Package 'gemlog'

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Type Package

Title File Conversion for 'Gem Infrasound Logger'

Date 2018-07-11

Version 0.30

Author Jake Anderson

Maintainer Jake Anderson <ajakef@gmail.com>

Description Reads data files from the 'Gem infrasound logger' for analysis and converts to segy format (which is convenient for reading with traditional seismic analysis software). The Gem infrasound logger is an in-development low-cost, lightweight, low-power instrument for recording infrasound in field campaigns; email the maintainer for more information.

Depends signal

License GPL

LazyLoad yes

Repository CRAN

NeedsCompilation no

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R topics documented:

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gemlog-package	File Conversion for 'Gem Infrasound Logger'

~~ An overview of how to use the package, including the most important ~~ ~~ functions ~~

Author(s)

Jake Anderson

Maintainer: Jake Anderson <ajakef@gmail.com>

References

Anderson, JF, JB Johnson, DC Bowman, and TJ Ronan (2018). The Gem Infrasound Logger and Custom-Built Instrumentation. Seismological Research Letters 89 (1), 153-164. https://doi.org/10.1785/0220170067

Examples

```
## Not run:
# define bitweight for 0.5 inch sensor with Rg = 2.2k
sensitivity = 22.014e-6 # 22.014 uV/Pa
Rg = 2.2 # gain-setting resistor value in kilo-ohms
gain = 1 + 49.4/2.2 # amplifier gain
A2D = 0.256/2^15 # volts per count in analog-digital converter
bitweight = A2D / (gain * sensitivity) # conversion from counts to Pa (Pa/count)

# convert files from two Gems (SNs 000 and 001)
Convert('raw/000', bitweight = bitweight)
Convert('raw/001', bitweight = bitweight)

## End(Not run)

## Not run:
ReadGem(0:1, 'raw/000') # read files raw/000/FILE0000.TXT and raw/000/FILE0001.TXT

## End(Not run)
```

`Convert` *Convert raw Gem data to segy*

Description

Convert takes a directory of raw Gem data files and converts them to PASSCAL segy files, including interpolating time with GPS strings and converting from counts to pressure units.

Usage

```
Convert(rawpath = ".", convertedpath = "converted", metadatapath = "metadata",
metadatafile = NA, gpspath = "gps", gpsfile = NA, t1 = -Inf, t2 = Inf, nums = NaN,
SN = character(), bitweight = 0.256/2^15/(4.6e-05 * 3.4/7)/23.455, time_adjustment = 0,
yr = 2016, blockdays = 1)
```

Arguments

`rawpath`	Directory containing raw data to be converted.
`convertedpath`	Directory (to be created, if necessary) where output segy files will be saved.
`metadatapath`	Directory (to be created, if necessary) where output metadata file will be saved.
`metadatafile`	Filename for output metadata. If set, overrides metadatapath. If unset, Convert creates the next logical filename in metadatapath.
`gpspath`	Directory (to be created, if necessary) where output gps file will be saved.
`gpsfile`	Filename for output gps data. If set, overrides gpspath. If unset, Convert creates the next logical filename in gpspath.

t1	Time at which conversion should start (class POSIXct).
t2	Time at which conversion should end (class POSIXct).
nums	File numbers to convert.
SN	Serial number of Gem data files to convert (to be safe, when data from multiple Gems could be mixed).
bitweight	Conversion factor between counts and Pascals (Pa per count).
time_adjustment	Offset to add to output times (usually unnecessary, sometimes +/- 1 s).
yr	Year of data (unnecessary).
blockdays	Amount of data (measured in days) to process at a time. Normally 1, but for computers with little memory, might be necessary to make less than 1.

Details

This is the usual function to use when converting data to segy files. To read data directly into R, use ReadGem.

Value

None; writes files only.

Note

A good directory structure might be something like

projectname

—-raw

———010: Directory containing data from Gem SN 010 (e.g.)

———011: Directory containing data from Gem SN 011 (e.g.)

—-converted

———segy files

—-gps

———010gps_000.txt: GPS file for Gem 010

———011gps_000.txt: GPS file for Gem 011

—-metadata

———010metadata_000.txt: Metadata file for Gem 010

———011metadata_000.txt: Metadata file for Gem 011

—-projectname_notes.txt

Author(s)

Jake Anderson

See Also

ReadGem

Examples

```
## Not run:
# define bitweight for 0.5 inch sensor with Rg = 2.2k
sensitivity = 22.014e-6 # 22.014 uV/Pa
Rg = 2.2 # gain-setting resistor value in kilo-ohms
gain = 1 + 49.4/2.2 # amplifier gain
A2D = 0.256/2^15 # volts per count in analog-digital converter
bitweight = A2D / (gain * sensitivity) # conversion from counts to Pa (Pa/count)

# convert files from two Gems (SNs 000 and 001)
Convert('raw/000', bitweight = bitweight)
Convert('raw/001', bitweight = bitweight)

## End(Not run)
```

---

gem_metadata *Example Metadata from Gem Logger*

Description

Metadata (temperature, battery, etc.) from a Gem data logger. Provided as an example for running PlotMetadata.

Usage

```
gem_metadata
```

Format

List containing vectors (time series) of different metadata types.

Source

Recording made by author.

See Also

PlotMetadata

PlotMetadata *Read and plot Gem metadata*

Description

ScanMetadata reads a Gem metadata file produced by Convert. PlotMetadata plots battery, temperature, GPS metadata.

Usage

```
ScanMetadata(fn, plot = TRUE)
PlotMetadata(M, xlim = range(M$t, na.rm = TRUE))
```

Arguments

fn	Filename to read
plot	If true, plots metadata after reading the file
M	Metadata, such as output of ScanMetadata
xlim	Time limits to plot, in fractional days of year

Value

ScanMetadata: list including metadata from file:

millis	millis count of metadata sample
batt	battery voltage
temp	temperature in (deg C)
maxWriteTime	maximum time required to write a sample
minFifoFree	minimum number of free sampes in FIFO buffer
maxFifoUsed	maximum number of used samples in FIFO buffer
maxOverruns	maximum number of sample overruns
gpsOnFlag	1 if gps is turned on, 0 otherwise
unusedStack1	free memory in stack 1
unusedStackIdle	free memory in idle stack

PlotMetadata: None.

Author(s)

Jake Anderson

Examples

```
## Not run:
M = ScanMetadata('metadata/001metadata_000.txt') # scan the first metadata file from Gem SN 001

## End(Not run)

data(gem_metadata)
PlotMetadata(gem_metadata)
```

ReadGem *Read raw Gem data*

Description

Reads raw Gem data into R. To write segy files, use Convert.

Usage

```
ReadGem(nums = 0:9999, path = "./", alloutput = FALSE,
verbose = TRUE, requireGPS = FALSE, SN = character())
```

Arguments

nums	File numbers to convert.
path	Directory in which raw data files are contained.
alloutput	Include raw data in the output, in addition to the processed data.
verbose	Provide verbose output.
requireGPS	Require GPS strings to perform the conversion.
SN	If set, only read files of this serial number.

Value

t	sample times (POSIXct)
p	samples (counts)

- gps$yryear of gps samples
- gps$dategps sample time, as fractional day of year
- gps$latlatitude
- gps$lonlongitude

- metadata$millismillis count of metadata sample
- metadata$battbattery voltage
- metadata$temptemperature in (deg C)

- metadata$maxWriteTimemaximum time required to write a sample
- metadata$minFifoFreeminimum number of free sampes in FIFO buffer
- metadata$maxFifoUsedmaximum number of used samples in FIFO buffer
- metadata$maxOverrunsmaximum number of sample overruns
- metadata$gpsOnFlag1 if gps is turned on, 0 otherwise
- metadata$unusedStack1free memory in stack 1
- metadata$unusedStackIdlefree memory in idle stack

- header$filevector of raw file names
- header$SNvector of Gem serial numbers
- header$latmean latitude
- header$lonmean longitude
- header$t1start time
- header$t2end time
- header$alloutputif alloutput == TRUE, list including raw data

Author(s)

Jake Anderson

See Also

Convert

Examples

```
## Not run:
ReadGem(0:1, 'raw/000') # read files raw/000/FILE0000.TXT and raw/000/FILE0001.TXT

## End(Not run)
```

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