Package 'multiocc'

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Type Package

Title Fits Multivariate Spatio-Temporal Occupancy Model

Version 0.1.0

Depends R (>= 4.1.0)

Description Spatio-temporal multivariate occupancy models can handle multiple species in occupancy models. This method for fitting such models is described in Hepler and Erhardt (2021) ``A spatiotemporal model for multivariate occupancy data'' <https://onlinelibrary.wiley.com/doi/abs/10.1002/env.2657>.

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Imports MASS, truncnorm, tmvtnorm, fields, interp, MCMCpack, stats

Encoding UTF-8

LazyData true

RoxygenNote 7.2.0

NeedsCompilation no

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R topics documented:

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coords	*Coords*

Description

site by x coordinate by y coordinate

Usage

```
data(Example)
```

Format

An object of class `data.frame` with 267 rows and 3 columns.

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create.data	*This function creates model.input for the run.mcmc() function*

Description

This function creates model.input for the run.mcmc() function

Usage

```
create.data(detection, occupancy, coords, names, threshold)
```

Arguments

detection	a data frame that is one row for every site X season X survey combination contains columns for the site, season, survey within season, all covariates to be used in the detection process of the model, and binary indicators of detections for all species to be modeled
occupancy	A data frame that is one row for every site x season combination contains columns for the site, season, and all covariates to be used in the latent occupancy process of the model
coords	is a data frame that is one row for every site included in the study contains columns for the site, x, and y output adjacency based on Euclidean distance threshold the user provides as a function input
names	is a list with elements "species", "detection", and "occupancy" names$species is a vector with the name of every species in the study names$detection is a vector with the names of the detection covariates names$occupancy is a vector with the names of the occupancy covariates
threshold	is the distance which determines if two locations are neighbors in the adjacency matrix or not.

Value

model.input a list with

- X design matrix for occupancy
- W design matriw for detection
- y observed data
- A adjacency matrix
- detection.info details for detection
- occupancy.info details for occupancy

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detection	*Detection*

Description

site by season by survey, for six species. Also contains the standardized covariate duration.

Usage

```
data(Example)
```

Format

An object of class `data.frame` with 8010 rows and 10 columns.

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make.basis	*This function constructs basis functions. It assumes coordinates form a metric.*

Description

This function constructs basis functions. It assumes coordinates form a metric.

Usage

```
make.basis(q = q, model.input)
```

Arguments

q	The desired number of basis functions. Must be an integer greater than or equal to 1.
model.input	A list of output created by running the create.data.R function

Value

A list with

- K spatial basis functions
- KtQK which is literally the matrix operation transpose(K) times Q times K, and is the variance of the multivariate #' random effect gamma.

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occupancy   *Occupancy*

Description

site by season with covariate forest (standardized percentage forest cover) and elevation (standardized).

Usage

```
data(Example)
```

Format

An object of class `data.frame` with 2670 rows and 4 columns.

---

run.mcmc   *This function runs the MCMC.*

Description

This function runs the MCMC.

Usage

```
run.mcmc(
  M.iter,
  M.burn = NULL,
  M.thin = NULL,
  model.input,
  q = NULL,
  sv = FALSE
)
```

Arguments

`M.iter`	The total number of iterations in MCMC
`M.burn`	The length of the burn in
`M.thin`	The number to thin the chain. Thinning by 10 only stores every 10th run.
`model.input`	A list of output created by running the create.data.R function
`q`	Desired number of Moran's I basis functions in the restricted spatial regression model
`sv`	A TRUE/FALSE on whether or not the MCMC output should be saved as 'MCMC.Rdata' and overwritten every 1000 iterations. Defaults to false.

Value

A list with all standard MCMC output

Examples

```
data(Example)
head(detection)
head(occupancy)
head(coords)
names = list("species"=colnames(detection)[4:9],
"detection"=c("duration"),"occupancy"=c("forest","elev"))
model.input = create.data(detection, occupancy, coords, names, threshold = 15000)
out = run.mcmc(M.iter=3, M.burn=1, M.thin=1, model.input, q=10, sv=FALSE)
```

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