`

Method `new()`: Initialize

Usage:

```
FullTestStrategy$new(
  load_helpers = TRUE,
  load_package = c("source", "none", "installed")
)
```

Arguments:

`load_helpers` Whether to load test helpers
`load_package` The package loading strategy

Method `execute()`: Execute the test strategy

Usage:

```
FullTestStrategy$execute(path, plan, reporter)
```

Arguments:

`path` The path to the test directory
`plan` The current mutation plan. See `plan()`.
`reporter` The reporter to use for test results

Returns: The test results

Method `clone()`: The objects of this class are cloneable with this method.

Usage:

```
FullTestStrategy$clone(deep = FALSE)
```

Arguments:

`deep` Whether to make a deep clone.

See Also

Other TestStrategy: [FileTestStrategy](#), [TestStrategy](#), [default_test_strategy\(\)](#)

MutationReporter	<i>Reporter for Mutation Testing</i>
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Description

The job of a mutation reporter is to aggregate and display the results of mutation tests. It tracks each mutation attempt, reporting on whether the tests killed the mutation or the mutation survived.

Public fields

`test_reporter` Reporter to use for the `testthat::test_dir` function
`out` Output destination for reporter messages
`width` Width of the console in characters
`unicode` Whether Unicode output is supported
`crayon` Whether colored output is supported
`rstudio` Whether running in RStudio
`hyperlinks` Whether terminal hyperlinks are supported
`current_file` Path of the file currently being mutated
`current_mutator` Mutator currently being applied
`plan` Complete mutation plan for the test run
`results` List of mutation test results, indexed by file path
`current_score` Current score of the mutation tests

Methods**Public methods:**

- [MutationReporter\\$new\(\)](#)
- [MutationReporter\\$start_reporter\(\)](#)
- [MutationReporter\\$start_file\(\)](#)
- [MutationReporter\\$start_mutator\(\)](#)
- [MutationReporter\\$add_result\(\)](#)
- [MutationReporter\\$end_mutator\(\)](#)
- [MutationReporter\\$end_file\(\)](#)
- [MutationReporter\\$end_reporter\(\)](#)
- [MutationReporter\\$get_score\(\)](#)
- [MutationReporter\\$cat_tight\(\)](#)
- [MutationReporter\\$cat_line\(\)](#)
- [MutationReporter\\$rule\(\)](#)

- `MutationReporter$clone()`

Method `new()`: Initialize a new reporter

Usage:

```
MutationReporter$new(test_reporter = "silent", file = stdout())
```

Arguments:

`test_reporter` Reporter to use for the `testthat::test_dir` function

`file` Output destination (default: `stdout`)

Method `start_reporter()`: Start reporter

Usage:

```
MutationReporter$start_reporter(plan = NULL)
```

Arguments:

`plan` The complete mutation plan

`temp_dir` Path to the temporary directory for testing

Method `start_file()`: Start testing a file

Usage:

```
MutationReporter$start_file(filename)
```

Arguments:

`filename` Path to the file being mutated

Method `start_mutator()`: Start testing with a specific mutator

Usage:

```
MutationReporter$start_mutator(mutator)
```

Arguments:

`mutator` The mutator being applied

Method `add_result()`: Add a mutation test result

Usage:

```
MutationReporter$add_result(plan, killed, survived, errors)
```

Arguments:

`plan` Current testing plan. See `plan()`.

`killed` Whether the mutation was killed by tests

`survived` Number of survived mutations

`errors` Number of errors encountered

Method `end_mutator()`: End testing with current mutator

Usage:

```
MutationReporter$end_mutator()
```

Method `end_file()`: End testing current file

Usage:

MutationReporter\$end_file()

Method end_reporter(): End reporter and show summary

Usage:

MutationReporter\$end_reporter()

Method get_score(): Get the current score

Usage:

MutationReporter\$get_score()

Method cat_tight(): Print a message to the output

Usage:

MutationReporter\$cat_tight(...)

Arguments:

... Message to print

Method cat_line(): Print a message to the output

Usage:

MutationReporter\$cat_line(...)

Arguments:

... Message to print

Method rule(): Print a message to the output with a rule

Usage:

MutationReporter\$rule(...)

Arguments:

... Message to print

Method clone(): The objects of this class are cloneable with this method.

Usage:

MutationReporter\$clone(deep = FALSE)

Arguments:

deep Whether to make a deep clone.

See Also

Other MutationReporter: [ProgressMutationReporter](#), [default_reporter\(\)](#)

muttest

Run a mutation test

Description

Run a mutation test

Usage

```
muttest(
  plan,
  path = "tests/testthat",
  reporter = default_reporter(),
  test_strategy = default_test_strategy(),
  copy_strategy = default_copy_strategy()
)
```

Arguments

plan	A data frame with the test plan. See <code>plan()</code> .
path	Path to the test directory.
reporter	Reporter to use for mutation testing results. See <code>?MutationReporter</code> .
test_strategy	Strategy for running tests. See <code>?TestStrategy</code> . The purpose of test strategy is to control how tests are executed. We can run all tests for each mutant, or only tests that are relevant to the mutant.
copy_strategy	Strategy for copying the project. See <code>?CopyStrategy</code> . This strategy controls which files are copied to the temporary directory, where the tests are run.

Value

A numeric value representing the mutation score.

operator

Mutate an operator

Description

It changes a binary operator to another one.

Usage

```
operator(from, to)
```

Arguments

from	The operator to be replaced.
to	The operator to replace with.

Examples

```
operator("==", "!=")
operator(">", "<")
operator("<", ">")
operator("+", "-")
```

PackageCopyStrategy	<i>Package copy strategy</i>
---------------------	------------------------------

Description

It copies all files and directories from the original directory to a temporary directory.

Super class

`muttest::CopyStrategy` -> PackageCopyStrategy

Methods**Public methods:**

- `PackageCopyStrategy$execute()`
- `PackageCopyStrategy$clone()`

Method `execute()`: Copy project files, excluding hidden and temp directories

Usage:

`PackageCopyStrategy$execute(original_dir, plan)`

Arguments:

`original_dir` The original directory to copy from

`plan` The current test plan

Returns: The path to the temporary directory

Method `clone()`: The objects of this class are cloneable with this method.

Usage:

`PackageCopyStrategy$clone(deep = FALSE)`

Arguments:

`deep` Whether to make a deep clone.

See Also

Other CopyStrategy: `CopyStrategy`, `default_copy_strategy()`

plan	<i>Create a plan for mutation testing</i>
------	---

Description

Each mutant requires rerunning the tests. For large project it might be not feasible to test all mutants in one go. This function allows you to create a plan for selected source files and mutators.

Usage

```
plan(mutators, source_files = fs::dir_ls("R", regexp = "[rR]$"))
```

Arguments

mutators	A list of mutators to use. See operator() .
source_files	A vector of file paths to the source files.

Details

The plan is in a data frame format, where each row represents a mutant.

You can subset the plan before passing it to the `muttest()` function.

Value

A data frame with the test plan. The data frame has the following columns:

- filename: The name of the source file.
- original_code: The original code of the source file.
- mutated_code: The mutated code of the source file.
- mutator: The mutator that was applied.

ProgressMutationReporter

Progress Reporter for Mutation Testing

Description

A reporter that displays a progress indicator for mutation tests. It provides real-time feedback on which mutants are being tested and whether they were killed by tests.

Super class

```
muttest::MutationReporter -> ProgressMutationReporter
```

Public fields

start_time Time when testing started (for duration calculation)
 min_time Minimum test duration to display timing information
 col_config List of column configuration for report formatting

Methods**Public methods:**

- `ProgressMutationReporter$format_column()`
- `ProgressMutationReporter$fmt_h()`
- `ProgressMutationReporter$fmt_r()`
- `ProgressMutationReporter$new()`
- `ProgressMutationReporter$start_reporter()`
- `ProgressMutationReporter$add_result()`
- `ProgressMutationReporter$update()`
- `ProgressMutationReporter$end_file()`
- `ProgressMutationReporter$cr()`
- `ProgressMutationReporter$end_reporter()`
- `ProgressMutationReporter$clone()`

Method `format_column()`: Format a column with specified padding and width

Usage:

`ProgressMutationReporter$format_column(text, col_name, colorize = NULL)`

Arguments:

text Text to format
 col_name Column name to use configuration from
 colorize Optional function to color the text

Method `fmt_h()`: Format the header of the report

Usage:

`ProgressMutationReporter$fmt_h()`

Method `fmt_r()`: Format a row of the report

Usage:

`ProgressMutationReporter$fmt_r(status, k, s, e, t, score, mutator, file)`

Arguments:

status Status symbol (e.g., tick or cross)
 k Number of killed mutations
 s Number of survived mutations
 e Number of errors
 t Total number of mutations
 score Score percentage

mutator The mutator used

file The file being tested

Returns: Formatted row string

Method new(): Initialize a new progress reporter

Usage:

```
ProgressMutationReporter$new(
  test_reporter = "silent",
  min_time = 1,
  file = stdout()
)
```

Arguments:

test_reporter Reporter to use for testthat::test_dir

min_time Minimum time to show elapsed time (default: 1s)

file Output destination (default: stdout)

Method start_reporter(): Start reporter

Usage:

```
ProgressMutationReporter$start_reporter(plan = NULL)
```

Arguments:

plan The complete mutation plan

Method add_result(): Add a mutation test result

Usage:

```
ProgressMutationReporter$add_result(plan, killed, survived, errors)
```

Arguments:

plan Current testing plan. See plan().

killed Whether the mutation was killed by tests

survived Number of survived mutations

errors Number of errors encountered

Method update(): Update status spinner (for long-running operations)

Usage:

```
ProgressMutationReporter$update(force = FALSE)
```

Arguments:

force Force update even if interval hasn't elapsed

Method end_file(): End testing current file

Usage:

```
ProgressMutationReporter$end_file()
```

Method cr(): Carriage return if dynamic, newline otherwise

Usage:

ProgressMutationReporter\$cr()

Method end_reporter(): End reporter with detailed summary

Usage:

ProgressMutationReporter\$end_reporter()

Method clone(): The objects of this class are cloneable with this method.

Usage:

ProgressMutationReporter\$clone(deep = FALSE)

Arguments:

deep Whether to make a deep clone.

See Also

Other MutationReporter: [MutationReporter](#), [default_reporter\(\)](#)

TestStrategy

TestStrategy interface

Description

Extend this class to implement a custom test strategy.

Methods

Public methods:

- [TestStrategy\\$execute\(\)](#)
- [TestStrategy\\$clone\(\)](#)

Method execute(): Execute the test strategy

Usage:

TestStrategy\$execute(path, plan, reporter)

Arguments:

path The path to the test directory

plan The current mutation plan. See [plan\(\)](#).

reporter The reporter to use for test results

Returns: The test result

Method clone(): The objects of this class are cloneable with this method.

Usage:

TestStrategy\$clone(deep = FALSE)

Arguments:

deep Whether to make a deep clone.

See Also

Other TestStrategy: [FileTestStrategy](#), [FullTestStrategy](#), [default_test_strategy\(\)](#)

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