Package ‘wyz.code.metaTesting’

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**Type** Package

**Title** Wizardry Code Meta Testing

**Version** 1.1.22

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**Description** Meta testing is the ability to test a function without having to provide its parameter values. Those values will be generated, based on semantic naming of parameters, as introduced by package ‘wyz.code.offensiveProgramming’. Value generation logic can be completed with your own data types and generation schemes. This to meet your most specific requirements and to answer to a wide variety of usages, from general use case to very specific ones.

While using meta testing, it becomes easier to generate stress test campaigns, non-regression test campaigns and robustness test campaigns, as generated tests can be saved and reused from session to session.

Main benefits of using ‘wyz.code.metaTesting’ is ability to discover valid and invalid function parameter combinations, ability to infer valid parameter values, and to provide smart summaries that allows you to focus on dysfunctional cases.

**Encoding** UTF-8

**License** GPL-3

**Depends** R (>= 4.0)

**Imports** methods, data.table (>= 1.11.8), tidyr,

  wyz.code.offensiveProgramming (>= 1.1.22), crayon, utils, stats

**Suggests** testthat, knitr, rmarkdown

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**VignetteBuilder** knitr

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buildSemanticArgumentName

*Build semantic argument name*

Description

Build a semantic argument name from the suffix you provide.

Usage

```r
buildSemanticArgumentName(suffix_s_1, variableName_s_1 = "x_")
```

Arguments

- **suffix_s_1**
  - one string to be used as a suffix. Use `retrieveDataFactory()$getKnownSuffixes()` to get a vector of known suffixes.
- **variableName_s_1**
  - a string that is the variable name you want to use.

Details

Know that no checks are done on `suffix_s_1`. Value you provide will be trusted, regular or irregular one.

Value

A single string that is the argument name build from your `variableName_s_1` and `suffix_s_1` values.
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See Also

Refer to testFunction

Examples

# typical example
buildSemanticArgumentName('i') # x_i

buildSemanticArgumentName('ui_1', 'numberOfItems') # numberOfItems_ui_1

computeArgumentsCombination

computeArgumentsCombination

Description

Computes a priori legal combinations of function arguments, according to the function definition (see formals).

Usage

computeArgumentsCombination(fun_f_1)

Arguments

fun_f_1 an R function

Details

Computes an a priori legal list of argument signatures for the provided function.

Allows to foresee test complexity for a function, as this is in narrow relationship, with the number of various call signatures that should be tested. The number of signatures is in itself a good indicator of complexity.

Value

A list containing following named list

names names of mandatory arguments, ellipsis (...) arguments and of default arguments.
number The number provides the number of replacements per argument.
signatures The signatures are the resulting textual argument combinations.
exploreSignatures

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See Also

Refer to testFunction

Examples

# typical example
computeArgumentsCombination(append)
computeArgumentsCombination(kronecker)

exploreSignatures Explore Signatures

Description

Test an offensive programming wrapper function, applying various argument signatures.

Usage

exploreSignatures(fun_f_1,
                   argumentsTypeRestrictions_l = list(),
                   signaturesRestrictions_l = list())

Arguments

fun_f_1 a single R function. Must be an offensive programming wrapper function. See opwf.
argumentsTypeRestrictions_l
                   a named list. Each name must match a function argument name. Each content
                   must be a vector of strings, each of them matching a retrieveDataFactory()$getKnownSuffixes()
                   known suffix.
signaturesRestrictions_l
                   an unnamed list of single strings, each of them matching one of computeArgumentsCombination(fun_f_1)

Details

This function offers a really convenient way to test your own functions, without the burden of
building the execution context, that is much trickier than one can imagine at first glance.
Moreover it provides argument signature analysis, which is not provided by testFunction.
Arguments restriction parameter argumentsTypeRestrictions_l allows to restrict on demand,
value types exploration. It is very useful and convenient to reduce the exploration tree, and to
shorten execution time.
By default, a total of 768 tests will run for a single function, when no `signaturesRestrictions_l` is set. This may require some time to achieve.

When working interactively, a good practice is to use `computeArgumentsCombination` prior to use function `computeArgumentsCombination`, as it will provide complexity information about the function you wish to test. The number of signature is a good metric of function call complexity. Know that each of them will be tested, and data generation has to be achieved for each parameter according to global or restricted scheme, depending on your `argumentsTypeRestrictions_l` inputs.

Value

A list with names info, success, failure, each of them being a list.

The info sub list holds execution results. It holds following entries

- `raw` is a list, providing capture of execution context, data and results.
- `good` is a list, providing same information as `raw`, filtered to retain only tests that do not generate any error.
- `bad` is a list, providing same information as `raw`, filtered to retain only tests that do generate error.

The success sub list holds analysis results for tests which do not generate errors. It holds following entries

- `code` is a `data.table`, providing used call code and results.
- `table` is a `data.table`, providing used argument signatures and execution context information.
- `synthesis` is a list, providing synthesis information. Much easier to read, than `table` entry.

The failure sub list holds analysis results for tests which do generate errors. It holds following entries

- `table` is a `data.table`, providing encountered error messages and execution context information
- `synthesis` is a list, providing synthesis information. Much easier to read, than `table` entry.

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See Also

Refer to `testFunction` and to `generateData`.
Examples

# typical use case
op_sum <- opwf(sum, c('...', 'removeNA_b_1'))

rv_sum <- exploreSignatures(op_sum, list(... = c('im', 'r', 'cm')))

# which are the errors of exploration and in what context do they occur?
print(rv_sum$failure$synthesis)

# which are the good behaviors of exploration and in what context do they occur?
print(rv_sum$success$synthesis)

# Restrict signatures to use for exploration testing on op_sum
# Consider only two cases: no argument and ellipsis1_, ellipsisis2_
cac_sum <- computeArgumentsCombination(op_sum)
rv_sum_f <- exploreSignatures(op_sum, list(... = c('im', 'r', 'cm')),
                               cac_sum$signatures[c(1, 5)])

generateData

Generate Data

Description

Function to generate data.

Usage

generateData(function_f_1,
             argumentsTypeRestrictions_l = list(),
             replacementContext_l = setGenerationContext(),
             ellipsisReplacementContext_l = setGenerationContext(),
             defaultArgumentsContext_l = setDefaultArgumentsGenerationContext(),
             functionName_s_1 = deparse(substitute(function_f_1)))

Arguments

function_f_1 a single R function, offensive programming ready, therefore using semantic argument names

argumentsTypeRestrictions_l a named list. Each name must match a function argument name. Each content must be a vector of strings, each of them matching a retrieveDataFactory()$getKnownSuffixes() known suffix.

replacementContext_l a generation context object, as defined by setGenerationContext function, applicable to standard arguments of the function, if any.
opMetaTestingInformation

ellipsisReplacementContext_l
an ellipsis replacement context object, as defined by \texttt{setGenerationContext}
function, applicable to \ldots arguments of the function.
defaultArgumentsContext_l
a default argument context object, as defined by \texttt{setDefaultArgumentsGenerationContext}
function, applicable to default arguments of the function.
functionName_s_1
A character vector of length 1, holding the function name. Particularly useful
in \texttt{R} scripts.

Details
Generate a driven aleatory set of data to be used as argument in a call to function \texttt{fun_f_1}. Generation is driven by the \texttt{argumentsTypeRestrictions_l} argument.

Value
A object with following names

\begin{itemize}
  \item \texttt{generation} argument name generation
  \item \texttt{codedata} the generated data
  \item \texttt{context} data type generation context
  \item \texttt{n} number of first level data generations
\end{itemize}

See Also
Refer to \texttt{coderetrieveDataFactory} and to \texttt{testFunction}.

Examples

\begin{verbatim}
# typical example
op_sum <- opwf(sum, c('...', 'removeNA_b_1'))
op_sum_atr <- list('...' = c('i', 'd', 'c'))
ec <- setGenerationContext(0, TRUE, FALSE)
gd <- generateData(op_sum, op_sum_atr, ec, erc$hetero_vector[[1]], dac$none)
\end{verbatim}

opMetaTestingInformation

Package functions information

Description
A reminder of available functions from this package, and, most common usage intent. A poor man
CLI cheat sheet.

Usage

opMetaTestingInformation()
opwf

Offensive Programming Wrap Function

Description
Create an offensive programming function, wrapping a standard R function.

Usage
opwf(fun_f_1, parameterNames_s, functionName_s_1 = NA_character_)

Arguments
fun_f_1 a single R function
parameterNames_s the new names of the parameter function, must be semantic argument names.
functionName_s_1 A string holding the function name. Default value, implies evaluation using
deparse(substitute(fun_f_1))

Details
If any arguments default values are present, they are managed transparently and should be correctly
and automatically substituted.

Value
A R function which takes given parameterNames_s as arguments.
**qualifyFunctionArguments**

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**See Also**

Refer to testFunction

**Examples**

```r
# typical example
op_sum <- opwf(sum, c('...', 'removeNA_b_1'))

# example with substituted argument in existing default valued arguments
op_append <- opwf(append, c('originalValues_', 'valuesToInsert_', 'afterIndex_ui_1'))
```

**Description**

Retrieve information about function arguments.

**Usage**

```r
qualifyFunctionArguments(fun_f_1)
```

**Arguments**

```r
fun_f_1 A single function, not a string.
```

**Value**

A list with following names

- **argument_names**: a character vector of all the function argument names
- **owns_ellipsis**: a boolean. Is TRUE when ... belongs to argument names
- **symbol_names**: a character vector of argument names that are symbols
- **symbol_indexes**: the integer indexes of symbol names in the argument names
- **stripped_symbol_names**: a character vector of argument names that are symbols, not considering ...
- **stripped_symbol_indexes**: the integer indexes of stripped symbol names in the argument names
- **default_names**: a character vector of argument names that owns default values
default_indexes
the integer indexes of default valued arguments names in the argument names
codearguments
a pairList of argument names and values. Refer to formals for more information

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Examples
# typical examples
qualifyFunctionArguments(Sys.Date)
qualifyFunctionArguments(cos)
qualifyFunctionArguments(sum)

Description
As the data factory may be modified, this function allows you to make changes and to record them in your own specialized data generation factory, to match various needs and ease reuse.

Usage
retrieveDataFactory()

Details
Provides a data factory.
Retrieves a retrieveDataFactory from options variable op_mt_data_factory.
Allow to customize data factory entries.

Value
An R object that is a retrieveDataFactory.

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Examples

```r
#---- typical case ----

draw_integer_array_dim2 <- function(n, replace_b_1 = TRUE) {
  m <- n + sample(0:3, 1)
  matrix(seq(1, n * m), byrow = TRUE, nrow = n,
  dimnames = list(paste('row_', 1:n), paste('col_', 1:m)))
}

def <- retrieveDataFactory()
def$addSuffix('a', "array", draw_integer_array_dim2)

options(op_mt_data_factory = df)
fg <- retrieveDataFactory() # retrieves the user defined data factory
fg$getRecordedTypes()[suffix == 'a'] # right behavior !

# wrong behavior as retrieveDataFactory will provide the default factory and not yours!
options(op_mt_data_factory = NULL)
fh <- retrieveDataFactory() # retrieves the default factory
fh$getRecordedTypes()[suffix == 'a']
```

setDefaultArgumentsGenerationContext

Set default arguments generation context.

Description

Set default arguments generation context

Usage

```r
setDefaultArgumentsGenerationContext(useDefaultArguments_b_1 = TRUE, 
  useAllDefaultArguments_b_1 = FALSE)
```

Arguments

useDefaultArguments_b_1

A single boolean value to specify the usage of default arguments in generated function call

useAllDefaultArguments_b_1

A single boolean value to specify usage of all default valued arguments in generated function call. Second argument is considered only when first argument is TRUE.

Value

A list holding the provided values, allowing easy reuse either interactively or programmatically, accessible through names `use`, and `use_all`.

Predefined variables named `default_arguments_context` and `dac` hold most common definition cases. Very helpfull as it simplifies reuses and reduces code length.
setGenerationContext

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Examples

# a typical instanciation
mydgc <- list(
  setDefaultArgumentsGenerationContext(FALSE, FALSE),
  setDefaultArgumentsGenerationContext(TRUE, FALSE),
  setDefaultArgumentsGenerationContext(TRUE, TRUE)
)

# uses predefined variable
print(dac$partial)

Description

Use this function to set a generation context

Usage

setGenerationContext(replacementNumber_ui_1 = sample(0:3L, 1),
  homogeneousTypeReplacement_b_1 = FALSE,
  allowList_b_1 = TRUE,
  forceList_b_1 = FALSE)

Arguments

replacementNumber_ui_1
  a single positive integer expressing the number of arguments to generate.

homogeneousTypeReplacement_b_1
  A single boolean expressing willingness to replace chosen argument with same type arguments, or not. Useful when dealing with ....

allowList_b_1
  a single boolean, expressing the desired result. When TRUE result is a list, a vector otherwise.

forceList_b_1
  a single boolean, expressing the desire to get the result as a list.

Value

A list containing all the provided arguments, accessible through names homogeneous_type, number_replacements, and allow_list.

Predefined variables named established_replacement_context and erc hold most common definition cases. Very helpful as it simplifies reuses and reduces code length.
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Examples

# a typical instanciation
egc <- list(
  setGenerationContext(homogeneous = TRUE),
  setGenerationContext(allowList = FALSE)
)

# uses predefined variable
print(erc$homo_vector[[2]])

---

testFunction \hspace{1cm} Test function

Description

Apply data to function signature and record results.

Usage

testFunction(function_f_1, 
generatedData_l, 
functionName_s_1 = deparse(substitute(function_f_1)))

Arguments

function_f_1 \hspace{1cm} a single R function, offensive programming ready, with using semantic argument names
generatedData_l \hspace{1cm} data to apply to the function. Could be generated by generateData function is desired.
functionName_s_1 \hspace{1cm} A string that is the function name. Particularly useful, in scripts.

Details

Executes code and captures execution context and result, for posterior analysis.
Value
A list with following names

<table>
<thead>
<tr>
<th>generation</th>
<th>argument name generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>data</td>
<td>generated data</td>
</tr>
<tr>
<td>context</td>
<td>data type generation context</td>
</tr>
<tr>
<td>n</td>
<td>number of first level data generated</td>
</tr>
</tbody>
</table>

Generated data are ready for use and accessible using the data name of the list.

See Also
Refer to opwf.

Examples

```r
# typical example
op_sum <- opwf(sum, c('...', 'removeNA_b_1'))
op_sum_atr <- list('...' = c('i', 'd', 'c'))
ec <- setGenerationContext(0, TRUE, FALSE)
gd <- generateData(op_sum, op_sum_atr, ec, erc$hetero_vector[[1]], dac$none)
tf <- testFunction(op_sum, gd$data)
```

usesSemanticArgumentNames

Uses semantic argument names.

Description
Determine if the given function uses semantic argument names.

Usage

```r
usesSemanticArgumentNames(fun_f_1)
```

Arguments

- `fun_f_1`: A single function

Value
A TRUE when arguments used by function are all semantic names.

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Examples

f <- function(x_) x_

usesSemanticArgumentNames(f)
# TRUE

usesSemanticArgumentNames(sum)
# FALSE
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