

Bym model for spatial effects

Parametrization

This model is simply the sum of a besag model and a iid model.

The benefite is that this allows to get the posterior marginals of the sum of the spatial and iid model; otherwise it offers no advantages.

Hyperparameters

The hyperparameters are the precision τ_1 of the iid model and the precision τ_2 of the besag model. The precision parameters are represented as

$$\theta = (\theta_1, \theta_2) = (\log \tau_1, \log \tau_2)$$

and the prior is defined on θ .

Specification

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

```
f(<whatever>, model="bym", graph.file=<graph file name>, hyper=<hyper>)
```

The neighbourhood structure of `x` is passed to the program through the `graph.file` argument. The structure of this file is described below.

Hyperparameter spesification and defaults

hyper

theta1

```
name    precision iid
short.name  prec.iid
initial  4
fixed   FALSE
prior   loggamma
param   c(1, 1e-04)
```

theta2

```
name    precision spatial
short.name  prec.spatial
initial  4
fixed   FALSE
prior   normal
param   c(0, 1e-04)
```

```
constr  TRUE
```

```
nrow.ncol  FALSE
```

```
augmented  TRUE
```

```
aug.factor  2
```

```
aug.constr  2
```

n.div.by NULL

n.required TRUE

set.default.values TRUE

Structure of the graph file

We describe the required format for the graph file using a small example. Let the file **gra.dat**, relative to a small graph of only 5 elements, be

```
5
1 1 2
2 2 1 3
3 3 2 4 5
4 1 3
5 1 3
```

Line 1 declares the total number of nodes in the graph (5), then, in lines 2-6 each node is described. For example, line 4 states that node 3 has 4 neighbours and these are nodes 2, 4 and 5.

The graph file can either have nodes indexed from 1 to n , or from 0 to $n - 1$. Note that in the latter case, node i seen from R corresponds to node $i - 1$ in the 0-indexed graph.

Example

For examples of application of this model see the **Bym** example in Volume I.

The model is modified accordingly is the graph has more than one connected components.

Notes

None