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

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

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 margainal 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`

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 $\text{Prob}(\phi \le u) = \alpha$. If $\alpha < 0$ or $\alpha > 1$, then it is set to a value close to the minimum value of α allowed.