Package ‘BRugs’

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Title Interface to the 'OpenBUGS' MCMC Software

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Author OpenBUGS was developed by Andrew Thomas, Dave Lunn, David Spiegelhalter and Nicky Best. R interface developed by Uwe Ligges, Sibylle Sturtz, Andrew Gelman, Gregor Gorjanc and Chris Jackson. Linux port and most recent developments by Chris Jackson.

Description Fully-interactive R interface to the 'OpenBUGS' software for Bayesian analysis using MCMC sampling. Runs natively and stably in 32-bit R under Windows. Versions running on Linux and on 64-bit R under Windows are in ``beta'' status and less efficient.

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Depends R (>= 3.3.0)

Imports utils, coda, grDevices, graphics, stats

SystemRequirements OpenBUGS (>= 3.2.2), hence Windows or Linux

License GPL-2

NeedsCompilation yes

Repository CRAN

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R topics documented:

`BRugs` *Introduction to BRugs*

Description

This manual describes how to use the BRugs software

Usage

```
help.BRugs(browser = getOption("browser"))
```

Arguments

`browser`	the name of the program to be used as hypertext browser. It should be in the PATH, or a full path specified.

Details

BRugs is a collection of R functions that allow users to analyze graphical models using MCMC techniques. Most of the R functions in BRugs provide a interface to the BRugs dynamic link library (shared object file). The BRugs dynamic link library is able to make use of many of the WinBUGS components, in particular those components concerned with graphical models and MCMC simulation. BRugs lacks the GUI interface of WinBUGS but is able to use R to create graphical displays of the MCMC simulation. BRugs uses the same model specification language as WinBUGS and the same format for data and initial values. However BRugs always uses plain text files for input inplace of WinBUGS compound documents. The BRugs functions can be split into two groups: those associated with setting up and simulating the graphical model and those associated with making statistical inference. In general the R functions in BRugs correspond to the command buttons and text entry fields in the menus of WinBUGS. Each WinBUGS text entry field splits into two R functions, one to set the quantity and the other to get the value of the quantity.

Andrew Gelman suggests to use the function bugs in the **R2WinBUGS** package with argument `program="openbugs"` as a wrapper.

Permission and Disclaimer

BRugs is released under the GNU GENERAL PUBLIC LICENSE. For details see `http://www.openbugs.net/` or type `help.BRugs()`.

More informally, potential users are reminded to be extremely careful if using this program for serious statistical analysis. We have tested the program on quite a wide set of examples, but be particularly careful with types of model that are currently not featured. If there is a problem, BRugs might just crash, which is not very good, but it might well carry on and produce answers that are wrong, which is even worse. Please let us know of any successes or failures.

If BRugs does cause R to crash, it is advised to run the model from within the Windows interface to OpenBUGS. This should give a "Trap" window, which indicates an internal problem with OpenBUGS. See

`http://www.openbugs.net/Manuals/TipsTroubleshooting.html#TrapMessages`

for suggestions for how to interpret these problematic error messages.

See Also

help.WinBUGS (which currently is called from help.BRugs) and the meta function BRugsFit

Examples

```
###    Step by step example:    ###
library("BRugs") # loading BRugs

## Prepare the example files in a temporary directory
exfiles <- dir(options()$OpenBUGSExamples, pattern="^Rats.*txt$", full.names=TRUE)
ok <- file.copy(exfiles, tempdir())

## Now setting the working directory to the temporary one:
oldwd <- setwd(tempdir())

## some usual steps (like clicking in WinBUGS):
modelCheck("Ratsmodel.txt")          # check model file
modelData("Ratsdata.txt")            # read data file
modelCompile(numChains=2)            # compile model with 2 chains
modelInits(rep("Ratsinits.txt", 2))  # read init data file
modelUpdate(1000)                    # burn in
samplesSet(c("alpha0", "alpha"))     # alpha0 and alpha should be monitored
modelUpdate(1000)                    # 1000 more iterations ....

samplesStats("*")                    # the summarized results

## some plots
samplesHistory("*", mfrow = c(4, 2)) # plot the chain,
samplesDensity("alpha")              # plot the densities,
samplesBgr("alpha[1:6]")             # plot the bgr statistics, and
samplesAutoC("alpha[1:6]", 1)        # plot autocorrelations of 1st chain

## switch back to the previous working directory:
setwd(oldwd)

## Not run:
# Getting more (online-)help:
if (is.R())
  help.BRugs()

## End(Not run)
```

BRugsFit *BRugs' meta function*

Description

This function takes model, data and starting values as input and automatically runs a simulation in BRugs.

Usage

```
BRugsFit(modelFile, data, inits, numChains = 3, parametersToSave,
    nBurnin = 1000, nIter = 1000, nThin = 1, coda = FALSE,
    DIC = TRUE, working.directory = NULL, digits = 5, seed=NULL,
    BRugsVerbose = getOption("BRugsVerbose"))
```

Arguments

`modelFile`	File containing the model written in OpenBUGS code, an R function that contains a BUGS model that is written to a temporary model file (see `tempfile`) using `writeModel`.
`data`	Either a named list (names corresponding to variable names in the `modelFile`) of the data for the OpenBUGS model, *or* a vector or list of the names of the data objects used by the model. In these cases data are written into a file '`data.txt`' into the temporary directory of the current R session. If a filename of an existing file is given, data are read from that file.
`inits`	A list with `numChains` elements; each element of the list is itself a list of starting values for the OpenBUGS model, *or* a function creating (possibly random) initial values. In these cases inits are written into files '`inits1.txt`', ..., '`initsN.txt`' into the temporary directory of the current R session. If a vector of filenames of existing files is given, inits are read from those files. Alternatively, if `inits` is not specified, initial values are generated by OpenBUGS.
`numChains`	Number of Markov chains (default: 3).
`parametersToSave`	Character vector of the names of the parameters to save which should be monitored.
`nBurnin`	Length of burn in (before `nIter` iterations start).
`nIter`	Number of iterations (without burn in).
`nThin`	Every `nThin`-th iteration of each chain is stored.
`coda`	Determines the output format: if `FALSE` (default), a list containing sample and DIC statistics is returned. If `TRUE`, an `mcmc.list` object as known from the **coda** package is returned.
`DIC`	Logical, whether to calculate and return the DIC.
`working.directory`	Sets working directory during execution of this function; `data`, `inits` and other files are written to / read from this directory if no other directory is explicitly given in those arguments. If `NULL`, the current working directory is chosen.
`digits`	Number of significant digits used for OpenBUGS input, see `formatC`.
`seed`	Integer value from 1 to 14 defining the state of the random number generator - default is to not specify the state (see `modelSetRN`).
`BRugsVerbose`	Logical, whether BRugs is supposed to be verbose. This can be controlled for the whole BRugs package by by the option 'BRugsVerbose' (see `options`) which is set to `TRUE` by default.

Value

If coda is set to TRUE, an `mcmc.list` object as known from the **coda** package is returned, otherwise a list containg components

`Stats`	A data frame containing sample statistics. See `samplesStats`.
`DIC`	The DIC statistics, if `DIC=TRUE`, else `NULL`. See `dicStats`.

See Also

`BRugs`, `help.WinBUGS`. Andrew Gelman proposes some `print` and `plot` methods that can be accessed by the openbugs (and bugs) and `as.bugs.array` functions in the CRAN package **R2WinBUGS**.

Examples

```
## Prepare the example files in a temporary directory
exfiles <- dir(options()$OpenBUGSExamples, pattern="^Rats.*txt$", full.names=TRUE)
ok <- file.copy(exfiles, tempdir())
BRugsFit(data = "Ratsdata.txt", inits = "Ratsinits.txt",
    para = c("alpha", "beta"), modelFile = "Ratsmodel.txt",
    numChains = 1,
    working.directory = tempdir())
```

`bugsData` *Writing input for OpenBUGS*

Description

Write data file for OpenBUGS.

Usage

```
bugsData(data, fileName = file.path(tempdir(), "data.txt"),
         format="E", digits = 5)
```

Arguments

`data`	Either a named list (names corresponding to variable names in the model file) of the data for the OpenBUGS model, *or* a vector or list of the names of the data objects used by the model
`fileName`	The filename, defaults to '`data.txt`' in the temporary directory of the current R session
`format`	String to pass to `formatC` which controls formatting of numbers. The default `"E"` formats all numbers in scientific notation. The alternative `"fg"` uses a standard format, which is more readable but less safe for extreme numbers.
`digits`	Number of significant digits used for OpenBUGS input, see `formatC`. This may need to be adjusted from the default of 5, for example when writing large integers.

Value

Invisibly returns the `fileName`.

See Also

`BRugs`

`bugsInits` *Writing input for OpenBUGS*

Description

Write files containing initial values.

Usage

```
bugsInits(inits, numChains = 1, fileName, format="E", digits = 5)
```

Arguments

`inits`	a list with `n.chains` elements; each element of the list is itself a list of starting values for the OpenBUGS model, *or* a function creating (possibly random) initial values
`numChains`	number of Markov chains
`fileName`	the filename(s), one for each chain. Defaults to '`inits1.txt`', ..., '`initsN.txt`' in the temporary directory of the current R session.
`format`	String to pass to `formatC` which controls formatting of numbers. The default `"E"` formats all numbers in scientific notation. The alternative `"fg"` uses a standard format.
`digits`	number of significant digits used for OpenBUGS input, see `formatC`

Value

Invisibly returns the `fileName`(s).

See Also

`BRugs`

`buildMCMC` *Generating mcmc.list objects for package coda*

Description

This functions reads samples from OpenBUGS and converts the results into an object of class mcmc.list that can directly be used by package coda for further analysis.

Usage

```
buildMCMC(node, beg = samplesGetBeg(), end = samplesGetEnd(),
    firstChain = samplesGetFirstChain(),
    lastChain = samplesGetLastChain(), thin = samplesGetThin())
```

Arguments

`node`	Character vector of length 1, name of a variable in the model.
`beg, end`	Arguments to select a slice of monitored values corresponding to iterations `beg:end`.
`firstChain, lastChain`	Arguments to select a sub group of chains.
`thin`	To only use every `thin`-th value of the stored sample.

Details

If the variable of interest is an array, slices of the array can be selected using the notation `variable[lower0:upper0,lower1:`
A star '`*`' can be entered as shorthand for all the stored samples.

If the arguments are left at their defaults the whole sample for all chains will be used for calculation.

Value

An object of class `mcmc.list` which is a list containing `mcmc` objects.

See Also

`mcmc.list`, `mcmc`, `BRugs`, `help.WinBUGS`

dic *DIC*

Description

These functions are used to evaluate the Deviance Information Criterion.

Usage

```
dicSet()
dicStats()
dicClear()
```

Details

These functions are used to evaluate the Deviance Information Criterion (DIC; Spiegelhalter et al., 2002) and related statistics - these can be used to assess model complexity and compare different models. Most of the examples packaged with OpenBUGS contain an example of their usage.

It is important to note that DIC assumes the posterior mean to be a good estimate of the stochastic parameters. If this is not so, say because of extreme skewness or even bimodality, then DIC may not be appropriate. There are also circumstances, such as with mixture models, in which OpenBUGS will not permit the calculation of DIC and so the menu option is greyed out. Please see `help.WinBUGS` for restrictions.

Value

`dicStats` returns a data frame with columns:

`Dbar`	The posterior mean of the deviance, which is exactly the same as if the node ‘deviance’ had been monitored. This deviance is defined as -2 * log(likelihood): ‘likelihood’ is defined as p(y | theta), where y comprises all stochastic nodes given values (i.e. data), and theta comprises the stochastic parents of y - ‘stochastic parents’ are the stochastic nodes upon which the distribution of y depends, when collapsing over all logical relationships.
`Dhat`	A point estimate of the deviance (-2 * log(likelihood)) obtained by substituting in the posterior means theta.bar of theta: thus Dhat = -2 * log(p(y | theta.bar)).
`pD`	The effective number of parameters is given by pD = Dbar - Dhat. Thus pD is the posterior mean of the deviance minus the deviance of the posterior means.
`DIC`	The Deviance Information Criterion is given by DIC = Dbar + pD = Dhat + 2 * pD. The model with the smallest DIC is estimated to be the model that would best predict a replicate dataset of the same structure as that currently observed.

Note

Users should ensure their simulation has converged before using these functions. If the MCMC simulation has an adaptive phase it will not be possible to make inference using values sampled before the end of this phase.

References

Spiegelhalter, D.J., Best, N.G., Carlin B.P., and van der Linde, A. (2002): Bayesian measures of model complexity and fit (with discussion). *J. Roy. Statist. Soc. B.* 64, 583-640.

See Also

`BRugs`, `help.WinBUGS`

`getNumChains` *Number of chains*

Description

This function returns the number of chains being simulated.

Usage

```
getNumChains()
```

Value

Returns the number of chains from the current simulation.

See Also

`BRugs`, `help.WinBUGS`

`help.WinBUGS` *WinBUGS documentation*

Description

Function that open the html version of the OpenBUGS manual

Usage

```
help.WinBUGS(browser = getOption("browser"))
```

Arguments

`browser`	the name of the program to be used as hypertext browser. It should be in the PATH, or a full path specified.

Details

Not yet available in S-PLUS.

See Also

help.BRugs

Examples

```
## Not run:
help.WinBUGS()

## End(Not run)
```

---

infoMemory — *Show memory usage*

Description

Shows the amount of memory allocated to OpenBUGS

Usage

```
infoMemory()
```

Value

Amount of memory allocated to OpenBUGS, in bytes.

See Also

BRugs, help.WinBUGS

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infoModules — *Loaded modules*

Description

Displays all the modules (dynamic link libraries) in use.

Usage

```
infoModules()
```

Value

Dataframe containing information on all the modules (dynamic link libraries) in use.

See Also

BRugs, help.WinBUGS

`infoNode` *Node information*

Description

List current values, data types and samplers corresponding to a variable.

Usage

```
infoNodeValues(nodeLabel)
infoNodeMethods(nodeLabel)
infoNodeTypes(nodeLabel)
```

Arguments

`nodeLabel`	Character vector of length 1, name of a variable in the model.

Value

`infoNodeValues` returns a vector of the current (last sampled) values of a variable.

`infoNodeMethods` returns a data frame listing the method used internally by OpenBUGS to sample values from the full conditional distribution of the node.

`infoNodeTypes` returns a data frame listing the OpenBUGS data type which represents each node internally. For example, stochastic nodes with normal priors are of type `GraphNormal.StdNode`.

See Also

`setValues`, `BRugs`, `help.WinBUGS`

`infoUpdaters` *Information on MCMC updaters*

Description

List the MCMC sampling algorithms in use by the current model.

Usage

```
infoUpdatersbyName()
infoUpdatersbyDepth()
```

Value

A data frame listing the MCMC updating algorithms chosen for each stochastic node in the model after the model has been compiled.

For block updating algorithms, the first component in the block is shown followed by the other components of the block in angle brackets. For vector nodes, only the first element is shown.

`infoUpdatersbyName` sorts the nodes alphabetically.

`infoUpdatersbyDepth` sorts the nodes in their reverse topological order in the graphical model. Nodes which are forward sampled have a negative depth.

See Also

`infoNodeMethods`,BRugs, `help.WinBUGS`

`loadOpenBUGS` *Load OpenBUGS from given directory*

Description

Load OpenBUGS from given directory. Only available on Windows.

Usage

```
loadOpenBUGS(dir)
```

Arguments

`dir`	Directory where OpenBUGS is installed

Details

Only available on Windows. Valid OpenBUGS installations should always be detected by the configure script on Linux.

`modelAdaptivePhase` *Getting length of adaptive phase*

Description

This function returns the length of the adaptive phase of the simulation.

Usage

```
modelAdaptivePhase()
```

Value

This function returns the length of the adaptive phase of the simulation. This is only known after the simulation has finished adapting. If this function is called while the simulation is still adapting `MAX(INTEGER)` is returned. If the simulation does not have an adaptive phase then zero is returned.

Note

This function can be executed once the model has been compiled and initialized.

If an attempt is made to execute this function in an inappropriate context the generic error message ‘command is not allowed (greyed out)’ is displayed.

See Also

`BRugs`, `help.WinBUGS`

`modelCheck` *Checking the model file*

Description

This function parses a BUGS language description of the statistical model.

Usage

```
modelCheck(fileName)
```

Arguments

`fileName`	file containing the BUGS language description of the statistical model.

Value

If a syntax error is detected the position of the error and a description of the error is printed, otherwise the ‘model is syntaxicaly correct’ message is displayed.

Note

If an attempt is made to execute this function in an inappropriate context the generic error message ‘command is not allowed (greyed out)’ is displayed.

See Also

`BRugs`, `help.WinBUGS`

`modelCompile` *Compiling the model*

Description

This function builds the data structures needed to carry out MCMC sampling.

Usage

```
modelCompile(numChains = 1)
```

Arguments

`numChains`	Simulation is carried out for `numChains` chains.

Details

The model is checked for completeness and consistency with the data. A node called 'deviance' is automatically created which calculates minus twice the log-likelihood at each iteration, up to a constant. This node can be used like any other node in the graphical model.

Value

When the model has been successfully compiled, 'model compiled' message should be printed.

Note

This command becomes active once the model has been successfully checked (see `modelCheck`).

If an attempt is made to execute this function in an inappropriate context the generic error message 'command is not allowed (greyed out)' is displayed.

See Also

`BRugs`, `help.WinBUGS`

`modelData` *Loading the data*

Description

This function loads data into the statistical model.

Usage

```
modelData(fileName = "data.txt")
```

Arguments

`fileName`	Filename(s) of file(s) containing the data in OpenBUGS format.

Value

If any syntax errors or data inconsistencies are detected an error message is displayed. Corrections can be made to the data without returning to the 'check model' stage. When the data have been loaded successfully the message 'data loaded' should appear.

Note

This function can be executed once a model has been successfully checked (see `modelCheck`), it can no longer be executed once the model has been successfully compiled.

If an attempt is made to execute this function in an inappropriate context the generic error message 'command is not allowed (greyed out)' is displayed.

See Also

`BRugs`, `help.WinBUGS`

`modelFactory` *Enable and disable factories to create updaters*

Description

These functions enable and disable factories that create updaters. Currently only supported on Windows, not Linux. Linux support should be available in the next OpenBUGS release after version 3.2.1.

Usage

```
modelEnable(factory)
modelDisable(factory)
```

Arguments

`factory`	Character (length 1) name of the factory to be disabled/enabled, for example `"conjugate gamma"`. See `http://www.openbugs.net/Manuals/ModelMenu.html#Updateroptions` for more information. A list of the currently-used updaters in a compiled model is given by `infoUpdatersbyName` or `infoUpdatersbyDepth`. After enabling or disabling an updater, the model must be compiled or re-compiled.

See Also

`BRugs`, `help.WinBUGS`

Examples

```
## Not run:
modelDisable("conjugate gamma")

## End(Not run)
```

`modelGenInits` *Generating initial values*

Description

This function attempts to generate initial values by sampling either from the prior or from an approximation to the prior.

Usage

```
modelGenInits()
```

Details

In the case of discrete variables a check is made that a configuration of zero probability is not generated. This function will generate extreme values if any of the priors are very vague.

Value

If the function is successful the message ‘initial values generated: model initialized’ is displayed otherwise the message ‘could not generate initial values’ is displayed.

Note

This function can be executed once the model has been successfully compiled (`modelCompile`), and can no longer be executed once the model has been initialized.

If an attempt is made to execute this function in an inappropriate context the generic error message ‘command is not allowed (greyed out)’ is displayed.

See Also

`BRugs`, `help.WinBUGS`

`modelInits` *Loading initial values*

Description

This function loads initial values for the MCMC simulation.

Usage

```
modelInits(fileName, chainNum = NULL)
```

Arguments

`fileName`	Character vector of filenames containing the initial values in OpenBUGS format.
`chainNum`	The initial values will be loaded for the chain number `chainNum`. By default `chainNum` is one the first time `modelInits` is executed and incremented by one after each call modula the number of chains `numChains` being simulated (and restarts at 1 after that). If `fileName` is a vector, `chainNum` is increased automatically by default after processing each file. If there is more than one file containing initial values for one chain, either set `chainNum` explicitly, or wait until cycle restarts at chain 1.

Details

This function checks that initial values are in the form of an appropriate R object or rectangular array and that they are consistent with any previously loaded data. If some of the elements in an array are known (say because they are constraints in a parameterisation), those elements should be specified as missing (NA) in the initial values file.

Generally it is recommended to load initial values for all fixed effect nodes (founder nodes with no parents) for all chains, initial values for random effects can be generated using the `modelGenInits` function.

Value

Any syntax errors or inconsistencies in the initial value are displayed. If, after loading the initial values, the model is fully initialized this will be reported by displaying the message 'model initialized'. Otherwise the message 'initial values loaded but this or another chain contain uninitialized variables' will be displayed. The second message can have several meanings:

`a)`	If only one chain is simulated it means that the chain contains some nodes that have not been initialized yet.
`b)`	If several chains are to be simulated it could mean (a) or that no initial values have been loaded for one of the chains.

In either case further initial values can be loaded, or `modelGenInits` can be executed to try and generate initial values for all the uninitialized nodes in all the simulated chains.

Note

This function can be executed once the model has been successfully compiled. It can still be executed once MCMC sampling has been started having the effect of starting the sampler out on a new trajectory.

If an attempt is made to execute this function in an inappropriate context the generic error message ‘command is not allowed (greyed out)’ is displayed.

See Also

`BRugs`, `help.WinBUGS`

`modelIteration` *Returns number of iterations*

Description

This function returns the total number of iterations carried out divided by thin.

Usage

```
modelIteration()
```

Value

This function returns the total number of iterations carried out divided by thin.

Note

This function can be executed once the model has been compiled and initialized.

If an attempt is made to execute this function in an inappropriate context the generic error message ‘command is not allowed (greyed out)’ is displayed.

See Also

`BRugs`, `help.WinBUGS`

`modelNames` *Get variable names in model*

Description

This function returns the names of variables contained in the current model.

Usage

```
modelNames()
```

Value

Character vector of names of variables contained in the current model.

See Also

`BRugs`, `help.WinBUGS`

`modelPrecision` *Setting precision for prec figures*

Description

This function sets the precision to which results are displayed to prec figures.

Usage

```
modelPrecision(prec)
```

Arguments

`prec`	precision used in the figures

Details

It does not affect the precision of any calculations!

See Also

`BRugs`, `help.WinBUGS`

modelRN *State of Random Number Generator*

Description

Set the starting state of the random number generator.

Usage

```
modelSetRN(state)
```

Arguments

`state`	An integer from 1 to 14. The internal state of the OpenBUGS random number generator can be set to one of 14 predefined states. Each predefined state is 10^12 draws apart to avoid overlap in random number sequences.

Details

Warning: `modelSetRN` must not be used before `modelCompile` has been executed successfully! The state can be changed after initial values are generated but before updates have been performed, however, this is not recommended.

See Also

`BRugs`, `help.WinBUGS`

modelSaveState *Save the model's current state*

Description

This function saves the sate of each chain in OpenBUGS model

Usage

```
modelSaveState(stem)
```

Arguments

`stem`	The filestem of the files to be generated.

Details

Example for argument `stem`: If `stem = "c:/myFolder/stem"`, the resulting files are called '`stem1.txt`', ..., '`stemN.txt`'. They are written into the `tempdir()` and copied to the path '`"c:/myFolder"`'.

Note

This function can be executed once a model has been successfully checked (see `modelCheck`).

If an attempt is made to execute this function in an inappropriate context the generic error message 'command is not allowed (greyed out)' is displayed.

See Also

`BRugs`, `help.WinBUGS`

`modelSetAP` *Changing settings of updating algorithms*

Description

These functions change adaptive phase, iterations, and overRelaxation settings. Currently only supported on Windows, not Linux.

Usage

```
modelSetAP(factoryName, adaptivePhase)
modelSetIts(factoryName, iterations)
modelSetOR(factoryName, overRelaxation)
```

Arguments

`factoryName`	String defining which particular MCMC updating algorithm is to be tuned. Technically this string is the type name of the factory object used to create the updater, for example 'UpdaterMetnormal.Factory' for the random walk Metropolis sampler.
`adaptivePhase`	length of the updater's adaptive phase
`iterations`	number of times an iterative algorithm is run before a failure is reported
`overRelaxation`	amount of over relaxation the updater uses

Details

Once a model has been compiled, the various updating algorithms required in order to perform the MCMC simulation may be 'tuned' somewhat via these three functions.

See Also

`BRugs`, `help.WinBUGS`

`modelSetWD` *Set working directory*

Description

Change the working directory

Usage

```
modelSetWD(dir)
```

Arguments

`dir`	Directory to change to. A character string

Details

Simply an alias for `setwd` from base R, provided to mimic the OpenBUGS script function `modelSetWD`.

`modelUpdate` *Updating the model*

Description

This function updates the model.

Usage

```
modelUpdate(numUpdates, thin = 1, overRelax = FALSE)
```

Arguments

`numUpdates`	This function updates the model by carrying out `thin * numUpdates` MCMC iterations for each chain.
`thin`	The samples from every k*th* iteration will be used for inference, where k is the value of `thin`. Setting `thin > 1` can help to reduce the autocorrelation in the sample, but there is no real advantage in thinning except to reduce storage requirements.
`overRelax`	If `overRelax` is `TRUE` an over-relaxed form of MCMC (Neal, 1998) which will be executed where possible. This generates multiple samples at each iteration and then selects one that is negatively correlated with the current value. The time per iteration will be increased, but the within-chain correlations should be reduced and hence fewer iterations may be necessary. However, this method is not always effective and should be used with caution. The auto-correlation function may be used to check whether the mixing of the chain is improved.

Note

This function can be executed once the model has been compiled and initialized.

If an attempt is made to execute this function in an inappropriate context the generic error message 'command is not allowed (greyed out)' is displayed.

References

Neal, R. (1998): Suppressing random walks in Markov chain Monte Carlo using ordered over-relaxation. In M.I. Jordan (Ed.): *Learning in Graphical Models*, Kluwer Academic Publishers, Dordrecht, 205-230. `http://www.cs.utoronto.ca/~radford/publications.html`

See Also

`BRugs`, `help.WinBUGS`

`plotAutoC` *Plot autocorrelation function for a scalar variable*

Description

This function plots the autocorrelation function of a scalar variable.

Usage

```
plotAutoC(node, plot = TRUE,
    colour = c("red", "blue", "green", "yellow", "black"),
    lwd = 5, main = NULL, ...)
```

Arguments

`node`	Character, name of a scalar variable in the model.
`plot`	Logical, whether to plot the ACF or only return the values. If `TRUE`, values are returned invisibly.
`colour`	Colours used to represent different chains.
`lwd, main`	graphical parameters, see `plot.default`
`...`	Further graphical parameters as in `par`.

Details

Acts on a scalar variable. See the wrapper function `samplesAutoC` for more details.

Value

An `acf` object. See `acf` for details.

See Also

`samplesAutoC`, `acf`, `BRugs`, `help.WinBUGS`

plotBgr — *Plot the Gelman-Rubin convergence statistic for a scalar variable*

Description

This function calculates and plots the Gelman-Rubin convergence statistic for a scalar variable, as modified by Brooks and Gelman (1998).

Usage

```
plotBgr(node, plot = TRUE, main = NULL, xlab = "iteration",
    ylab = "bgr", col = c("red", "blue", "green"), bins = 50,
    ...)
```

Arguments

`node`	Character, name of a scalar variable in the model.
`plot`	Logical, whether to plot the BGR statistics or only return the values. If `TRUE`, values are returned invisibly.
`main, xlab, ylab`	annotation, see `plot.default`
`col`	Colours, see Details Section in `samplesBgr`.
`bins`	Number of blocks
`...`	Further graphical parameters as in `par`.

Details

Acts on a scalar variable. See the wrapper function `samplesBgr` for more details.

Value

Data frame with elements

`Iteration`	end iteration of corresponding bin
`pooledChain80pct)`	80pct interval (normalized) of pooled chains
`withinChain80pct`	80pct interval (normalized) of mean within chain
`bgrRatio`	BGR ratio

See Also

`samplesBgr`, `BRugs`, `help.WinBUGS`

plotDensity — *Plot density estimate or histogram of a scalar variable*

Description

This function plots a smoothed kernel density estimate for a scalar variable if it is continuous or a histogram if it is discrete.

Usage

```
plotDensity(node, plot=TRUE, main = NULL, xlab = "" , ylab = "", col = "red",
            ...)
```

Arguments

`node`	Character, name of a scalar variable in the model.
`plot`	Logical, whether to plot the trace or only return density estimates. If `TRUE`, density estimates are returned invisibly.
`main, xlab, ylab, col`	graphical parameters, see `plot.default`
`...`	Further graphical parameters as in `par`.

Details

Acts on a scalar variable. See the wrapper function `samplesDensity` for more details.

See Also

`samplesDensity`, `BRugs`, `help.WinBUGS`

plotHistory — *Trace of a scalar variable*

Description

This function returns and plots a complete trace for a scalar variable.

Usage

```
plotHistory(node, plot = TRUE,
    colour = c("red", "blue", "green", "yellow", "black"),
    main = NULL, xlab = "iteration", ylab = "", ...)
```

Arguments

`node`	Character, name of a scalar variable in the model.
`plot`	Logical, whether to plot the trace or only return the values. If `TRUE`, values are returned invisibly.
`colour`	Colours used to represent different chains.
`main, xlab, ylab`	graphical parameters, see `plot.default`
`...`	Further graphical parameters as in `par`.

Details

Acts on a scalar variable. See the wrapper function `samplesHistory` for more details.

Value

A matrix containing samples of `node`, each row corresponds to one chain.

See Also

`samplesHistory`, `BRugs`, `help.WinBUGS`

ranks *Calculation of ranks*

Description

These functions are used to calculate ranks of vector valued quantities in the model.

Usage

```
ranksSet(node)
ranksStats(node)
ranksClear(node)
```

Arguments

`node`	Character, name of a vector (one dimensional array) variable in the model.

Details

`ranksSet` creates a monitor that starts building running histograms to represent the rank of each component of `node`. An amount of storage proportional to the square of the number of components of `node` is allocated. Even for large numbers of components this can require less storage than calculating the ranks explicitly in the model specification and storing their samples, and it is also much quicker.

`ranksStats` displays summarises of the distribution of the ranks of each component of `node`.

`ranksClear` removes the monitor calculating running histograms for `node`.

Value

`ranksStats` returns a data frame with columns:

`val2.5pc`	0.025 quantiles
`median`	medians
`val97.5pc`	0.975 quantiles

Note

Users should ensure their simulation has converged before using these functions. Note that if the MCMC simulation has an adaptive phase it will not be possible to make inference using values sampled before the end of this phase.

See Also

`BRugs`, `help.WinBUGS`

`rats` *ratsdata example*

Description

ratsdata example

Usage

```
data(ratsdata)
data(ratsinits)
```

Format

The list `ratsdata` contains data originally taken from section 6 of Gelfand and Smith (1990).

Source

A. Gelfand and A. Smith (1990): Sampling-based Approaches to Calculating Marginal Densities. *Journal of the American Statistical Association*, 85, 398-409.

samplesAutoC *Plot autocorrelation function*

Description

This function calculates and plots the autocorrelation function of a variable.

Usage

```
samplesAutoC(node, chain, beg = samplesGetBeg(),
    end = samplesGetEnd(), thin = samplesGetThin(), plot = TRUE,
    mfrow = c(3, 2), ask = NULL, ann = TRUE, ...)
```

Arguments

`node`	Character vector of length 1, name of a variable in the model.
`chain`	Selects a chain to plot autocorrelation function for.
`beg, end`	Arguments to select a slice of monitored values corresponding to iterations `beg:end`.
`thin`	To only use every `thin`-th value of the stored sample for statistics.
`plot`	Logical, whether to plot the ACF or only return the values. If `TRUE`, values are returned invisibly.
`mfrow, ask, ann`	Graphical parameters, see `par` for details. `ask` defaults to `TRUE` unless it is plotting into an already opened non-interactive device. The `ann` parameter is not available in S-PLUS, and will be ignored if it is set.
`...`	Further graphical parameters as in `par` may also be passed as arguments to `plotAutoC`.

Details

If the variable of interest is an array, slices of the array can be selected using the notation `variable[lower0:upper0,lower1:`
A star '`*`' can be entered as shorthand for all the stored samples.

If the arguments are left at their defaults the whole sample for all chains will be used for calculation.

Value

A list containing `acf` objects - one for each scalar variable contained in argument `node`. See `acf` for details on the list elements.

Note

If the MCMC simulation has an adaptive phase it will not be possible to make inference using values sampled before the end of this phase.

See Also

`plotAutoC`, `acf`, `BRugs`, `help.WinBUGS`

samplesBgr *Plot the Gelman-Rubin convergence statistic*

Description

This function calculates and plots the Gelman-Rubin convergence statistic, as modified by Brooks and Gelman (1998).

Usage

```
samplesBgr(node, beg = samplesGetBeg(), end = samplesGetEnd(),
    firstChain = samplesGetFirstChain(),
    lastChain = samplesGetLastChain(), thin = samplesGetThin(),
    bins = 50, plot = TRUE, mfrow = c(3, 2), ask = NULL,
    ann = TRUE, ...)
```

Arguments

`node`	Character vector of length 1, name of a variable in the model.
`beg, end`	Arguments to select a slice of monitored values corresponding to iterations `beg:end`.
`firstChain, lastChain`	Arguments to select a sub group of chains to calculate the Gelman-Rubin convergence statistics for. Number of chains must be larger than one.
`thin`	Only use every `thin`-th value of the stored sample for statistics.
`bins`	Number of blocks
`plot`	Logical, whether to plot the BGR statistics or only return the values. If `TRUE`, values are returned invisibly.
`mfrow, ask, ann`	Graphical parameters, see `par` for details. `ask` defaults to `TRUE` unless it is plotting into an already opened non-interactive device. The `ann` parameter is not available in S-PLUS, and will be ignored if it is set.
`...`	Further graphical parameters as in `par` may also be passed as arguments to `plotBgr`.

Details

The width of the central 80% interval of the pooled runs is green, the average width of the 80% intervals within the individual runs is blue, and their ratio $R (= pooled/within)$ is red. For plotting purposes the pooled and within interval widths are normalised to have an overall maximum of one. The statistics are calculated in bins of length 50: R would generally be expected to be greater than 1 if the starting values are suitably over-dispersed. Brooks and Gelman (1998) emphasise that one should be concerned both with convergence of R to 1, and with convergence of both the pooled and within interval widths to stability.

If the variable of interest is an array, slices of the array can be selected using the notation `variable[lower0:upper0,lower1:` A star '`*`' can be entered as shorthand for all the stored samples.

If the arguments are left at their defaults the whole sample for all chains will be used for calculation.

Value

A list containing data frames - one for each scalar variable contained in argument `node`. Each data frames contains elements

`Iteration`	end iteration of corresponding bin
`pooledChain80pct)`	80pct interval (normalized) of pooled chains
`withinChain80pct`	80pct interval (normalized) of mean within chain
`bgrRatio`	BGR ratio

Note

If the MCMC simulation has an adaptive phase it will not be possible to make inference using values sampled before the end of this phase.

References

Brooks, S.P. and Gelman A. (1998): Alternative Methods for Monitoring Convergence of Iterative Simulations. *Journal of Computational and Graphical Statistics*, 7, 434-455.

See Also

`plotBgr`, `BRugs`, `help.WinBUGS`

`samplesClear` *Clear recorded values*

Description

This function is used to remove the stored values of a variable.

Usage

```
samplesClear(node)
```

Arguments

`node`	Character vector of length 1, name of a variable in the model.

Details

If the variable of interest is an array, slices of the array can be selected using the notation `variable[lower0:upper0,lower1:`
A star '`*`' can be entered as shorthand for all the stored samples.

See Also

`BRugs`, `help.WinBUGS`

samplesCoda *Writing files in CODA format*

Description

This function writes files in CODA format to be processed or imported, e.g, by some other software.

Usage

```
samplesCoda(node, stem, beg = samplesGetBeg(),
    end = samplesGetEnd(), firstChain = samplesGetFirstChain(),
    lastChain = samplesGetLastChain(), thin = samplesGetThin())
```

Arguments

`node`	Character vector of length 1, name of a variable in the model.
`stem`	The filestem of the CODA files to be generated. See details.
`beg, end`	Arguments to select a slice of monitored values corresponding to iterations `beg:end`.
`firstChain, lastChain`	Arguments to select a sub group of chains.
`thin`	to only use every `thin`-th value of the stored sample.

Details

Example for argument `stem`: If `stem = "c:/myFolder/foo"`, the resulting files are called '`fooCODAchain1.txt`', ..., '`fooCODAchainN.txt`', and '`fooCODAindex.txt`'. They are written into the `tempdir()` and copied to the path '`"c:/myFolder"`'.

If the variable of interest is an array, slices of the array can be selected using the notation `variable[lower0:upper0,lower1:`

If the arguments are left at their defaults the whole sample for all chains will be used for output.

Value

Prints 'CODA files written'.

Note

If the MCMC simulation has an adaptive phase it will not be possible to make inference using values sampled before the end of this phase.

See Also

`BRugs`, `help.WinBUGS`

samplesCorrel *Correlation*

Description

This function calculates the correlation matrix between two vectors of variables.

Usage

```
samplesCorrel(node0, node1, beg = samplesGetBeg(),
    end = samplesGetEnd(), firstChain = samplesGetFirstChain(),
    lastChain = samplesGetLastChain(), thin = samplesGetThin())
```

Arguments

`node0, node1`	Character vectors of length 1, name of variables in the model.
`beg, end`	Arguments to select a slice of monitored values corresponding to iterations `beg:end`.
`firstChain, lastChain`	Arguments to select a sub group of chains to calculate correlation(s) for.
`thin`	to only use every `thin`-th value of the stored sample for statistics.

Details

If the variable of interest is an array, slices of the array can be selected using the notation `variable[lower0:upper0,lower1:`

If the arguments are left at their defaults the whole sample for all chains will be used for calculation.

Value

Correlation matrix.

Note

If the MCMC simulation has an adaptive phase it will not be possible to make inference using values sampled before the end of this phase.

See Also

`BRugs`, `help.WinBUGS`

samplesDensity *Plot density estimate or histogram*

Description

This function plots a smoothed kernel density estimate for a variable if it is continuous or a histogram if it is discrete.

Usage

```
samplesDensity(node, beg = samplesGetBeg(), end = samplesGetEnd(),
    firstChain = samplesGetFirstChain(),
    lastChain = samplesGetLastChain(), thin = samplesGetThin(),
    plot = TRUE, mfrow = c(3, 2), ask = NULL, ann = TRUE, ...)
```

Arguments

`node`	Character vector of length 1, name of a variable in the model.
`beg, end`	Arguments to select a slice of monitored values corresponding to iterations `beg:end`.
`firstChain, lastChain`	Arguments to select a sub group of chains to plot density estimate or histogram for.
`thin`	to only use every `thin`-th value of the stored sample for statistics.
`plot`	Logical, whether to plot the trace or only return density estimates. If `TRUE`, density estimates are returned invisibly.
`mfrow, ask, ann`	Graphical parameters, see `par` for details. `ask` defaults to `TRUE` unless it is plotting into an already opened non-interactive device. The `ann` parameter is not available in S-PLUS, and will be ignored if it is set.
`...`	Further graphical parameters as in `par` may also be passed as arguments to `plotDensity`.

Details

If the variable of interest is an array, slices of the array can be selected using the notation `variable[lower0:upper0,lower1:`
A star '`*`' can be entered as shorthand for all the stored samples.

If the arguments are left at their defaults the whole sample for all chains will be used for calculation.

Note

If the MCMC simulation has an adaptive phase it will not be possible to make inference using values sampled before the end of this phase.

See Also

`BRugs`, `help.WinBUGS`

`samplesGet` *Get settings used for calculations*

Description

These low level functions can be used to get information on settings of begin, end, and thinning of chains, as well as the number of the first/last chain of the stored sample.

Usage

```
samplesGetBeg()
samplesGetEnd()
samplesGetThin()
samplesGetFirstChain()
samplesGetLastChain()
```

Value

`samplesGetBeg` returns the first iteration of the stored sample used for calculating statistics.

`samplesGetEnd` returns the last iteration of the stored sample used for calculating statistics to end.

`samplesGetThin` returns the thin parameter, see `samplesSetThin`.

`samplesGetFirstChain` returns the number of the first chain of the stored sample used for calculating statistics.

`samplesGetLastChain` returns the number of the last chain of the stored sample used for calculating statistics.

See Also

`samplesSetBeg`, `BRugs`, `help.WinBUGS`

`samplesHistory` *Trace of a variable*

Description

This function returns and plots a complete trace for a variable.

Usage

```
samplesHistory(node, beg = samplesGetBeg(), end = samplesGetEnd(),
    firstChain = samplesGetFirstChain(),
    lastChain = samplesGetLastChain(), thin = samplesGetThin(),
    plot = TRUE, mfrow = c(3, 1), ask = NULL, ann = TRUE, ...)
```

Arguments

`node`	Character vector of length 1, name of a variable in the model.
`beg, end`	Arguments to select a slice of monitored values corresponding to iterations `beg:end`.
`firstChain, lastChain`	Arguments to select a sub group of chains to plot the trace for.
`thin`	to only use every `thin`-th value of the stored sample for statistics.
`plot`	Logical, whether to plot the trace or only return the values. If `TRUE`, values are returned invisibly.
`mfrow, ask, ann`	Graphical parameters, see `par` for details. `ask` defaults to `TRUE` unless it is plotting into an already opened non-interactive device. The `ann` parameter is not available in S-PLUS, and will be ignored if it is set.
`...`	Further graphical parameters as in `par` may also be passed as arguments to `plotHistory`.

Details

If the variable of interest is an array, slices of the array can be selected using the notation `variable[lower0:upper0,lower1:`
A star '`*`' can be entered as shorthand for all the stored samples.

If the arguments are left at their defaults the whole sample for all chains will be used for calculation.

Value

A list containing matrices - one for each scalar variable contained in argument `node`. Each row of a matrix corresponds to one chain.

See Also

`plotHistory`, `BRugs`, `help.WinBUGS`

`samplesMonitors` *Names of monitored scalar variables*

Description

This function returns names of monitored scalar variables.

Usage

```
samplesMonitors(node)
```

Arguments

`node`	Character vector of length 1, name of a variable in the model, or simply '`*`'. `node` can be a vector quantity with sub ranges given to indices (e.g. `samplesMonitors("node[3:5]")`).

Value

A list of names that are monitored. If sampling a vector of parameters of node, all elements are printed, e.g.: `"node[beg]",...,"node[end]"`.

See Also

`BRugs`, `help.WinBUGS`

`samplesSample` *Stored values*

Description

This function returns an array of stored values.

Usage

```
samplesSample(node)
```

Arguments

`node`	Character vector of length 1, name of a variable in the model.

Value

Values of the stored sample.

Note

If sampling a vector of parameters, the function must be called for each parameter separately such as `samplesSample("node[1]")`.

To get samples from more than only one scalar node, see `samplesHistory` with argument `plot=FALSE`.

See Also

`BRugs`, `help.WinBUGS`

samplesSet *Start recording*

Description

This function is used to start recording a chain of values for particular variables.

Usage

```
samplesSet(node)
```

Arguments

node	Character vector of names of variables in the model.

Details

WinBUGS generally automatically sets up a logical node to measure a quantity known as deviance; this may be accessed, in the same way as any other variable of interest, by typing its name, i.e. "deviance"

See Also

BRugs, help.WinBUGS

samplesSetting *Change settings used for calculations*

Description

These low level functions can be used to set begin, end, and thinning of chains as well as the first/last chain of the stored sample.

Usage

```
samplesSetBeg(begIt)
samplesSetEnd(endIt)
samplesSetThin(thin)
samplesSetFirstChain(first)
samplesSetLastChain(last)
```

Arguments

`begIt`	First iteration of the stored sample used for calculating statistics.
`endIt`	Last iteration of the stored sample used for calculating statistics.
`thin`	Every `thin`-th iteration of each chain is used to contribute to the statistics being calculated.
`first, last`	First/last chain of the stored sample used for calculating statistics.

Details

`samplesSetBeg` sets the first iteration of the stored sample used for calculating statistics to `begIt`.

`samplesSetEnd` sets the last iteration of the stored sample used for calculating statistics to `endIt`.

`samplesSetThin` sets the numerical field used to select every `thin`-th iteration of each chain to contribute to the statistics being calculated.

`samplesSetFirstChain` is used to set the first chain of the stored sample used for calculating statistics to be `first`.

`samplesSetLastChain` is used to set the last chain of the stored sample used for calculating statistics to be `last`.

Note

Note the difference between this and the thinning facility of the update function: when thinning via the update function we are permanently discarding samples as the MCMC simulation runs, whereas here we have already generated (and stored) a suitable number of (posterior) samples and may wish to discard some of them only temporarily. Thus, setting `thin > 1` here will not have any impact on the storage (memory) requirements; if you wish to reduce the number of samples actually stored (to free-up memory) you should thin via the update function.

See Also

`BRugs`, `help.WinBUGS`

`samplesSize` *Size of the stored sample*

Description

This function returns the size of the stored sample.

Usage

```
samplesSize(node)
```

Arguments

`node`	Character vector of length 1, name of a variable in the model.

Value

Size of the stored sample. If no samples exist, -1 will be returned.

Note

If sampling a vector of parameters, the function must be called for each parameter separately such as `samplesSize(node[1])`.

See Also

`BRugs`, `help.WinBUGS`

`samplesStats` *Calculate summary statistics*

Description

This function produces summary statistics for a variable, pooling over the chains selected.

Usage

```
samplesStats(node, beg = samplesGetBeg(), end = samplesGetEnd(),
    firstChain = samplesGetFirstChain(),
    lastChain = samplesGetLastChain(), thin = samplesGetThin())
```

Arguments

`node`	Character vector containing names of variables in the model.
`beg, end`	Arguments to select a slice of monitored values corresponding to iterations `beg:end`.
`firstChain, lastChain`	Arguments to select a sub group of chains to calculate summary statistics for.
`thin`	to only use every `thin`-th value of the stored sample for statistics.

Details

If the variable of interest is an array, slices of the array can be selected using the notation `variable[lower0:upper0,lower1:`
A star '`*`' can be entered as shorthand for all the stored samples.

If the arguments are left at their defaults the whole sample for all chains will be used for calculation.

Value

`samples.stats` returns a data frame with columns:

`mean`	means
`sd`	standard deviations
`MC_error`	Estimate of $s/\sqrt(N)$, the Monte Carlo standard error of the mean. The batch means method outlined by Roberts (1996; p.50) is used to estimate s.
`val2.5pc`	0.025 quantiles
`median`	medians
`val97.5pc`	0.975 quantiles
`start`	beg + 1
`sample`	sample sizes

Note

If the MCMC simulation has an adaptive phase it will not be possible to make inference using values sampled before the end of this phase.

References

Roberts, G.O. (1996): Markov Chain Concepts Related to Sampling Algorithms. In: W.R. Gilks, S. Richardson and D.J. Spiegelhalter (Eds.): *Markov Chain Monte Carlo in Practice*. Chapman and Hall, London, UK.

See Also

`BRugs`, `help.WinBUGS`

`setValues` *Setting current values*

Description

This function sets the current values of a variable for future iterations. Only stochastic nodes can be set using this facility, and logical nodes are then updated if necessary.

Usage

```
setValues(nodeLabel, values)
```

Arguments

`nodeLabel`	Character vector of length 1, name of a node in the model.
`values`	The values to be set, generated, e.g., by `infoNodeValues`.

Details

Current values of a node can be stored to be used later as initial values.

Value

The number of values set.

See Also

`infoNodeValues`, `BRugs`, `help.WinBUGS`

`summary` *Summary of MCMC simulation*

Description

These functions are used to calculate running means, standard deviations and quantiles.

Usage

```
summarySet(node)
summaryStats(node)
summaryClear(node)
```

Arguments

`node`	Character vector containing names of a variables in the model.

Details

`summarySet` creates monitor(s) that starts recording the running totals for `node`.

`summaryStats` displays the running means, standard deviations, and 2.5%, 50% (median) and 97.5% quantiles for `node`. Note that these running quantiles are calculated via an approximate algorithm and should therefore be used with caution.

`summaryClear` removes the monitor(s) calculating running totals for `node`.

These functions are less powerful and general than the samples functions (e.g., see `samplesSet`), but they also require much less storage (an important consideration when many variables and/or long runs are of interest).

Value

`summaryStats` returns a data frame with columns:

`mean`	means
`sd`	standard deviations
`val2.5pc`	0.025 quantiles

`median`	medians
`val97.5pc`	0.975 quantiles
`sample`	sample sizes

Note

Users should ensure their simulation has converged before using these functions. Note that if the MCMC simulation has an adaptive phase it will not be possible to make inference using values sampled before the end of this phase.

See Also

`BRugs`, `help.WinBUGS`

`writeModel` *Creating an OpenBUGS model file*

Description

Convert R function to an OpenBUGS model file

Usage

```
writeModel(model, con = "model.txt", digits = 5)
```

Arguments

`model`	R function containing the BUGS model in the BUGS model language, for minor differences see Section Details.
`con`	passed to `link{writeLines}` which actually writes the model file
`digits`	number of significant digits used for **BUGS** input, see `formatC`

Details

The fact that bugs models follow closely to S (R) syntax is used. It should be possible to write most BUGS models as R functions.

As a difference, BUGS syntax allows truncation specification like this: `dnorm(...) I(...)` but this is illegal in R. To overcome this incompatibility, use `%_%` before `I(...)`: `dnorm(...) %_% I(...)`. The dummy operator `%_%` will be removed before the BUGS code is saved.

Value

Nothing, but as a side effect, the model file is written.

Author(s)

original idea by Jouni Kerman, modified by Uwe Ligges

See Also

modelCheck, BRugs

Examples

```
## Same "ratsmodel" that is used in the examples in ?BRugs and ?BRugsFit:
ratsmodel <- function(){
    for(i in 1:N){
        for(j in 1:T){
            Y[i, j] ~ dnorm(mu[i, j],tau.c)
            mu[i, j] <- alpha[i] + beta[i] * (x[j] - xbar)
        }
        alpha[i] ~ dnorm(alpha.c, alpha.tau)
        beta[i] ~ dnorm(beta.c, beta.tau)
    }
    tau.c ~ dgamma(0.001, 0.001)
    sigma <- 1 / sqrt(tau.c)
    alpha.c ~ dnorm(0.0, 1.0E-6)
    alpha.tau ~ dgamma(0.001, 0.001)
    beta.c ~ dnorm(0.0, 1.0E-6)
    beta.tau ~ dgamma(0.001, 0.001)
    alpha0 <- alpha.c - xbar * beta.c
}

## some temporary filename:
filename <- file.path(tempdir(), "ratsmodel.txt")
## write model file:
writeModel(ratsmodel, filename)
## and let's take a look:
file.show(filename)
```

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