

Continuous random walk model of order 2 (CRW2)

Parametrization

The continuous random walk model of order 2 (CRW2) for the Gaussian vector $\mathbf{x} = (x_1, \dots, x_n)$ is described in the GMRF-book chapter 3. It is an exact representation of the continuous CRW2 model augmented with its derivatives. The use is the same as for RW2.

Hyperparameters

The precision parameter τ is represented as

$$\theta = \log \tau$$

and the prior is defined on θ . Note that τ is the precision for the first order increments.

Specification

The CRW2 model is specified inside the `f()` function as

```
f(<whatever>, model="crw2", values=<values>, hyper = <hyper>)
```

The (optional) argument `values` is a numeric or factor vector giving the values assumed by the covariate for which we want the effect to be estimated. See next example for an application.

Hyperparameter specification and default values

```
doc Exact solution to the random walk of order 2
```

```
hyper
```

```
  theta
```

```
    hyperid 6001
```

```
    name log precision
```

```
    short.name prec
```

```
    prior loggamma
```

```
    param 1 5e-05
```

```
    initial 4
```

```
    fixed FALSE
```

```
    to.theta function(x) log(x)
```

```
    from.theta function(x) exp(x)
```

```
constr TRUE
```

```
nrow.ncol FALSE
```

```
augmented FALSE
```

```
aug.factor 2
```

```
aug.constr 1
```

```
n.div.by
```

```
n.required FALSE
```

```
set.default.values FALSE
```

```
min.diff 1e-08
```

```
pdf crw2
```

Example

```
n=100
```

```
z=seq(0,6,length.out=n)
```

```
y=sin(z)+rnorm(n,mean=0,sd=0.5)
```

```
data=data.frame(y=y,z=z)
```

```
formula=y~f(z,model="crw2")
```

```
result=inla(formula,data=data,family="gaussian")
```

Notes

- The CRW2 is a intrinsic with rank deficiency 2.
- The CRW2 model for irregular locations are supported although not described here.
- The $\frac{n-r}{2} \log(|R|^*)$ -part (with $r = 2$) of the normalisation constant is not computed, hence you need to add this part to the log marginal likelihood estimate, if you need it.
- Usually, you may want to use the model RW2 instead.