Package 'TempOcc'

February 24, 2012

Maintainer Paul B Conn <paul.conn@noaa.gov>

License Unlimited

Title Functions for performing temporal occupancy analysis

Type Package

LazyLoad yes

Author P.B. Conn

Description Functions needed for performing haul-out analysis for Bering seals, and generally conducting temporal occupancy analyses when data consist of known occupancy, known non-occupancy, and missing data (with data possibly not missing-at-random)

Version 1.0

Depends truncnorm (>= 1.0-4), MASS (>= 7.3), date (>= 1.2), ggplot2 (>= 0.1), Matrix (>= 0.999375-46), coda (>= 0.1),

Date 2011-01-26

Collate 'analyze_temp_occ_probit.R' 'CAR_funcs.R' 'plot_temp_occ.R''sim_data_probit.R'

R topics documented:

`analyze_temp_occ_probit` *Main function for running MCMC simulations for temporal occupancy analysis*

Description

Main function for running MCMC simulations for temporal occupancy analysis

Usage

```
analyze_temp_occ_probit(detection.model, process.model,
  Dat, prior, control, q.window = 2)
```

Arguments

`detection.model`	an object of class 'formula' (as in 'lm') for the detection process. In addition to covariates in "Dat" one has access to the keywords "Lag" and "Z"; "Lag" denotes using the observation in the previous time period as a predictor, while "Z" denotes using the current occupancy state as a covariate.
`process.model`	an object of class 'formula' for factors affecting haul-out probability
`Dat`	a data frame giving the data to be analyzed; the first column should be a response variable (0=missing data, 1=not occupied, 2=occupied). Another column should be named "Indiv" and include unique individual identifiers (numbers are fine). Remaining columns consist of explanatory variables specified by the analyst (columns should be named to correspond to given formulas for detection and process models).
`prior`	a list giving prior gamma parameter for tau (e.g., list(a.eta=1,b.eta=0.005))
`control`	a list specifying MCMC options (e.g., list(burnin=100, iter=1000, thin=1)
`q.window`	an integer specifying the number of consecutive hours that are 'replicates' for eta; this number must be >1 for parameter identifiability; the default is 2

Value

returns a list with the following slots: `Dat` is the Data data frame object, possibly with amended columns to represent "Lag" and "Z" effects, `Q` is the matrix representing the temporal autocorrelation structure used in the analysis,`DM.Y` returns design matrix for detection model for final iteration of MCMC, `DM.eta` returns the design matrix used to scale up to the number of observations (this is needed when q.window>1), `E.Zt.minus.Ez` returns posterior predicitons of residuals needed for making posthoc posterior predictions, `det` returns posterior samples for detection probability parameters, `process` returns posterior samples for occupancy probability parameters, `tau.eta` returns posterior samples for the precision parameter associated with correlated random effects, `G.m` Goodness-of-fit component for posterior predictive loss `P.m` Variance component (penalty) for posterior predictive loss `D.m` Overall posterior predictive loss score

Author(s)

Paul Conn

Examples

```
#warning: the following takes a few minutes
n.indiv=100
n.obs=100
tau=20
P=c(.9,.8,.2,.1)
Dat=sim_data_probit(n.indiv,n.obs,q.window=2,tau,P)
detection.model=~Z*Lag
process.model=~1
prior=list(a.eta=1,b.eta=0.005)
thin=10
control <- list(burnin=100/thin, iter=1100/thin, thin=thin)
q.window=1
out=analyze_temp_occ_probit(detection.model, process.model, Dat, prior, control, q.window)

#compute some posterior predictions
Hr=c(1:24)
Day=10
New.dat=data.frame(Hr=as.factor(Hr),Day=rep(Day,24),Day2=rep(Day^2,24))
process.model=~Hr+Day+Day2
New.X=model.matrix(process.model,New.dat)
#now, matrix multiply New.X and t(out$process) to get posterior predictive distribution at desired design p
```

---

expit *Inverse logit function*

Description

Inverse logit function

Usage

```
expit(x)
```

Arguments

x	value on the logit scale

Value

returns logit^(-1) (x)

Author(s)

Paul Conn

get_Q_1indiv — *Formulate an RW1 Q matrix (precision matrix = tau*Q) for one individual*

Description

Formulate an RW1 Q matrix (precision matrix = tau*Q) for one individual

Usage

```
get_Q_1indiv(n)
```

Arguments

n	number of timesteps an individual is available to be observed

Value

returns an (n x n) Q matrix

Author(s)

Paul Conn

get_Q_1indiv_RW2 — *Formulate an RW2 Q matrix (precision matrix = tau*Q) for one individual*

Description

Formulate an RW2 Q matrix (precision matrix = tau*Q) for one individual

Usage

```
get_Q_1indiv_RW2(n)
```

Arguments

n	number of timesteps an individual is available to be observed

Author(s)

Paul Conn

plot_temp_occ *Plot temporal occupancy data for inidivual "sites" using ggplot2*

Description

Plot temporal occupancy data for inidivual "sites" using ggplot2

Usage

```
plot_temp_occ(Dat, Time, Ind, plot.ncol = 1, DayMoYear,
  Label.times, First, Last, min.bar.length = 1)
```

Arguments

Dat	matrix object with number of rows equal to the number of sites (individuals) and the number of columns equal to the number of occasions (analagous to an encounter history). NAs give missing, 0 gives not hauled out, 1 gives hauled out
Time	a vector giving times that each occasion is associated with; for evenly spaced occasions this could simply be c(1:ncol(Dat))
Ind	a vector of individual IDs (can be a character or integer vector)
plot.ncol	an integer specifying the number of columns desired in the figure
DayMoYear	a vector giving the day, month, and year, of each element in Time (formatted using the date.mmddyy function in the 'date' package)
Label.times	a vector giving the elements of DayMoYear to plot as labels on the graph
First	an integer vector giving the indices of the first observations of animals in the study; assumed to be in same order as "Ind"
Last	an integer vector givign the indices of the last observations of animals
min.bar.length	relative number of hours each haulout "block" takes up on the graph

Author(s)

Paul Conn

rrw *Simulate an ICAR Process*

Description

Simulate an ICAR Process

Usage

```
rrw(x)
```

Arguments

x	a precision matrix = tau*Q

Value

returns a vector of spatially correlated random effects of length = to the number of rows of x

Author(s)

Devin Johnson

`sim_data_probit` *Simulate temporal occupancy data*

Description

Simulate temporal occupancy data

Usage

```
sim_data_probit(n.indiv, n.obs, q.window = 2, tau, P)
```

Arguments

`n.indiv`	integer giving number of sites (individuals)
`n.obs`	integer giving number of observation per site (assumed equal for every individual)
`q.window`	is an integer giving the number of replicates for each eta (must be >1; default is 2)
`tau`	gives the precision (1/variance) of the CAR process
`P`	is a vector with 4 detection probabilities: (1) state_t=not occupied, detected at t-1, (2) state_t = occupied, detected at t-1, (3) state_t=not occupied, not detected at t-1, and (4) state_t = occupied, not detected at t-1

Value

Stacked data.frame object with "Response" as the first column (0=missing, 1=Not occupied, 2=Occupied), "Hr" (timestep) as second column, and "Ind" (individual identifier) as third column

Author(s)

Paul Conn

Index