Generic 1 model

Parametrization

The Type 1 generic model implements the following precision matrix

$$\mathbf{Q} = \tau(\mathbf{I} - \frac{\beta}{\lambda_{max}}\mathbf{C})$$

where $\mathbf{C}$ is the structure matrix. The parameter λ_{max} is the maximum eigenvalue of $\mathbf{C}$, which allows β to be in the range $\beta \in [0, 1)$

Hyperparameters

The two parameters of the generic1 model are represented as

$$\begin{aligned} \theta_1 &= \log(\tau) \\ \theta_2 &= \text{logit}(\beta) \end{aligned}$$

and priors are assigned to (θ_1, θ_2)

Specification

The generic1 model is specified inside the `f()` function as

```
f(<whatever>,model="generic1",Cmatrix = <Cmat>,
             prior=c(<prior.model.theta1>,<prior.model.theta2>),
             param=c(<param.prior.theta1>,<param.prior.theta1>,
                     <param.prior.theta2>,<param.prior.theta2>))
```

where `<Cmat>` can be given in two different ways:

- a list of type `Cmatrix = list(i = c(), j = c(), values = c())`, where `i`, `j` and `values` are vectors of the non-zero elements of $\mathbf{C}$. Note that `i` and `j` start from 1, and only the upper or lower part of $\mathbf{C}$ need to be given.
- the name of a file giving the structure matrix. The file should have the following format

  $$i \quad j \quad \mathbf{C}_{ij}$$

  where i and j are the row and column index and $\mathbf{C}_{ij}$ is the corresponding element of the precision matrix. Only the non-zero elements of the precision matrix need to be stored in the file. **NOTE:** the indexes for i and j start from 0, as this matrix is passed directly into the `inla`-program.

Example

```
n = 10

#build a structure matrix
Cm = matrix(runif(n^2,min=-1,max=1),n,n)
diag(Cm) = 0
Cm = 0.5*(Cm + t(Cm))
lambda.max = max(eigen(Cm)$values)
```

```
#define the precision matrix
beta = 0.5
Q = diag(rep(1,n)) - beta/lambda.max * Cm
Sigma = solve(Q)

#simulate data
require(mvtnorm)
sd = 0.001
z = rnorm(n)
eta = rmvnorm(n=1,sigma = Sigma)
y = c(eta) + sd*rnorm(n) + z

#print the file containing the C matrix
file = "Cmatrix.dat"
cat("",file=file, append = FALSE)
for(i in 1:n)
{
    j = i
    cat(i,j,Cm[i,j], "\n", sep = " ", file=file, append=TRUE)
    if (i < n)
        for(j in (i+1):n)
            cat(i, j, Cm[i,j], "\n", sep = " ", file=file, append=TRUE)
}


idx = 1:n
formula = y ~ f(idx, model = "generic1", Cmatrix = file, initial=c(0,0),fixed=c(F,F) ) + z

d = list(y=y,idx=idx,z=z)
result = inla(formula, data=d,family="gaussian",
              control.data = list(initial = log(1/sd^2), fixed=TRUE))
```

Notes

None