
mdfreader Documentation

Release 2.7.5

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Jan 19, 2018

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Contents:

MDF MODULE DOCUMENTATION

MDFREADER MODULE DOCUMENTATION

Measured Data Format file reader main module

2.1 Platform and python version

With Unix and Windows for python 2.6+ and 3.2+

Author Aymeric Rateau

Created on Sun Oct 10 12:57:28 2010

2.2 Dependencies

- Python >2.6, >3.2 <<http://www.python.org>>
- Numpy >1.6 <<http://numpy.scipy.org>>
- Sympy to convert channels with formula
- bitarray for not byte aligned data parsing
- Matplotlib >1.0 <<http://matplotlib.sourceforge.net>>
- NetCDF
- h5py for the HDF5 export
- xlwt for the excel export (not existing for python3)
- openpyxl for the excel 2007 export
- scipy for the Matlab file conversion
- zlib to uncompress data block if needed

2.3 Attributes

PythonVersion [float] Python version currently running, needed for compatibility of both python 2.6+ and 3.2+

2.4 mdfreader module

class mdfreader.mdfreader.**mdf** (*fileName=None, channelList=None, convertAfterRead=True, filter-ChannelNames=False, noDataLoading=False, compression=False*)
Bases: *mdfreader.mdf3reader.mdf3, mdfreader.mdf4reader.mdf4*

mdf class

Notes

mdf class is a nested dict Channel name is the primary dict key of mdf class At a higher level, each channel includes the following keys :

- ‘data’ : containing vector of data (numpy)
- ‘unit’ : unit (string)
- ‘master’ : master channel of channel (time, crank angle, etc.)
- ‘description’ : Description of channel
- ‘conversion’: **mdfinfo nested dict for CCBLOCK**. Exist if channel not converted, used to convert with getChannelData method

Examples

```
>>> import mdfreader
>>> yop=mdfreader.mdf('NameOfFile')
>>> yop.keys() # list channels names
# list channels grouped by raster or master channel
>>> yop.masterChannelList
>>> yop.plot('channelName') or yop.plot({'channel1','channel2'})
>>> yop.resample(0.1) or yop.resample(channelName='master3')
>>> yop.exporttoCSV(sampling=0.01)
>>> yop.exportNetCDF()
>>> yop.exporttoHDF5()
>>> yop.exporttoMatlab()
>>> yop.exporttoExcel()
>>> yop.exporttoXlsx()
>>> yop.convertToPandas() # converts data groups into pandas dataframes
>>> yop.write() # writes mdf file
# drops all the channels except the one in argument
>>> yop.keepChannels({'channel1','channel2','channel3'})
>>> yop.getChannelData('channelName') # returns channel numpy array
```

Attributes

fileName	(str) file name
MDFVersionNumber	(int) mdf file version number
masterChannelList	(dict) Represents data structure: a key per master channel with corresponding value containing a list of channels One key or master channel represents then a data group having same sampling interval.
multiProc	(bool) Flag to request channel conversion multi processed for performance improvement. One thread per data group.
file_metadata	(dict) file metadata with minimum keys : author, organisation, project, subject, comment, time, date

Methods

read(fileName = None, multiProc = False, channelList=None, convertAfterRead=True, filterChannelNames=False, noDataLoading=False, compression=False)	reads mdf file version 3.x and 4.x
write(fileName=None)	writes simple mdf file
getChannelData(channelName)	returns channel numpy array
convertAllChannel()	converts all channel data according to CCBlock information
getChannelUnit(channelName)	returns channel unit
plot(channels)	Plot channels with Matplotlib
resample(samplingTime = 0.1, masterChannel=None)	Resamples all data groups
exportToCSV(filename = None, sampling = 0.1)	Exports mdf data into CSV file
exportToNetCDF(filename = None, sampling = None)	Exports mdf data into netcdf file
exportToHDF5(filename = None, sampling = None)	Exports mdf class data structure into hdf5 file
exportToMatlab(filename = None)	Exports mdf class data structure into Matlab file
exportToExcel(filename = None)	Exports mdf data into excel 95 to 2003 file
exportToXlsx(filename=None)	Exports mdf data into excel 2007 and 2010 file
convertToPandas(sampling=None)	converts mdf data structure into pandas dataframe(s)
keepChannels(channelList)	keeps only list of channels and removes the other channels
mergeMdf(mdfClass):	Merges data of 2 mdf classes

allPlot ()

convertAllChannel ()

Converts all channels from raw data to converted data according to CCBlock information Converted data will take more memory.

convertToPandas (*sampling=None*)

converts mdf data structure into pandas dataframe(s)

Parameters **sampling** : float, optional

resampling interval

Notes

One pandas dataframe is converted per data group Not adapted yet for mdf4 as it considers only time master channels

copy ()

make a shallow copy a mdf class

cut (*begin=None, end=None*)

Cut data

Parameters **begin** : float

beginning value in master channel from which to start cutting in all channels

end : float

ending value in master channel from which to start cutting in all channels

Notes

Use this method if whole data in mdf are using same physical or type of master channel (for instance time).

exportToCSV (*filename=None, sampling=None*)

Exports mdf data into CSV file

Parameters **filename** : str, optional

file name. If no name defined, it will use original mdf name and path

sampling : float, optional

sampling interval. None by default

Notes

Data saved in CSV file be automatically resampled as it is difficult to save in this format data not sharing same master channel Warning: this can be slow for big data, CSV is text format after all

exportToExcel (*filename=None*)

Exports mdf data into excel 95 to 2003 file

Parameters **filename** : str, optional

file name. If no name defined, it will use original mdf name and path

Notes

xlwt is not fast even for small files, consider other binary formats like HDF5 or Matlab If there are more than 256 channels, data will be saved over different worksheets Also Excel 2003 is becoming rare these days, prefer using exportToXlsx

exportToHDF5 (*filename=None, sampling=None, compression=None, compression_opts=None*)

Exports mdf class data structure into hdf5 file

Parameters filename : str, optional

file name. If no name defined, it will use original mdf name and path

sampling : float, optional

sampling interval.

compression : str, optional

HDF5 compression algorithm. Valid options are 'gzip', 'lzf'. gzip compression recommended for portability. szip compression not supported due to legal reasons.

compression_opts : int, optional

HDF5 gzip compression level, 0-9. Only valid if gzip compression is used. Level 4 (default) recommended for best balance between compression and time.

Notes

The maximum attributes will be stored Data structure will be similar has it is in masterChannelList attribute

exportToMatlab (*filename=None*)

Export mdf data into Matlab file format 5, tentatively compressed

Parameters filename : str, optional

file name. If no name defined, it will use original mdf name and path

Notes

This method will dump all data into Matlab file but you will loose below information: - unit and descriptions of channel - data structure, what is corresponding master channel to a channel.

Channels might have then different lengths

exportToNetCDF (*filename=None, sampling=None*)

Exports mdf data into netcdf file

Parameters filename : str, optional

file name. If no name defined, it will use original mdf name and path

sampling : float, optional

sampling interval.

exportToXlsx (*filename=None*)

Exports mdf data into excel 2007 and 2010 file

Parameters filename : str, optional

file name. If no name defined, it will use original mdf name and path

Notes

It is recommended to export resampled data for performances

getChannelData (*channelName*, *raw_data=False*)

Return channel numpy array

Parameters **channelName** : str

channel name

raw_data: bool

flag to return non converted data

Notes

This method is the safest to get channel data as numpy array from 'data' dict key might contain raw data

keepChannels (*channelList*)

keeps only list of channels and removes the other channels

Parameters **channelList** : list of str

list of channel names

mergeMdf (*mdfClass*)

Merges data of 2 mdf classes

Parameters **mdfClass** : mdf

mdf class instance to be merge with self

Notes

both classes must have been resampled, otherwise, impossible to know master channel to match create union of both channel lists and fill with Nan for unknown sections in channels

plot (*channels*)

Plot channels with Matplotlib

Parameters **channels** : str or list of str

channel name or list of channel names

Notes

Channel description and unit will be tentatively displayed with axis labels

read (*fileName=None*, *multiProc=False*, *channelList=None*, *convertAfterRead=True*, *filterChannelNames=False*, *noDataLoading=False*, *compression=False*)

reads mdf file version 3.x and 4.x

Parameters **fileName** : str, optional

file name

multiProc : bool

flag to activate multiprocessing of channel data conversion

channelList : list of str, optional

list of channel names to be read If you use channelList, reading might be much slower but it will save you memory. Can be used to read big files

convertAfterRead : bool, optional

flag to convert channel after read, True by default If you use convertAfterRead by setting it to false, all data from channels will be kept raw, no conversion applied. If many float are stored in file, you can gain from 3 to 4 times memory footprint To calculate value from channel, you can then use method `.getChannelData()`

filterChannelNames : bool, optional

flag to filter long channel names from its module names separated by ‘.’

noDataLoading : bool, optional

Flag to read only file info but no data to have minimum memory use

compression : bool or str, optional

To compress data in memory using `blosc` or `bcolz`, takes cpu time if `compression = int(1 to 9)`, uses `bcolz` for compression if `compression = ‘blosc’`, uses `blosc` for compression Choice given, efficiency depends of data

Notes

If you keep `convertAfterRead` to true, you can set attribute `mdf.multiProc` to activate channel conversion in multiprocessing. Gain in reading time can be around 30% if file is big and using a lot of float channels

resample (*samplingTime=None, masterChannel=None*)

Resamples all data groups into one data group having defined sampling interval or sharing same master channel

Parameters **samplingTime** : float, optional

resampling interval, None by default. If None, will merge all datagroups into a unique datagroup having the highest sampling rate from all datagroups

****or****

masterChannel : str, optional

master channel name to be used for all channels

Notes

1. resampling is relatively safe for mdf3 as it contains only time series. However, mdf4 can contain also distance, angle, etc. It might make not sense to apply one resampling to several data groups that do not share same kind of master channel (like time resampling to distance or angle data groups) If several kind of data groups are used, you should better use pandas to resample

2. resampling will convert all your channels so be careful for big files and memory consumption

write (*fileName=None*)

Writes simple mdf file, same format as originally read, default is 4.x

Parameters **fileName** : str, optional

Name of file If file name is not input, written file name will be the one read with appended ‘_new’ string before extension

Notes

All channels will be converted, so size might be bigger than original file

```
class mdfreader.mdfreader.mdfinfo (fileName=None, filterChannelNames=False, fid=None, minimal=0)
```

Bases: dict

Methods

fid

fileName

filterChannelNames

listChannels (*fileName=None*)

Read MDF file blocks and returns a list of contained channels

Parameters **fileName** : string

file name

Returns **nameList** : list of string

list of channel names

mdfversion

readinfo (*fileName=None, fid=None, minimal=0*)

Reads MDF file and extracts its complete structure

Parameters **fileName** : str, optional

file name. If not input, uses fileName attribute

fid : file identifier, optional

minimal : int

0 will load every metadata 1 will load DG, CG, CN and CC 2 will load only DG

zipfile

MDF3READER MODULE DOCUMENTATION

Measured Data Format file reader module for version 3.x

3.1 Platform and python version

With Unix and Windows for python 2.6+ and 3.2+

Author Aymeric Rateau

Created on Sun Oct 10 12:57:28 2010

3.2 Dependencies

- Python >2.6, >3.2 <<http://www.python.org>>
- Numpy >1.6 <<http://numpy.scipy.org>>
- Sympy to convert channels with formula

3.3 Attributes

PythonVersion [float] Python version currently running, needed for compatibility of both python 2.6+ and 3.2+

3.4 mdf3reader module

class `mdfreader.mdf3reader.DATA` (*fid, pointer*)

Bases: `dict`

DATA class is organizing record classes itself made of channel. This class inherits from dict. Keys are corresponding to channel group recordID. A DATA class corresponds to a data block, a dict of record classes (one per channel group). Each record class contains a list of channel class representing the structure of channel record.

Attributes

<code>fid</code>	(io.open) file identifier
<code>pointerToData</code>	(int) position of Data block in mdf file
<code>BlockLength</code>	(int) total size of data block

Methods

<code>addRecord(record)</code>	Adds a new record in DATA class dict
<code>read(channelSet)</code>	Reads data block
<code>loadSorted(record, nameList=None)</code>	Reads sorted data block from record definition
<code>loadUnSorted(nameList=None)</code>	Reads unsorted data block, not yet implemented

addRecord (*record*)

Adds a new record in DATA class dict

Parameters **record** class

channel group definition listing record channel classes

loadSorted (*record, nameList=None*)

Reads sorted data block from record definition

Parameters **record** class

channel group definition listing record channel classes

channelSet : set of str, optional

list of channel names

Returns numpy recarray of data

loadUnSorted (*nameList=None*)

Reads unsorted data block from record definition

Parameters **record** class

channel group definition listing record channel classes

channelSet : set of str, optional

list of channel names

Returns numpy recarray of data

read (*channelSet, filename*)

Reads data block

Parameters **channelSet** : set of str, optional

list of channel names

filename : str

name of file

`mdfreader.mdf3reader.expConv` (*data, conv*)

apply exponential conversion to data

Parameters **data** : numpy 1D array

raw data to be converted to physical value

conv : mdfinfo3.info3 conversion block ('CCBlock') dict

Returns converted data to physical value

`mdfreader.mdf3reader.formulaConv` (*data, conv*)

apply formula conversion to data

Parameters **data** : numpy 1D array

raw data to be converted to physical value

conv : mdfinfo3.info3 conversion block ('CCBlock') dict

Returns converted data to physical value

Notes

Requires sympy module

`mdfreader.mdf3reader.linearConv(data, conv)`

apply linear conversion to data

Parameters **data** : numpy 1D array

raw data to be converted to physical value

conv : mdfinfo3.info3 conversion block ('CCBlock') dict

Returns converted data to physical value

`mdfreader.mdf3reader.logConv(data, conv)`

apply logarithmic conversion to data

Parameters **data** : numpy 1D array

raw data to be converted to physical value

conv : mdfinfo3.info3 conversion block ('CCBlock') dict

Returns converted data to physical value

class `mdfreader.mdf3reader.mdf3` (*fileName=None, channelList=None, convertAfterRead=True, filterChannelNames=False, noDataLoading=False, compression=False*)

Bases: `mdfreader.mdf.mdf_skeleton`

mdf file version 3.0 to 3.3 class

Attributes

<code>fileName</code>	(str) file name
<code>MDFVersionNumber</code>	(int) mdf file version number
<code>masterChannelList</code>	(dict) Represents data structure: a key per master channel with corresponding value containing a list of channels One key or master channel represents then a data group having same sampling interval.
<code>multiProc</code>	(bool) Flag to request channel conversion multi processed for performance improvement. One thread per data group.
<code>convertAfterRead</code>	(bool) flag to convert raw data to physical just after read
<code>filterChannelNames</code>	(bool) flag to filter long channel names from its module names separated by '.'
<code>file_metadata</code>	(dict) file metadata with minimum keys: author, organisation, project, subject, comment, time, date

Methods

<code>read3(fileName=None, info=None, multiProc=False, channelList=None, convertAfterRead=True)</code>	Reads mdf 3.x file data and stores it in dict
<code>_getChannelData3(channelName)</code>	Returns channel numpy array
<code>_convertChannel3(channelName)</code>	converts specific channel from raw to physical data according to CCBlock information
<code>_convertAllChannel3()</code>	Converts all channels from raw data to converted data according to CCBlock information
<code>write3(fileName=None)</code>	Writes simple mdf 3.3 file

read3 (*fileName=None, info=None, multiProc=False, channelList=None, convertAfterRead=True, filterChannelNames=False, compression=False*)

Reads mdf 3.x file data and stores it in dict

Parameters **fileName** : str, optional

file name

info : `mdfinfo3.info3` class

info3 class containing all MDF Blocks

multiProc : bool

flag to activate multiprocessing of channel data conversion

channelList : list of str, optional

list of channel names to be read If you use channelList, reading might be much slower but it will save you memory. Can be used to read big files

convertAfterRead : bool, optional

flag to convert channel after read, True by default If you use convertAfterRead by setting it to false, all data from channels will be kept raw, no conversion applied. If many float are stored in file, you can gain from 3 to 4 times memory footprint To calculate value from channel, you can then use method `.getChannelData()`

compression : bool, optional

flag to activate data compression with `blosc`

write3 (*fileName=None*)

Writes simple mdf 3.3 file

Parameters **fileName** : str, optional

Name of file If file name is not input, written file name will be the one read with appended `'_new'` string before extension

Notes

All channels will be converted to physical data, so size might be bigger than original file

`mdfreader.mdf3reader.polyConv` (*data, conv*)

apply polynomial conversion to data

Parameters **data** : numpy 1D array

raw data to be converted to physical value

conv : `mdfinfo3.info3` conversion block (`'CCBlock'`) dict

Returns converted data to physical value

`mdfreader.mdf3reader.rationalConv(data, conv)`
 apply rational conversion to data

Parameters `data` : numpy 1D array

raw data to be converted to physical value

`conv` : `mdfinfo3.info3` conversion block ('CCBlock') dict

Returns converted data to physical value

class `mdfreader.mdf3reader.record(dataGroup, channelGroup)`
 Bases: list

record class lists Channel classes, it is representing a channel group

Attributes

<code>CGrecordLength</code>	(int) length of record from channel group block information in Byte
<code>recordLength</code>	(int) length of record from channels information in Byte
<code>numberOfRecords</code>	(int) number of records in data block
<code>recordID</code>	(int) recordID corresponding to channel group
<code>recordIDnumber</code>	(int) size of recordID
<code>dataGroup</code>	(int:) data group number
<code>channelGroup</code>	(int) channel group number
<code>numpyDataRecordFormat</code>	(list) list of numpy (dtype) for each channel
<code>dataRecordName</code>	(list) list of channel names used for recarray attribute definition
<code>master</code>	(dict) define name and number of master channel
<code>recordToChannelMatching</code>	(dict) helps to identify nested bits in byte
<code>channelNames</code>	(set) channel names to be stored, useful for low memory consumption but slow
<code>hiddenBytes</code>	(Bool, False by default) flag in case of non declared channels in record
<code>byte_aligned</code>	(Bool, True by default) flag for byte aligned record

Methods

<code>addChannel(info, channelNumber)</code>	
<code>loadInfo(info)</code>	
<code>readSortedRecord(fid, pointer, channelSet=None)</code>	
<code>readRecordBuf(buf, channelSet=None)</code>	
<code>readRecordBits(bita, channelSet=None)</code>	

addChannel (*info*, *channelNumber*)
 add a channel in class

Parameters `info` : `mdfinfo3.info3` class

`channelNumber` : int

channel number in `mdfinfo3.info3` class

loadInfo (*info*)
 gathers records related from info class

Parameters `info` : `mdfinfo3.info3` class

readRecordBits (*bita*, *channelSet=None*)

read stream of record bits by bits in case of not aligned or hidden bytes

Parameters **buf** : stream

stream of bytes read in file

channelSet : Set of str, optional

list of channel to read

Returns **rec** : dict

returns dictionary of channel with its corresponding values

readRecordBuf (*buf*, *channelSet=None*)

read stream of record bytes

Parameters **buf** : stream

stream of bytes read in file

channelSet : Set of str, optional

list of channel to read

Returns **rec** : dict

returns dictionary of channel with its corresponding values

readSortedRecord (*fid*, *pointer*, *channelSet=None*)

reads record, only one channel group per datagroup

Parameters **fid** : float

file identifier

pointer

position in file of data block beginning

channelSet : Set of str, optional

list of channel to read

Returns **rec** : numpy recarray

contains a matrix of raw data in a recarray (attributes corresponding to channel name)

Notes

If *channelSet* is *None*, read data using `numpy.core.records.fromfile` that is rather quick. However, in case of large file, you can use *channelSet* to load only interesting channels or only one channel on demand, but be aware it might be much slower.

`mdfreader.mdf3reader.tabConv` (*data*, *conv*)

apply Tabular conversion to data

Parameters **data** : numpy 1D array

raw data to be converted to physical value

conv : `mdfinfo3.info3` conversion block ('CCBlock') dict

Returns converted data to physical value

`mdfreader.mdf3reader.tabInterpConv(data, conv)`

apply Tabular interpolation conversion to data

Parameters `data` : numpy 1D array

raw data to be converted to physical value

`conv` : `mdfinfo3.info3` conversion block ('CCBlock') dict

Returns converted data to physical value

`mdfreader.mdf3reader.textRangeTableConv(data, conv)`

apply text range table conversion to data

Parameters `data` : numpy 1D array

raw data to be converted to physical value

`conv` : `mdfinfo3.info3` conversion block ('CCBlock') dict

Returns converted data to physical value

MDFINFO3 MODULE DOCUMENTATION

Measured Data Format blocks parser for version 3.x

Created on Thu Dec 9 12:57:28 2014

4.1 Platform and python version

With Unix and Windows for python 2.6+ and 3.2+

Author Aymeric Rateau

4.2 Dependencies

- Python >2.6, >3.2 <<http://www.python.org>>
- Numpy >1.6 <<http://numpy.scipy.org>>

4.3 Attributes

PythonVersion [float] Python version currently running, needed for compatibility of both python 2.6+ and 3.2+

4.4 mdinfo3 module

```
class mdfreader.mdinfo3.info3 (fileName=None, fid=None, filterChannelNames=False, minimal=0)
```

Bases: dict

Methods

```
cleanDGinfo (dg)
    delete CN,CC and CG blocks related to data group
```

Parameters dg: int
data group number

fid

fileName

filterChannelNames

listChannels3 (*fileName=None, fid=None*)

reads data, channel group and channel blocks to list channel names

Returns list of channel names

Attributes

fileName	(str) file name
----------	-----------------

readCGBlock (*fid, dg, minimal=0*)

read all CG blocks and relying CN & CC

Parameters **fid** : float

file identifier

dg : int

datagroup number

channelSet : set

set of channel names to read

minimal : int

0 will load every metadata 1 will load DG, CG, CN and CC 2 will load only DG

readinfo3 (*fid, minimal=0*)

read all file blocks except data

Parameters **fid** : float

file identifier

minimal : int

0 will load every metadata 1 will load DG, CG, CN and CC 2 will load only DG

`mdfreader.mdinfo3.read_cc_block(fid, pointer)`

channel conversion block reading

`mdfreader.mdinfo3.read_cg_block(fid, pointer)`

channel block reading

`mdfreader.mdinfo3.read_cn_block(fid, pointer)`

channel block reading

`mdfreader.mdinfo3.read_dg_block(fid, pointer)`

data group block reading

`mdfreader.mdinfo3.read_hd_block(fid, pointer, version=0)`

header block reading

`mdfreader.mdinfo3.read_tx_block(fid, pointer)`

reads text block

MDF4READER MODULE DOCUMENTATION

Measured Data Format file reader module for version 4.x.

5.1 Platform and python version

With Unix and Windows for python 2.6+ and 3.2+

Author Aymeric Rateau

Created on Thu Dec 10 12:57:28 2013

5.2 Dependencies

- Python >2.6, >3.2 <<http://www.python.org>>
- Numpy >1.6 <<http://numpy.scipy.org>>
- bitarray to parse bits in not aligned bytes
- Sympy to convert channels with formula if needed
- zlib to uncompress data block if needed

5.3 Attributes

PythonVersion [float] Python version currently running, needed for compatibility of both python 2.6+ and 3.2+

5.4 mdf4reader module

class `mdfreader.mdf4reader.DATA` (*fid, pointer*)
Bases: dict

Methods

addRecord (*record*)
Adds a new record in DATA class dict.

Parameters record class

channel group definition listing record channel classes

fid

load (*record*, *info*, *nameList=None*, *sortedFlag=True*, *vlsd=False*)

Reads data block from record definition

Parameters **record class**

channel group definition listing record channel classes

info class

contains blocks

nameList : list of str, optional

list of channel names

sortedFlag : bool, optional

flag to know if data block is sorted (only one Channel Group in block) or unsorted (several Channel Groups identified by a recordID). As unsorted block can contain CG records in random order, block is processed iteratively, not in raw like sorted -> much slower reading

vlsd : bool

indicate a sd block, compressed (DZ) or not (SD)

Returns numpy recarray of data

pointerTodata

read (*channelSet*, *info*, *filename*)

Reads data block

Parameters **channelSet** : set of str

set of channel names

info : info object

contains blocks structures

filename

name of file ot read

readRecord (*recordID*, *info*, *buf*, *channelSet=None*)

read record from a buffer

Parameters **recordID** : int

record identifier

info class

contains blocks

buf : str

buffer of data from file to be converted to channel raw data

channelSet : set of str

setof channel names to be read

type

`mdfreader.mdf4reader.DATABlock(record, info, parent_block, channelSet=None, nrecords=None, sortedFlag=True, vlsc=False)`

DATABlock converts raw data into arrays

Parameters **record** : class

record class instance describing a channel group record

parent_block : class

MDFBlock class containing at least parent block header

channelSet : set of str, optional

defines set of channels to only read, can be slow but saves memory, for big files

nrecords: int, optional

number of records to read

sortedFlag : bool, optional

flag to know if data block is sorted (only one Channel Group in block) or unsorted (several Channel Groups identified by a recordID). As unsorted block can contain CG records in random order, block is processed iteratively, not in raw like sorted -> much slower reading

vlsc : bool

indicate a sd block, compressed (DZ) or not (SD)

Returns a recarray containing the channels data

Notes

This function will read DTBlock, RDBlock, DZBlock (compressed), RDBlock (VLSD), sorted or unsorted

`mdfreader.mdf4reader.decompress_datablock(block, zip_type, zip_parameter, org_data_length)`

decompress datablock.

Parameters **block** : bytes

raw data compressed

zip_type : int

0 for non transposed, 1 for transposed data

zip_parameter : int

first dimension of matrix to be transposed

org_data_length : int

uncompressed data length

Returns uncompressed raw data

`mdfreader.mdf4reader.equalizeStringLength(buf)`

Makes all strings in a list having same length by appending spaces strings.

Parameters **buf** : list of str

Returns list of str elements all having same length

`mdfreader.mdf4reader.formulaConv(vect, formula)`

apply formula conversion to data

Parameters `vect` : numpy 1D array

raw data to be converted to physical value

`cc_val` : `mdfinfo4.info4` conversion block ('CCBlock') dict

Returns converted data to physical value

`mdfreader.mdf4reader.linearConv(vect, cc_val)`

apply linear conversion to data

Parameters `vect` : numpy 1D array

raw data to be converted to physical value

`cc_val` : `mdfinfo4.info4` conversion block ('CCBlock') dict

Returns converted data to physical value

class `mdfreader.mdf4reader.mdf4(fileName=None, channelList=None, convertAfterRead=True, filterChannelNames=False, noDataLoading=False, compression=False)`

Bases: `mdfreader.mdf.mdf_skeleton`

mdf file reader class from version 4.0 to 4.1.1

Attributes

<code>fileName</code>	(str) file name
<code>MDFVersionNumber</code>	(int) mdf file version number
<code>masterChannelList</code>	(dict) Represents data structure: a key per master channel with corresponding value containing a list of channels. One key or master channel represents then a data group having same sampling interval.
<code>multiProc</code>	(bool) Flag to request channel conversion multi processed for performance improvement. One thread per data group.
<code>convertAfterRead</code>	(bool) flag to convert raw data to physical just after read
<code>filterChannelNames</code>	(bool) flag to filter long channel names from its module names separated by '.'
<code>file_metadata</code>	(dict) file metadata with minimum keys : author, organisation, project, subject, comment, time, date

Methods

<code>read4(fileName=None, info=None, multiProc=False, channelList=None, convertAfterRead=True)</code>	Reads mdf 4.x file data and stores it in dict
<code>_getChannelData4(channelName)</code>	Returns channel numpy array
<code>_convertChannel4(channelName)</code>	converts specific channel from raw to physical data according to CCBlock information
<code>_convertAllChannel4()</code>	Converts all channels from raw data to converted data according to CCBlock information

read4 (*fileName=None, info=None, multiProc=False, channelList=None, convertAfterRead=True, filterChannelNames=False, compression=False*)
 Reads mdf 4.x file data and stores it in dict

Parameters **fileName** : str, optional

file name

info : mdinfo4.info4 class

info4 class containing all MDF Blocks

multiProc : bool

flag to activate multiprocessing of channel data conversion

channelList : list of str, optional

list of channel names to be read If you use channelList, reading might be much slower but it will save you memory. Can be used to read big files

convertAfterRead : bool, optional

flag to convert channel after read, True by default If you use convertAfterRead by setting it to false, all data from channels will be kept raw, no conversion applied. If many float are stored in file, you can gain from 3 to 4 times memory footprint To calculate value from channel, you can then use method .getChannelData()

compression : bool, optional

flag to activate data compression with blosc

write4 (*fileName=None*)

Writes simple mdf 4.1 file

Parameters **fileName** : str, optional

Name of file If file name is not input, written file name will be the one read with appended '_new' string before extension

Notes

All channels will be converted to physical data, so size might be bigger than original file

`mdfreader.mdf4reader.rationalConv (vect, cc_val)`

apply rational conversion to data

Parameters **vect** : numpy 1D array

raw data to be converted to physical value

cc_val : mdinfo4.info4 conversion block ('CCBlock') dict

Returns converted data to physical value

`mdfreader.mdf4reader.readUnsorted (record, info, parent_block, channelSet=None)`

`mdfreader.mdf4reader.read_sdblock (signal_data_type, sdblock, sdblock_length)`

Reads vlsc channel from its SD Block bytes

Parameters **signal_data_type** : int

sdblock : bytes

SD Block bytes

sdblock_length: int

SD Block data length (header not included)

Returns array

class `mdfreader.mdf4reader.record` (*dataGroup, channelGroup*)

Bases: `list`

Methods

CANOpen

CGrecordLength

Flags

MLSD

VLSD

VLSD_CG

addChannel (*info, channelNumber*)

add a channel in class

Parameters **info** : `mdfinfo4.info4` class

channelNumber : int

channel number in `mdfinfo4.info4` class

byte_aligned

channelGroup

channelNames

dataGroup

dataRecordName

generate_chunks ()

Initialise recarray

Returns (*nrecord_chunk, chunk_size*)

hiddenBytes

initialise_recarray (*info, channelSet, nrecords, dtype=None, channels_indexes=None*)

Initialise recarray

Parameters **info: info** class

channelSet : set of str, optional

set of channel to read

nrecords: int

number of records

dtype: numpy dtype, optional

channels_indexes: list of int, optional

Returns **rec** : numpy recarray

contains a matrix of raw data in a recarray (attributes corresponding to channel name)

invalid_channel

loadInfo (*info*)

gathers records related from info class

Parameters **info** : mdfinfo4.info4 class

master

numberOfRecords

numpyDataRecordFormat

readRecordBuf (*buf, info, channelSet=None*)

read stream of record bytes

Parameters **buf** : stream

stream of bytes read in file

info class

contains blocks structure

channelSet : set of str, optional

set of channel to read

Returns **rec** : dict

returns dictionary of channel with its corresponding values

readSortedRecord (*fid, info, channelSet=None*)

reads record, only one channel group per datagroup

Parameters **fid** :

file identifier

pointer

position in file of data block beginning

channelSet : set of str, optional

set of channel to read

Returns **rec** : numpy recarray

contains a matrix of raw data in a recarray (attributes corresponding to channel name)

Notes

If channelSet is None, read data using `numpy.core.records.fromfile` that is rather quick. However, in case of large file, you can use channelSet to load only interesting channels or only one channel on demand, but be aware it might be much slower.

read_all_channels_sorted_record (*fid*)

reads all channels from file using numpy fromstring, chunk by chunk

Parameters **fid** :

file identifier

Returns **rec** : numpy recarray

contains a matrix of raw data in a recarray (attributes corresponding to channel name)

read_channels_from_bytes (*bita, info, channelSet=None, nrecords=None, dtype=None, channels_indexes=None*)

reads stream of record bytes using dataRead module if available otherwise bitarray

Parameters **bita** : stream

stream of bytes

info: info class

channelSet : set of str, optional

set of channel to read

nrecords: int

number of records

dtype: numpy dtype

channels_indexes: list of int

Returns **rec** : numpy recarray

contains a matrix of raw data in a recarray (attributes corresponding to channel name)

read_channels_from_bytes_fallback (*bita, info, channelSet=None, nrecords=None, dtype=None, channels_indexes=None*)

reads stream of record bytes using bitarray in case no dataRead available

Parameters **bita** : stream

stream of bytes

info: info class

channelSet : set of str, optional

set of channel to read

nrecords: int

number of records

dtype: numpy dtype

channels_indexes: list of int

Returns **rec** : numpy recarray

contains a matrix of raw data in a recarray (attributes corresponding to channel name)

read_not_all_channels_sorted_record (*fid, info, channelSet*)

reads channels from file listed in channelSet

Parameters **fid** :

file identifier

info: info class

channelSet : set of str, optional

set of channel to read

Returns **rec** : numpy recarray

contains a matrix of raw data in a recarray (attributes corresponding to channel name)

recordID**recordIDCFormat****recordIDsize****recordLength****recordToChannelMatching**`mdfreader.mdf4reader.textToTextConv(vect, cc_ref)`

apply text to text conversion to data

Parameters `vect` : numpy 1D array

raw data to be converted to physical value

`cc_ref` : `cc_ref` from `mdfinfo4.info4` conversion block ('CCBlock') dict**Returns** converted data to physical value`mdfreader.mdf4reader.textToValueConv(vect, cc_val, cc_ref)`

apply text to value conversion to data

Parameters `vect` : numpy 1D array

raw data to be converted to physical value

`cc_val` : `cc_val` from `mdfinfo4.info4` conversion block ('CCBlock') dict`cc_ref` : `cc_ref` from `mdfinfo4.info4` conversion block ('CCBlock') dict**Returns** converted data to physical value`mdfreader.mdf4reader.valueRangeToTextConv(vect, cc_val, cc_ref)`

apply value range to text conversion to data

Parameters `vect` : numpy 1D array

raw data to be converted to physical value

`cc_val` : `cc_val` from `mdfinfo4.info4` conversion block ('CCBlock') dict`cc_ref` : `cc_ref` from `mdfinfo4.info4` conversion block ('CCBlock') dict**Returns** converted data to physical value`mdfreader.mdf4reader.valueRangeToValueTableConv(vect, cc_val)`

apply value range to value table conversion to data

Parameters `vect` : numpy 1D array

raw data to be converted to physical value

`cc_val` : `mdfinfo4.info4` conversion block ('CCBlock') dict**Returns** converted data to physical value`mdfreader.mdf4reader.valueToTextConv(vect, cc_val, cc_ref)`

apply value to text conversion to data

Parameters `vect` : numpy 1D array

raw data to be converted to physical value

`cc_val` : `cc_val` from `mdfinfo4.info4` conversion block ('CCBlock') dict`cc_ref` : `cc_ref` from `mdfinfo4.info4` conversion block ('CCBlock') dict**Returns** converted data to physical value

`mdfreader.mdf4reader.valueToValueTableWInterpConv(vect, cc_val)`
apply value to value table with interpolation conversion to data

Parameters `vect` : numpy 1D array

raw data to be converted to physical value

`cc_val` : `mdfinfo4.info4` conversion block ('CCBlock') dict

Returns converted data to physical value

`mdfreader.mdf4reader.valueToValueTableWOInterpConv(vect, cc_val)`
apply value to value table without interpolation conversion to data

Parameters `vect` : numpy 1D array

raw data to be converted to physical value

`cc_val` : `mdfinfo4.info4` conversion block ('CCBlock') dict

Returns converted data to physical value

MDFINFO4 MODULE DOCUMENTATION

Measured Data Format blocks parser for version 4.x

6.1 Platform and python version

With Unix and Windows for python 2.6+ and 3.2+

Created on Sun Dec 15 12:57:28 2013

Author Aymeric Rateau

6.2 Dependencies

- Python >2.6, >3.2 <<http://www.python.org>>
- Numpy >1.6 <<http://numpy.scipy.org>>

6.3 Attributes

PythonVersion [float] Python version currently running, needed for compatibility of both python 2.6+ and 3.2+

6.4 mdinfo4 module

class `mdfreader.mdinfo4.ATBlock` (*fid, pointer*)

Bases: `dict`

reads Attachment block and saves in class dict

Methods

class `mdfreader.mdinfo4.CABlock` (*fid, pointer*)

Bases: `dict`

reads Channel Array block and saves in class dict

Methods

class mdfreader.mdinfo4.**CCBlock**

Bases: dict

reads Channel Conversion block and saves in class dict

Methods

read (*fid*, *pointer*)

class mdfreader.mdinfo4.**CGBlock** (*fid=None*, *pointer=None*)

Bases: dict

reads Channel Group block and saves in class dict

Methods

read (*fid*, *pointer*)

write (*fid*)

class mdfreader.mdinfo4.**CHBlock** (*fid*, *pointer*)

Bases: dict

reads Channel Hierarchy block and saves in class dict

Methods

class mdfreader.mdinfo4.**CNBlock**

Bases: dict

reads Channel block and saves in class dict

Methods

read (***kargs*)

write (*fid*)

class mdfreader.mdinfo4.**CommentBlock**

Bases: dict

reads or writes Comment block and saves in class dict

Methods

load (*data*, *MDType*)

read (***kargs*)

reads Comment block and saves in class dict Parameters ——— fid: file identifier pointer: int
position in file

MDType: str describes metadata type, ('CN', 'unit', 'FH', 'SI', 'HD', 'CC')

Notes

Can read xml (MD metadata) or text (TX) comments from several kind of blocks

write (*fid*)

class mdfreader.mdinfo4.**DGBlock** (*fid=None, pointer=None*)

Bases: dict

reads Data Group block and saves in class dict

Methods

read (*fid, pointer*)

write (*fid*)

class mdfreader.mdinfo4.**DLBlock** (*fid, link_count*)

Bases: dict

reads Data List block

Methods

class mdfreader.mdinfo4.**DZBlock** (*fid*)

Bases: dict

reads Data List block

Methods

class mdfreader.mdinfo4.**EVBlock** (*fid, pointer*)

Bases: dict

reads Event block and saves in class dict

Methods

class mdfreader.mdinfo4.**FHBlock** (*fid=None, pointer=None*)

Bases: dict

reads File History block and save in class dict

Methods

read (*fid, pointer*)

write (*fid*)

class mdfreader.mdinfo4.**HDBlock** (*fid=None, pointer=64*)

Bases: dict

reads Header block and save in class dict

Methods

read (*fid=None, pointer=64*)

write (*fid*)

class mdfreader.mdfinfo4.**HLBlock** (*fid*)

Bases: dict

reads Header List block

Methods

class mdfreader.mdfinfo4.**IDBlock** (*fid=None*)

Bases: dict

reads or writes ID Block

Methods

read (*fid*)

reads IDBlock

write (*fid*)

Writes IDBlock

class mdfreader.mdfinfo4.**SIBlock**

Bases: dict

reads Source Information block and saves in class dict

Methods

read (*fid, pointer*)

class mdfreader.mdfinfo4.**SRBlock** (*fid, pointer*)

Bases: dict

reads Sample Reduction block and saves in class dict

Methods

class mdfreader.mdfinfo4.**info4** (*fileName=None, fid=None, minimal=0*)

Bases: dict

Methods

cleanDGinfo (*dg*)

delete CN,CC and CG blocks related to data group

Parameters *dg*: int

data group number

fid

fileName

listChannels4 (*fileName=None, fid=None*)

Read MDF file and extract its complete structure

Parameters **fileName** : str

file name

Returns list of channel names contained in file

readATBlock (*self, fid, pointer*)

reads Attachment blocks

Parameters **fid** : float

file identifier

pointer : int

position of ATBlock in file

Returns Attachments Blocks in a dict

readCGBlock (*fid, dg, channelNameList=False, minimal=0*)

reads Channel Group blocks

Parameters **fid** : float

file identifier

dg : int

data group number

channelNameList : bool

Flag to reads only channel blocks for listChannels4 method

minimal: falg

to activate minimum content reading for raw data fetching

readCNBlock (*fid, dg, cg, channelNameList=False, minimal=0*)

reads Channel blocks

Parameters **fid** : float

file identifier

dg : int

data group number

cg : int

channel group number in data group

channelNameList : bool

Flag to reads only channel blocks for listChannels4 method

minimal: falg

to activate minimum content reading for raw data fetching

readComposition (*fid, dg, cg, MLSDChannels, channelNameList=False*)

check for composition of channels, arrays or structures

Parameters **fid** : float

file identifier

dg : int

data group number

cg : int

channel group number in data group

MLSDChannels : list of int

channel numbers

channelNameList : bool

Flag to reads only channel blocks for listChannels4 method

Returns MLSDChannels list of appended Maximum Length Sampling Data channels

readDGBlock (*fid*, *channelNameList=False*, *minimal=0*)

reads Data Group Blocks

Parameters **fid** : float

file identifier

channelNameList : bool

Flag to reads only channel blocks for listChannels4 method

minimal: falg

to activate minimum content reading for raw data fetching

readSRBlock (*fid*, *pointer*)

reads Sample Reduction Blocks

Parameters **fid** : float

file identifier

pointer : int

position of SRBlock in file

Returns Sample Reduction Blocks in a dict

readinfo (*fid*, *minimal*)

read all file blocks except data

Parameters **fid** : float

file identifier

minimal: falg

to activate minimum content reading for raw data fetching

zipfile

CHANNEL MODULE DOCUMENTATION

Measured Data Format file reader module.

7.1 Platform and python version

With Unix and Windows for python 2.7 and 3.4+

Author Aymeric Rateau

Created on Wed Oct 04 21:13:28 2017

7.2 Dependencies

- Python >2.6, >3.4 <<http://www.python.org>>
- Numpy >1.6 <<http://numpy.scipy.org>>

7.3 Attributes

PythonVersion [float] Python version currently running, needed for compatibility of both python 2.6+ and 3.4+

7.4 channel module

class `mdfreader.channel.Channel13` (*info, dataGroup, channelGroup, channelNumber, recordIDnumber*)
Channel class gathers all about channel structure in a record

Attributes

name	(str) Name of channel
unit	(str, default empty string) channel unit
desc	(str) channel description
conversion	(info class) conversion dictionary
channelNumber	(int) channel number corresponding to mdinfo3.info3 class
signalDataType	(int) signal type according to specification
bitCount	(int) number of bits used to store channel record
nBytes	(int) number of bytes (1 byte = 8 bits) taken by channel record
dataFormat	(str) numpy dtype as string
CFormat	(struct class instance) struct instance to convert from C Format
byteOffset	(int) position of channel record in complete record in bytes
bitOffset	(int) bit position of channel value inside byte in case of channel having bit count below 8
recAttribute-Name	(str) channel name compliant to a valid python identifier (recarray attribute)
RecordFormat	(list of str) dtype format used for numpy.core.records functions ((name_title,name),str_stype)
channelType	(int) channel type
posByteBeg	(int) start position in number of bit of channel record in complete record
posByteEnd	(int) end position in number of bit of channel record in complete record

Methods

<code>__init__(info, dataGroup, channelGroup, channelNumber, recordIDnumber)</code>	constructor
<code>__str__()</code>	to print class attributes

changeChannelName (*channelGroup*)

In case of duplicate channel names within several channel groups for unsorted data, rename channel name

Parameters **channelGroup** : int

channelGroup number

`mdfreader.channel.arrayformat4` (*signalDataType, numberOfBits*)

function returning numpy style string from channel data type and number of bits

Parameters **signalDataType** : int

channel data type according to specification

numberOfBits : int

number of bits taken by channel data in a record

Returns **endian, dataType** : str

numpy dtype format used by numpy.core.records to read channel raw data

class `mdfreader.channel.channel14`

Bases: object

Methods

CABlock (*info*)

Extracts channel CA Block from info4

Parameters **info** : mdinfo4.info4 class

info4 class containing all MDF Blocks

Returns CABlock object from mdinfo4 module

CANOpenOffset (*info*)

CANOpen channel bytes offset

Parameters **info** : mdinfo4.info4 class

info4 class containing all MDF Blocks

Returns integer, channel bytes offset

CFormat (*info*)

channel data C format struct object

Parameters **info** : mdinfo4.info4 class

info4 class containing all MDF Blocks

Returns string data C format struct object

CNBlock (*info*)

channel block

Parameters **info** : mdinfo4.info4 class

info4 class containing all MDF Blocks

Returns CNBlock class from mdinfo4 module

Format (*info*)

channel data C format

Parameters **info** : mdinfo4.info4 class

info4 class containing all MDF Blocks

Returns string data C format

VLSD_CG_Flag

attachment (*fid, info*)

In case of sync channel attached to channel

Parameters **fid** : class

file identifier

info : mdinfo4.info4 class

info4 class containing all MDF Blocks

Returns ATBlock class from mdinfo4 module

bitCount (*info*)

calculates channel number of bits

Parameters **info** : mdinfo4.info4 class

info4 class containing all MDF Blocks

Returns integer corresponding to channel number of bits

bitOffset (*info*)

channel data bit offset in record

Parameters **info** : mdinfo4.info4 class

info4 class containing all MDF Blocks

Returns integer, channel bit offset

byteOffset (*info*)

channel data bytes offset in record (without record id)

Parameters **info** : mdinfo4.info4 class

info4 class containing all MDF Blocks

Returns integer, channel bytes offset

changeChannelName (*channelGroup*)

In case of duplicate channel names within several channel groups for unsorted data, rename channel name

Parameters **channelGroup** : int

channelGroup number

channelGroup

channelNumber

channelSyncType (*info*)

Extracts channel sync type from info4

Parameters **info** : mdinfo4.info4 class

info4 class containing all MDF Blocks

Returns integer corresponding to channel sync type

0 no sync, normal data

1 time

2 angle

3 distance

4 index

channelType (*info*)

Extracts channel type from info4

Parameters **info** : mdinfo4.info4 class

info4 class containing all MDF Blocks

Returns integer describing channel type

0 normal channel

1 variable length

2 master channel

3 virtual master channel

4 sync channel

5 max length data

6 virtual data channel

conversion (*info*)

channel conversion CCBLOCK

Parameters **info** : mdfinfo4.info4 class

info4 class containing all MDF Blocks

Returns CCBLOCK

data (*info*)

returns data block pointer for VLSD, MLD or sync channels

dataFormat (*info*)

channel numpy.core.records data format

Parameters **info** : mdfinfo4.info4 class

info4 class containing all MDF Blocks

Returns string data format

dataGroup

desc (*info*)

channel description

Parameters **info** : mdfinfo4.info4 class

info4 class containing all MDF Blocks

Returns channel description string

invalid_bit (*info*)

extrzcts from info4 the channels valid bits positions

Parameters **info** : mdfinfo4.info4 class

info4 class containing all MDF Blocks

Returns dict of channels valid bits positions

isCABlock (*info*)

little_endian (*info*)

check if channel is little endian

Parameters **info** : mdfinfo4.info4 class

info4 class containing all MDF Blocks

Returns boolean

nBytes (*info*)

calculates channel bytes number

Parameters **info** : mdfinfo4.info4 class

info4 class containing all MDF Blocks

Returns number of bytes integer

name

nativedataFormat (*info*)

numpy_format (*info*)

channel numpy.core.records data format

Parameters **info** : mdinfo4.info4 class
info4 class containing all MDF Blocks

Returns **endian, dataType** : string data format

posBitBeg (*info*)
channel data bit starting position in record

Parameters **info** : mdinfo4.info4 class
info4 class containing all MDF Blocks

Returns integer, channel bit starting position

posBitEnd (*info*)
channel data bit ending position in record

Parameters **info** : mdinfo4.info4 class
info4 class containing all MDF Blocks

Returns integer, channel bit ending position

posByteBeg (*info*)
channel data bytes starting position in record

Parameters **info** : mdinfo4.info4 class
info4 class containing all MDF Blocks

Returns integer, channel bytes starting position

posByteEnd (*info*)
channel data bytes ending position in record

Parameters **info** : mdinfo4.info4 class
info4 class containing all MDF Blocks

Returns integer, channel bytes ending position

recAttributeName (*info*)
clean up channel name from unauthorised characters

Parameters **info** : mdinfo4.info4 class
info4 class containing all MDF Blocks

Returns channel name compliant to python attributes names (for recarray)

recordIDsize (*info*)
Extracts record id size from info4

Parameters **info** : mdinfo4.info4 class
info4 class containing all MDF Blocks

Returns integer describing record id size

0 no record id used

1 uint8

2 uint16

4 uint32

8 uint64

set (*info*, *dataGroup*, *channelGroup*, *channelNumber*)
channel initialisation

Parameters **info** : mdfinfo4.info4 class

dataGroup : int

data group number in mdfinfo4.info4 class

channelGroup : int

channel group number in mdfinfo4.info4 class

channelNumber : int

channel number in mdfinfo4.info4 class

recordIDsize : int

size of record ID in Bytes

setCANOpen (*info*, *dataGroup*, *channelGroup*, *channelNumber*, *name*)
CANOpen channel intialisation

Parameters **info** : mdfinfo4.info4 class

dataGroup : int

data group number in mdfinfo4.info4 class

channelGroup : int

channel group number in mdfinfo4.info4 class

channelNumber : int

channel number in mdfinfo4.info4 class

recordIDsize : int

size of record ID in Bytes

name : str

name of channel. Should be in ('ms', 'day', 'days', 'hour', 'month', 'minute', 'year')

setInvalidBytes (*info*, *dataGroup*, *channelGroup*, *channelNumber*)
invalid_bytes channel initialisation

Parameters **info** : mdfinfo4.info4 class

dataGroup : int

data group number in mdfinfo4.info4 class

channelGroup : int

channel group number in mdfinfo4.info4 class

channelNumber : int

channel number in mdfinfo4.info4 class

recordIDsize : int

size of record ID in Bytes

byte_aligned : Bool

Flag for byte alignment

signalDataType (*info*, *byte_aligned=True*)

extract signal data type from info4 class

Parameters **info** : mdfinfo4.info4 class

info4 class containing all MDF Blocks

byte_aligned : bool

flag activated if channel is part of a record byte aligned

Returns integer corresponding to channel data type

0 unsigned integer little endian

1 unsigned integer big endian

2 signed integer little endian

3 signed integer big endian

4 float little endian

5 float big endian

6 string latin

7 string utf-8

9 string utf-16

10 byte array

11 mime sample

12 mime stream

13 CANopen date

14 CANopen time

type

unit (*info*)

channel unit

Parameters **info** : mdfinfo4.info4 class

info4 class containing all MDF Blocks

Returns channel unit string

validity_channel (*info*, *invalid_bytes*)

extract channel validity bits

Parameters **info** : mdfinfo4.info4 class

invalid_bytes : bytes

bytes from where to extract validity bit array

`mdfreader.channel.datatypeformat4` (*signalDataType*, *numberOfBits*)

function returning C format string from channel data type and number of bits

Parameters **signalDataType** : int

channel data type according to specification

numberOfBits : int

number of bits taken by channel data in a record

Returns `dataType` : str

C format used by `fread` to read channel raw data

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