Package 'infraFDTD.assist'

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Type Package

Title IO Help for infraFDTD Model

Version 0.6

Date 2017-10-30

Imports fields

Suggests rNOMADS

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Description Facilitates the generation of input files for infraFDTD and processes snapshot output. in-fraFDTD is a finite-difference model written by Keehoon Kim for simulating infrasound that considers topography and a 1-D atmosphere (see Kim et al., 2015 <doi:10.1002/2015GL064466>).

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R topics documented:

infraFDTD.assist-package
IO Help for infraFDTD Model

Description

Facilitates the generation of input files for infraFDTD and processes snapshot output. infraFDTD is a finite-difference model written by Keehoon Kim for simulating infrasound that considers topography and a 1-D atmosphere (see Kim et al., 2015 <doi:10.1002/2015GL064466>).

Details

The DESCRIPTION file:

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Author:	Jake Anderson
Maintainer:	Jake Anderson <ajakef@gmail.com>
Description:	Facilitates the generation of input files for infraFDTD and processes snapshot output. infraFDTD is a finite-diff
License:	GPL (>=2)

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Before running the infraFDTD model, generate the input files using PrepFiles. After running the model, binary snapshot files can be converted into png files by MakeSnapshotInfo and MakeSnapshots.

Author(s)

Jake Anderson

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References

The infraFDTD code is available on request from Keehoon Kim at LLNL (kim84@llnl.gov) and is described in Kim et al. (2015) <doi:10.1002/2015GL064466>.

See Also

See package rNOMADS for help finding atmospheric profiles for given time/place.

MakeSnapshotInfo *First Step in Snapshot Conversion*

Description

Helps convert binary snapshot output from infraFDTD into images. This function collects information from the snapshots to facilitate the conversion. It does NOT perform the conversion itself (see MakeSnapshots for that).

Usage

```
MakeSnapshotInfo(inputdir = "./snapshots", dframe = 20, N = 400, xs, ys,
zs, makesec1 = TRUE, makesec2 = TRUE, makesurf = TRUE)
```

Arguments

inputdir	Directory containing snapshot files.
dframe	Snapshot interval in samples (difference between snapshot file numbers).
N	Number of snapshots.
xs	X source coordinates (m); can be a vector if multiple sources.
ys	Y source coordinates (m); can be a vector if multiple sources.
zs	Z source coordinates (m); can be a vector if multiple sources.
makesec1	Logical: should section 1 snapshots be processed?
makesec2	Logical: should section 2 snapshots be processed?
makesurf	Logical: should surface snapshots be processed?

Details

inputdir must include all snapshot files as well as coord_sec1.txt, coord_sec2.txt, and coord_sur.txt.

MakeSnapshotInfo is fairly time-consuming, so it's separated from MakeSnapshots so that MakeSnapshots can be run repeatedly to test different graphical settings without having to re-calculate this information every time.

Value

A list of data to be passed to MakeSnapshots.

Author(s)

Jake Anderson; code is heavily modified from Keehoon Kim's original snapshot code.

See Also

MakeSnapshots

Examples

```
## Don't Run: (requires snapshot files)
## info = MakeSnapshotInfo('./snapshots', dframe = 20, N = 400,
## xs = 100, ys = 100, zs = 500)
## MakeSnapshots(info, outputdir = './anim', prefix = 'snapshot', dt = 0.1)
```

MakeSnapshots   *Convert Binary Snapshot Output to PNGs*

Description

With the help of MakeSnapshotInfo, converts binary snapshot output files from infraFDTD to PNG format.

Usage

```
MakeSnapshots(info, outputdir = "./anim", prefix = "snapshot", nums =
1:info$N, dt = 0.1, makesec1 = TRUE, makesec2 = TRUE, makesurf = TRUE,
res = 96, fn_topomap = "topomap.png", width = 480, height = NaN, asp =
1, pointsize = 12)
```

Arguments

info	Output of MakeSnapshotInfo().
outputdir	Directory where PNG files should be written.
prefix	Prefix to use in output file names (e.g., outputdir/prefix_sec1_001.png).
nums	Vector of snapshot numbers to convert (default is all of them).
dt	Snapshot interval in seconds
makesec1	Logical: should section 1 snapshots be converted?
makesec2	Logical: should section 2 snapshots be converted?
makesurf	Logical: should surface snapshots be converted?
res	Resolution of output PNG files (see ?png).
fn_topomap	File name for topo map output.
width	Width of output images (pixels)
height	Optional: if blank, MakeSnapshots() will find the correct height given the image dimensions and asp. If set, forces the height of output images.
asp	Aspect ratio of images (default 1).
pointsize	Pointsize in output images (default 12).

Details

Use a shell command like 'convert' (imagemagick, available in linux) to make a gif out of the stills.

Value

None, file output only.

Author(s)

Jake Anderson; code is heavily modified from Keehoon Kim's original.

See Also

MakeSnapshotInfo

Examples

```
## Don't Run: (requires snapshot files)
## info = MakeSnapshotInfo('./snapshots', dframe = 20, N = 400,
## xs = 100, ys = 100, zs = 500)
## MakeSnapshots(info, outputdir = './anim', prefix = 'snapshot', dt = 0.1)
```

PrepFiles   *Generate Input Files for infraFDTD*

Description

infraFDTD requires text files defining the topography, atmospheric sound speed structure, atmospheric density structure, and station locations. PrepFiles generates these files from variables in R.

Usage

```
PrepFiles(X, sta, dh, fn_topo, fn_c, fn_rho, fn_sta, c = 335, rho = 1.2,
xlim = range(X$x), ylim = range(X$y), c_function = NA, rho_function =
NA, z_extent = NaN)
```

Arguments

X	DEM. Must include elements x (vector), y (vector), z (matrix: nrow = length(x), ncol = length(y))
sta	Station info. Must include elements x, y (vectors in meters, in same coordinate system as X). Station names are optionally stored in element sta. z is optional and should only be included if you want microphones in the air. If z is missing, all stations are located on surface. Otherwise, NaN elevations are located on the surface, and non-NaN elevations are preserved.
dh	Grid Spacing (m).

fn_topo	Output file name for DEM.
fn_c	Output file name for sound speed.
fn_rho	Output file name for density.
fn_sta	Output file name for stations.
c	Sound speed (m/s). If a scalar, sound speed is homogeneous in the model. If a vector with length equal to the number of vertical nodes in the model, sound speed varies vertically according to the vector (this is inconvenient; it's normally better to use c_function for a variable atmosphere). This input is ignored if c_function is provided.
rho	Density (kg/m^3). If a scalar, density is homogeneous in the model. If a vector with length equal to the number of vertical nodes in the model, density varies vertically according to the vector (this is inconvenient; it's normally better to use rho_function for a variable atmosphere). This input is ignored if rho_function is provided.
xlim	X limits of output DEM–must be contained within the boundaries of DEM.
ylim	Y limits of output DEM–must be contained within the boundaries of DEM.
c_function	Function giving sound speed as a function of height. Consider using approxfun() to generate this from an atmospheric profile.
rho_function	Function giving density as a function of height. Consider using approxfun() to generate this from an atmospheric profile.
z_extent	Vertical thickness of model (m); must be greater than total relief in model.

Details

This function does not generate a param.h file; however, it does print values that can be copied to param.h by the user.

Consider using package rNOMADS to find the atmospheric profile.

Value

None; print and file output only.

Author(s)

Jake Anderson

Examples

```
## generate the DEM
data(volcano) # Maunga Whau (NZ) from built-in package "datasets"
DEM = list(x = 10 * 1:87, y = 10 * 1:61, z = volcano)

## choose the station locations
sta = list(x = c(100, 500), y = c(100, 500))

## show the topo map with stations
image(DEM, col = terrain.colors(20))
```

```
contour(DEM, add = TRUE)
points(sta, pch = 25, bg = 1)

## make the input files for infraFDTD, using the default homogeneous
## sound speed and density
PrepFiles(X = DEM, sta = sta, dh = 10, fn_topo = 'topo.txt', fn_c =
'c.txt', fn_rho = 'rho.txt', fn_sta = 'sta.txt')
```

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