

RW2DIID model for spatial effects

Parametrization

This model is a union of the RW2D model u^* and a iid model v^* , so that

$$x = \begin{pmatrix} v^* + u^* \\ u^* \end{pmatrix}$$

where both u^* and v^* has a precision (hyper-)parameter. The length of x is $2n$ if the length of u^* (and v^*) is n . The RW2DIID model uses a different parameterisation of the hyperparameters where

$$x = \begin{pmatrix} \frac{1}{\sqrt{\tau}} (\sqrt{1-\phi} v + \sqrt{\phi} u) \\ u \end{pmatrix}$$

where both u and v are *standardised* to have (generalised) variance equal to one. The *marginal* precision is then τ and the proportion of the marginal variance explained by the spatial effect (u) is ϕ .

Hyperparameters

The hyperparameters are the marginal precision τ and the mixing parameter ϕ . The marginal precision τ is represented as

$$\theta_1 = \log(\tau)$$

and the mixing parameter as

$$\theta_2 = \log\left(\frac{\phi}{1-\phi}\right)$$

and the prior is defined on $\theta = (\theta_1, \theta_2)$.

Specification

The `rw2diid` model is specified inside the `f()` function as

```
f(<whatever>, model="rw2didd", nrow=<nrow>, ncol=<ncol>,  
  hyper=<hyper>)
```

Hyperparameter spesification and default values

doc Thin-plate spline with iid noise

hyper

theta1

hyperid 33001

name log precision

short.name prec

prior pc.prec

param 1 0.01

initial 4

fixed FALSE

to.theta function(x) log(x)

from.theta function(x) exp(x)

theta2

```
hyperid 33002  
name logit phi  
short.name phi  
prior pc  
param 0.5 0.5  
initial 3  
fixed FALSE  
to.theta function(x) log(x / (1 - x))  
from.theta function(x) exp(x) / (1 + exp(x))
```

constr TRUE

nrow.ncol TRUE

augmented TRUE

aug.factor 2

aug.constr 2

n.div.by

n.required FALSE

set.default.values TRUE

status experimental

pdf rw2diid

Example

Notes

The term $\frac{1}{2} \log(|R|^*)$ of the normalisation constant is not computed, hence you need to add this part to the log marginal likelihood estimate, if you need it. Here R is the precision matrix for the standardised RW2D part of the model.

The generic PC-prior for ϕ is available as **prior**="pc" and parameters **param**="c(u, alpha)", where $\text{Prob}(\phi \leq u) = \alpha$. If $\alpha < 0$ or $\alpha > 1$, then it is set to a value close to the minimum value of α allowed.