

Package ‘mtconnectR’

March 27, 2017

Type Package

Title Read Data from Delimited 'MTConnect' Data Files and Perform some Analysis

Version 1.1.0

Date 2016-06-15

Maintainer Subramanyam Ravishankar <subramanyam@systeminsights.com>

Description Read data in the 'MTConnect' <<http://www.mtconnect.org/>> standard. You can use the package to read data from historical 'MTConnect logs' along with the 'devices.xml' describing the device. The data is organised into a 'MTConnectDevice' S4 data structure and some convenience methods are also provided for basic read/view operations. The package also includes some functions for analysis of 'MTConnect' data. This includes functions to simulate data (primarily position data, feed rate and velocities) based on the G code and visualisation functions to compare the actual and simulated data.

Depends R (>= 3.0.0)

Imports methods, data.table (>= 1.9.6), XML (>= 3.98), stringr (>= 1.0), plyr (>= 1.8.3), dplyr (>= 0.5.0), ggplot2, magrittr, tidyr, dtw, proxy

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LazyData TRUE

Collate common.R MTCDDataItem.R merge.R MTCCycle.R MTCDevice.R deviceXML.R dataExtraction_mtc.R map_gcode_mtc.R parse_gcode.R simulate_gcode.R zzz.R mtconnectR.R

RoxygenNote 5.0.1

Suggests knitr, rmarkdown, testthat, roxygen2

BuildVignettes yes

VignetteBuilder knitr

NeedsCompilation no

Author Alex Joseph [aut],
Sainath Adapa [aut],
Nitin Madasu [aut],
Subramanyam Ravishankar [aut, cre]

Repository CRAN

Date/Publication 2017-03-27 14:07:22 UTC

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add_data_item_to_mtc_device
Add a new data item to an existing MTC Device Class

Description

Add a new data item to an existing MTC Device Class

Usage

```
add_data_item_to_mtc_device(mtc_device, data_item_data, data_item_name,
  data_item_type = "Event", source_type = "derived", xmlID = "")
```

Arguments

mtc_device	An existing object of MTCDevice Class
data_item_data	Data for the new data item to add
data_item_name	Name of the new data item
data_item_type	Type of the new data item. Can be Event or Sample
source_type	Source from which the data is derived. Free form text
xmlID	ID of the data item (optional)

Examples

```
data_item_data = data.frame(timestamp = as.POSIXct(c(0.5, 1, 1.008, 1.011) +
  1445579573, tz = 'CST6CDT', origin = "1970-01-01"),
  value = c("a", "b", "c", "d"))
data("example_mtc_device")
mtc_device_updated =
  add_data_item_to_mtc_device(example_mtc_device, data_item_data, data_item_name = "test",
    data_item_type = "Event", source_type = "derived")
print(mtc_device_updated)
```

calculated_feed_from_position

Calculate feed rate from the path position data items

Description

Returns a data.frame which contains the calculated feed rates and the corresponding time stamps

Usage

```
calculated_feed_from_position(mtc_device, pattern = "PATH_POSITION")
```

Arguments

mtc_device is the MTCDevice object
 pattern is the pattern of the path position data items in the device object

Examples

```
data("example_mtc_device_3")
calculated_feed_from_position = calculated_feed_from_position(example_mtc_device_3)
```

clean_redundant_rows *Removes Redundant Rows in a data frame assuming statefulness*

Description

Removes Redundant Rows in a data frame assuming statefulness

Usage

```
clean_redundant_rows(df, clean_colname = "value", echo = F)
```

Arguments

df Data.frame in timestamp, value1, value2,...
 clean_colname Name of the column to clean as basis
 echo Whether to return messages or not

Examples

```
test_interval =
  data.frame(timestamp = as.POSIXct(c(0.5, 1, 1.008, 1.011), origin = "1970-01-01"),
            x = c("a", "b", "b", "b"),
            y = c("e", "e", "e", "f"))
clean_redundant_rows(test_interval, "x")
```

`convert_interval_to_ts`*Convert Interval to Time Series*

Description

Basically reverse the effect of [convert_ts_to_interval](#). Column names should be same as mentioned in the example

Usage

```
convert_interval_to_ts(df, time_colname = "start", end_colname = "end",
  remove_last = F)
```

Arguments

<code>df</code>	Data.frame in start, end, duration, value1, value2,...
<code>time_colname</code>	Name of the time column
<code>end_colname</code>	Name of the end time column
<code>remove_last</code>	Logical value to remove the last row in the result

See Also

[convert_ts_to_interval](#)

Examples

```
test_interval =
  data.frame(start = as.POSIXct(c(0.5, 1, 1.008, 1.011), tz = 'CST6CDT', origin = "1970-01-01"),
    end = as.POSIXct(c(1, 1.008, 1.011, 2), tz = 'CST6CDT', origin = "1970-01-01"),
    duration = c(0.50, 0.01, 0.00, 0.99),
    y = c("e", "e", "e", "f"))
convert_interval_to_ts(test_interval)
```

`convert_ts_to_interval`*Convert Time Series to Intervals*

Description

Function to convert a continuous time series data to interval data. The last row which goes to infinity can be deleted, else will be given dump value.

Usage

```
convert_ts_to_interval(df, endtime_lastrow = as.POSIXct(NA),
  arrange_cols = T, time_colname = "timestamp", round_duration = 6)
```

Arguments

`df` A data frame with continuous time series data

`endtime_lastrow` POSIXct value for the last row. Defaults to NA

`arrange_cols` Whether to add the interval and duration columns at the front or not

`time_colname` Column name of the timestamp variable

`round_duration` Number of decimals to rounds the duration to. Defaults to 2. If no rounding required, give NULL.

See Also

[convert_interval_to_ts](#)

Examples

```
ts_data = data.frame(ts = as.POSIXct(c(0.5, 1, 1.008, 1.011), tz = 'UTC', origin = "1970-01-01"),
  x = c("a", "b", "c", "d"), y = c("e", "e", "e", "f"))
convert_ts_to_interval(ts_data, time_colname = "ts", endtime_lastrow = ts_data$ts[1] + 10)
```

```
create_mtc_device_from_dmtcd
```

Create MTCDevice class from Delimited MTC Data and log file

Description

Create MTCDevice class from Delimited MTC Data and log file

Usage

```
create_mtc_device_from_dmtcd(file_path_dmtcd, file_path_xml, device_name,
  mtconnect_version = NULL)
```

Arguments

`file_path_dmtcd` Path to Delimited MTC Data file

`file_path_xml` Path to the XML file

`device_name` Name of the device in the xml. List of all the devices and their names can be got using the [get_device_info_from_xml](#) function

`mtconnect_version` Specify MTConnect Version manually. If not specified, it is inferred automatically from the data.

Examples

```
file_path_dmtcd = "testdata/dataExtraction/test_dmtcd.log"
file_path_xml = "testdata/dataExtraction/test_devices.xml"
device_name = "test_device"
mtc_device = create_mtc_device_from_dmtcd(
  system.file(file_path_dmtcd, package = "mtconnectR"),
  system.file(file_path_xml, package = "mtconnectR"),
  device_name)
print(summary(mtc_device))
```

create_mtc_device_from_ts

Create a MTC device object from a merged time series data frame

Description

Create a MTC device object from a merged time series data frame

Usage

```
create_mtc_device_from_ts(merged_device, device_uuid = "unmerged_device")
```

Arguments

merged_device An existing object of MTCDevice Class
device_uuid UUID to be given to the device

Examples

```
data("example_mtc_device")
merged_device = merge(example_mtc_device)
create_mtc_device_from_ts(merged_device)
```

example_dmtcd

Example data set showing MTC Log data

Description

A manually created dataset showing a log data file, parsed and read into R. The columns are

- timestamp. Timestamp of the event
- data_item_name. Name of the data Item from the delimited MTC data. Can be empty.
- value. of the data item

Usage

```
example_dmtcd
```

Format

A data frame with some rows and 3 variables

```
example_gcode_parsed Example data set showing parsed G code data
```

Description

A manually created dataset showing a raw gcode data file, parsed and read into R. The columns are

- line Line number
- single_block A single block of G code from a line
- value Value of the data item corresponding to the command
- priority Priority of the block as per the pre-written dictionary
- prefix Prefix of the block
- type Type
- subtype Subtype
- supported Whether the specific G code block is supported or not by the dictionary

Usage

```
example_gcode_parsed
```

Format

A data frame with some rows and 8 variables

```
example_mapped_plot ggplot object showing mapping between simulated and actual time series
```

Description

ggplot object showing mapping between simulated and actual time series

Usage

```
example_mapped_plot
```

Format

An ggplot object

example_mtc_data_item *Example data set showing a MTConnect DataItem*

Description

The data can be accessed using the @ function. The slots are:

- data Data for a single data item in a data.frame in timestamp, value format
- data_type Type of Data - can be event or sample
- path XML Xpath
- data_source Source from which the data item was created
- xmlID ID of the data item in the devices XML

Usage

example_mtc_data_item

Format

An MTCDevice data item

example_mtc_device *Example data set showing a MTConnect Device*

Description

The data can be accessed using the @ function. The slots are:

- rawdata Original delimited MTC data (parsed from the file using which the data was created)
- metadata Metadata (if any) for the device
- data_item_list Processed data showing each data item as a separate device
- device_uuid UUID of the device

Usage

example_mtc_device

Format

An MTCDevice data item

example_mtc_device_2 *A bigger example data set showing a MTCConnect Device with path position and conditions*

Description

The data can be accessed using the @ function. The slots are:

- rawdata Original delimited MTC data (parsed from which the data was created)
- metadata Metadata (if any) for the device
- data_item_list Processed data showing each data item as a separate device
- device_uuid UUID of the device

Usage

example_mtc_device_2

Format

An MTCDevice data item

example_mtc_device_3 *Example data set showing a MTCConnect Device*

Description

The data can be accessed using the @ function. The slots are:

- rawdata Original delimited MTC data (parsed from the file using which the data was created)
- metadata Metadata (if any) for the device
- data_item_list Processed data showing each data item as a separate device
- device_uuid UUID of the device

Usage

example_mtc_device_3

Format

An MTCDevice data item

example_mtc_device_sim

MTCDevice object showing simulated G code data

Description

MTCDevice object created using the simulate_gcode function using parsed G code and convert_mtc_device_from_ts to convert data.frame to MTCDevice object.

Usage

```
example_mtc_device_sim
```

Format

A data frame with some rows and 13 variables

example_mtc_sim_mapped

MTCDevice object containing actual and simulated data and the mapping

Description

MTCDevice object containing actual and simulated data and the mapping

Usage

```
example_mtc_sim_mapped
```

Format

An MTCDevice object

example_parsed_device_xml

Example dataset showing the parsed xml for a device

Description

The data can be accessed using the @ function. The slots are:

- parsed_xml Raw XML
- device_details Name,uuid and id of the device
- mtconnect_version

Usage

example_parsed_device_xml

Format

An MTCDevice data item

example_simulated_gcode_data

Example data set showing simulated G code data

Description

Dataset created using the simulate_gcode function using parsed G code. The columns are

- timestamp Simulated timestamp
- lineid Line ID
- program Program name
- tool_id Tool ID
- pfr Simulated path feed rate
- rot_vel Simulated rotational velocity
- x_pos Simulated X axis position
- y_pos Simulated Y axis position
- z_pos Simulated Z axis position
- x_vel Simulated X axis velocity
- y_vel Simulated Y axis velocity
- z_vel Simulated Z axis velocity
- state_upcoming_tool State upcoming tool

Usage

```
example_simulated_gcode_data
```

Format

A data frame with some rows and 13 variables

```
example_xpath_info      Example data set showing Xpaths from a device XML
```

Description

Dataset showing a parsed DeviceXML file showing all the XPathS and the properties

- id ID of the data item
- name Name of the data Item from the delimited MTC data. Can be empty.
- type MTC Type of the data item
- category MTC Category of the data item
- subType MTC subType of the data item. Can be empty
- xpath xpath showing the truncated path to the particular data item in the device XML

Usage

```
example_xpath_info
```

Format

A data frame with some rows and 6 variables

```
extract_param_from_xpath
      Extract different parts of a xpath
```

Description

Returns a single parameter extracted from the xpath vector. It could be Data Item Name or Data Item type or name of the Device. If the character vector is not in xpath format, the original name is returned and a warning is given

Usage

```
extract_param_from_xpath(strName, param = "DIName", removeExtended = F,
  show_warnings = T)
```

Arguments

strName is the xpath string
 param is the parameter to be extracted. Can be "DIName", "DIType" or "Device"
 removeExtended if True, then the x: prefix is removed from extended JSON class Types
 show_warnings if false, silences the warnings

Examples

```
xpaths = c("timestamp",
  "nist_testbed_Mazak_QT_1<Device>:avail<AVAILABILITY>",
  "nist_testbed_Mazak_QT_1<Device>:execution<EXECUTION>",
  "nist_testbed_Mazak_QT_1<Device>:Fovr<x:PATH_FEEDRATE-OVERRIDE>")

extract_param_from_xpath(xpaths, "DIName")
extract_param_from_xpath(xpaths, "DIType")
extract_param_from_xpath(xpaths, "DIType", TRUE)
extract_param_from_xpath(xpaths, "Device")
```

```
filter_timestamps_mtc_device
```

Filter MTCDevice object based on time range

Description

Helper function to quickly filter based on time range

Usage

```
filter_timestamps_mtc_device(mtc_device, start_time, end_time)
```

Arguments

mtc_device is the MTCDevice object
 start_time is the Start time
 end_time is the End time

Examples

```
data("example_mtc_device_3")
start_time = as.POSIXct("2016-03-22 12:45:00.000")
end_time = as.POSIXct("2016-03-22 12:45:10.000")
filtered_data = filter_timestamps_mtc_device(example_mtc_device_3, start_time, end_time)
```

getData	<i>Get data from the object in a data frame form</i>
---------	--

Description

Get data from the object in a data frame form

Usage

```
getData(.Object, pattern)
```

Arguments

.Object	A MTC Object
pattern	OPTIONAL Can be used to query specific data items

Examples

```
data("example_mtc_data_item")
getData(example_mtc_data_item)
```

getData,MTCCycle-method	<i>Get Data from MTCDevice/MTCCycle Object as a data.frame</i>
-------------------------	--

Description

Get Data from MTCDevice/MTCCycle Object as a data.frame

Usage

```
## S4 method for signature 'MTCCycle'
getData(.Object)
```

Arguments

.Object	Object of MTCCycle or MTCDevice Class
---------	---------------------------------------

Examples

```
data("example_mtc_device")
getData(example_mtc_device)
```

getData, MTCDDataItem-method

Get Data from the Object as a data.frame

Description

Get Data from the Object as a data.frame

Usage

```
## S4 method for signature 'MTCDDataItem'  
getData(.Object)
```

Arguments

.Object Object of MTCDDataItem Class

Examples

```
data("example_mtc_data_item")  
getData(example_mtc_data_item)
```

getDataItem

Get data on one or more data items from the class

Description

Get data on one or more data items from the class

Usage

```
getDataItem(.Object, pattern)
```

Arguments

.Object object of MTCCycle or MTCDevice Class
pattern OPTIONAL can be used to query specific data items

Examples

```
data("example_mtc_device")  
getDataItem(example_mtc_device)
```

getDataItem,MTCCycle,ANY-method
Get the first dataitem

Description

Get the first dataitem

Usage

```
## S4 method for signature 'MTCCycle,ANY'  
getDataItem(.Object)
```

Arguments

.Object Object of MTCCycle or MTCDevice Class

Examples

```
data("example_mtc_device")  
getDataItem(example_mtc_device)
```

getDataItem,MTCCycle,character-method
*Get one or more data items from the MTCCycle or MTCDevice using
a character pattern*

Description

Get one or more data items from the MTCCycle or MTCDevice using a character pattern

Usage

```
## S4 method for signature 'MTCCycle,character'  
getDataItem(.Object, pattern)
```

Arguments

.Object Object of MTCCycle or MTCDevice Class
pattern Regex of the pattern by which the data is queried

Examples

```
data("example_mtc_device")  
getDataItem(example_mtc_device, "POSIT")
```

```
getDataItem,MTCCycle,numeric-method
```

Get one or more data items from the MTCCycle or MTCDevice using a numeric index

Description

Get one or more data items from the MTCCycle or MTCDevice using a numeric index

Usage

```
## S4 method for signature 'MTCCycle,numeric'
getDataItem(.Object, pattern)
```

Arguments

.Object	Object of MTCCycle or MTCDevice Class
pattern	Numeric index/indices of the data item to be queried

Examples

```
data("example_mtc_device")
getDataItem(example_mtc_device, 1:2)
```

```
get_device_info_from_xml
```

Get info on all the devices in the xml file

Description

Device XML usually consists of the configuration details of multiple devices. This function can detail all the device info in the XML into a data.frame for easy reference

Usage

```
get_device_info_from_xml(file_path_xml, mtconnect_version = NULL)
```

Arguments

file_path_xml	Path to the XML file
mtconnect_version	Specify MTConnect Version manually. If not specified, it is inferred automatically from the data.

See Also

[get_xpaths_from_xml](#)

Examples

```
file_path_xml = "testdata/dataExtraction/test_devices.xml"
devices_info = get_device_info_from_xml(system.file(file_path_xml, package = "mtconnectR"))
print(devices_info)
```

get_xpaths_from_xml *Get XML xpath info*

Description

Get info on all the xpaths for a single device from the xml file. Data is organized into a data.frame

Usage

```
get_xpaths_from_xml(file_path_xml, device_name, mtconnect_version = NULL)
```

Arguments

`file_path_xml` Path to the XML file

`device_name` Name of the device in the xml. List of all the devices and their names can be got using the [get_device_info_from_xml](#) function

`mtconnect_version`
Specify MTConnect Version manually. If not specified, it is inferred automatically from the data.

Examples

```
file_path_xml = "testdata/dataExtraction/test_devices.xml"
device_name = "test_device"
xpath_info = get_xpaths_from_xml(system.file(file_path_xml, package = "mtconnectR"), device_name)
print(xpath_info)
```

grep_subset	<i>Subset a data frame using regex matching on the column name and also on the value</i>
-------------	--

Description

Subset a data frame using regex matching on the column name and also on the value

Usage

```
grep_subset(dataFrame, colGrep, subGrep, echo = T, invert = F)
```

Arguments

dataFrame	is a data.frame
colGrep	is a regex pattern for finding the columns
subGrep	is a regex pattern to subset the values in the matched column
echo	If TRUE, messages are printed on the console
invert	If TRUE, returns everything other than the rows and columns matched using colGrep and subGrep

Examples

```
df = data.frame(type = c("sample", "event", "condition", "sample"), value = c("value1", "value2",
  "value3", "value4"))
filtered_df = grep_subset(df, "type", "sample")
```

map_gcode_mtc	<i>Create a mapping between simulated and actual data</i>
---------------	---

Description

Creates a timestamp based mapping to map every simulated timestamp to an actual timestamp based on real data

Usage

```
map_gcode_mtc(mtc_device_sim, mtc_device, elasticity = 2)
```

Arguments

mtc_device_sim	is the simulated version
mtc_device	is the actual log data
elasticity	is the maximum consecutive reference elements skippable (passed to dtw::mvmStepPattern())

Examples

```
data("example_gcode_parsed") # Parsed gcode
data("example_mtc_device_3") # MTCDevice object of actual log data
simulated_gcode_data = na.omit(simulate_data_from_gcode(example_gcode_parsed,
start_time = 0, data_res = 0.1, data_type = "HH"))
mtc_device_sim = create_mtc_device_from_ts(simulated_gcode_data)
mtc_sim_mapped = map_gcode_mtc(mtc_device_sim, example_mtc_device_3, elasticity = 200)
```

```
merge,MTCCycle,ANY-method
```

Merge all data items from the MTCCycle or MTCDevice

Description

Merge all data items from the MTCCycle or MTCDevice

Usage

```
## S4 method for signature 'MTCCycle,ANY'
merge(x)
```

Arguments

x Object of MTCCycle or MTCDevice Class

Examples

```
data("example_mtc_device")
merge(example_mtc_device)
```

```
merge,MTCCycle,character-method
```

Merge one or more data items from the MTCCycle or MTCDevice using a character pattern

Description

Merge one or more data items from the MTCCycle or MTCDevice using a character pattern

Usage

```
## S4 method for signature 'MTCCycle,character'
merge(x, y)
```

Arguments

x Object of MTCCycle or MTCDevice Class
 y Regex for picking data items which has to be merged

Examples

```
data("example_mtc_device")
merge(example_mtc_device, "POSIT")
```

```
merge,MTCCycle,numeric-method
```

Merge one or more data items from the MTCCycle or MTCDevice using an index

Description

Merge one or more data items from the MTCCycle or MTCDevice using an index

Usage

```
## S4 method for signature 'MTCCycle,numeric'
merge(x, y)
```

Arguments

x Object of MTCCycle or MTCDevice Class
 y Numeric index/indices of the data items to be merged

Examples

```
data("example_mtc_device")
merge(example_mtc_device, 1)
```

```
mergeTS
```

Merges all the data.frames in the list into single data.frame

Description

Merges all the data.frames in the list into single data.frame

Usage

```
mergeTS(DF_list, output_DF = T, use_list_names = F,
        additional_ts = .POSIXct(integer(0)))
```

Arguments

DF_list is a list of data.frames. Each data.frame should be of type timestamp|value1|value2...
 output_DF if TRUE, then returns output in the form of data.frame instead of data.table
 use_list_names if TRUE, the names of the list are assigned the columns names
 additional_ts an POSIXct vector of timestamps which needs to be added into the table. The values are repeated from the previous timestamp

Examples

```
data("example_mtc_device")
mtc_device = merge(example_mtc_device)
df_1 = mtc_device[seq(1,17,2),]
df_2 = mtc_device[seq(2,17,2),]
merged_df = mergeTS(list(df_1,df_2))
```

MTCCycle-class *An S4 class to represent the different data items of a device*

Description

An S4 class to represent the different data items of a device

Slots

data_item_list List of data items with data(data.frame of timestamp,value), data_type,path,dataSource,xmlID
 device_uuid UUID of the device

MTCDevice-class *An S4 class to represent a device. It contains MTCCycle class and the slots below.*

Description

An S4 class to represent a device. It contains MTCCycle class and the slots below.

Slots

rawdata Delimited MTC data (parsed from the file using which the data was created)
 metadata Metadata (if any about) the device

Examples

```
data('example_mtc_data_item')
mtc_data_item <- example_mtc_data_item
device_name = extract_param_from_xpath(mtc_data_item@path,"Device")
mtc_device_object = list(rawdata = list(),metadata = list(),
  data_item_list = list(mtc_data_item),device_uuid = device_name)
```

parse_gcode	<i>Read the gcode and translate it as per the dictionary</i>
-------------	--

Description

Returns a data frame with each row referring to a block of G-code

Usage

```
parse_gcode(gcode_file_path)
```

Arguments

gcode_file_path
Directory path of the file containing G-code

Examples

```
gcode_file_path = "extdata/raw_gcode_sample.NC"
gcode_parsed = parse_gcode(system.file(gcode_file_path, package = "mtconnectR"))
```

plot_twoway	<i>To plot the mapping between the simulated and actual versions</i>
-------------	--

Description

This function is a wrapper around the dtwPlotTwoWay from the dtw package in R.

Usage

```
plot_twoway(mtc_sim_mapped, mtc_device_sim, mtc_device, offset = 100,
            total_maps = 50, mtc_map_string = "path_pos_x",
            sim_map_string = "x_pos")
```

Arguments

mtc_sim_mapped is the mapping between simulated and actual data
 mtc_device_sim is the simulated data
 mtc_device is the actual log data
 offset is the amount by which the simulated data is shifted in the y axis
 total_maps is the number of mapping line segment between the two plots
 mtc_map_string is the name of the data item to match in the actual data
 sim_map_string is the name of the data item to match in the simulated data

Details

In our case, this function can be used to compare the variation of a single variable in the simulated and actual data. The simulated and actual data are represented on the same y axis with the time representing the x axis. An offset is provided to the simulated data to easily distinguish the two. Data points that are mapped to each other are connected by a line segment between the two graphs

Examples

```
data("example_mtc_device_3") # MTCDevice object of actual log data
data("example_mtc_device_sim") # Simulated gcode
data("example_mtc_sim_mapped") # Mapping between simulated and actual data
mapping_ggplot = plot_twoway(example_mtc_sim_mapped, example_mtc_device_sim,
example_mtc_device_3,offset = 20, total_maps = 100)
```

read_dmtcd_file	<i>Function to load Log data into R as a data.frame</i>
-----------------	---

Description

Function to load Log data into R as a data.frame

Usage

```
read_dmtcd_file(file_path_dmtcd, condition_names = c(),
path_position_names = c())
```

Arguments

file_path_dmtcd	Path to the file containing log data
condition_names	A character string with the names of the data items that represent the conditions in the log data
path_position_names	A character string with the names of the data items that represent the path_position data items

Examples

```
device_name = "test_device"
file_path_xml = "testdata/dataExtraction/test_devices.xml"
xpath_info = get_xpaths_from_xml(system.file(file_path_xml, package = "mtconnectR"), device_name)
```

`simulate_data_from_gcode`*Simulate position, velocity and other data from G-code*

Description

Reads parsed gcode and returns simulated data

Usage

```
simulate_data_from_gcode(gcode_parsed, start_time = 0, data_res = 0.2,  
  data_type = "ISO")
```

Arguments

<code>gcode_parsed</code>	Parsed gcode
<code>start_time</code>	Starting time (default 0)
<code>data_res</code>	Resolution for occurrence of a new data point. (seconds)
<code>data_type</code>	Data type

Examples

```
data("example_gcode_parsed")  
simulated_data_from_gcode <- simulate_data_from_gcode(example_gcode_parsed, start_time = 0,  
  data_res = 0.2, data_type = "HH")
```

`summary, MTCCycle-method`*Show a quick summary of the MTCCycle or MTCDevice Object*

Description

Show a quick summary of the MTCCycle or MTCDevice Object

Usage

```
## S4 method for signature 'MTCCycle'  
summary(object)
```

Arguments

<code>object</code>	The MTCDevice or MTCCycle object
---------------------	----------------------------------

summary,MTCDatItem-method

Show a quick summary of the MTCDatItem

Description

Show a quick summary of the MTCDatItem

Usage

```
## S4 method for signature 'MTCDatItem'  
summary(object)
```

Arguments

object The MTCDatItem object

Examples

```
data("example_mtc_data_item")  
summary(example_mtc_data_item)
```

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