Package ‘rngWELL’

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Type Package
Title Toolbox for WELL Random Number Generators
Version 0.10-5
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Description It is a dedicated package to WELL pseudo random generators, which were introduced in Panneton et al. (2006), “Improved Long-Period Generators Based on Linear Recurrences Modulo 2”, ACM Transactions on Mathematical Software. But this package is not intended to be used directly, you are strongly __encouraged__ to use the ‘randtoolbox’ package, which depends on this package.
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R topics documented:

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pseudo.rngWELL Toolbox for pseudo and quasi random number generation

Description

General linear congruential generators such as Park Miller sequence, generalized feedback shift register such as SF-Mersenne Twister algorithm and WELL generator; and a quasi random generator (pseudo random generators) and the Torus algorithm (quasi random generation).
Usage

\begin{verbatim}
WELL2test(n, dim = 1, order = 512, temper = FALSE, version = "a")
setSeed4WELL(seed)

doinitMT2002(seed, n, state)
doputRngWELL(order, version, state)
dogetRngWELL(order, version, state)
\end{verbatim}

Arguments

\begin{itemize}
  \item \texttt{n} number of observations. If \text{length}(n) > 1, the length is taken to be the required number.
  \item \texttt{dim} dimension of observations (must be \leq 100 000, default 1).
  \item \texttt{seed} a single value, interpreted as a positive integer for the seed. e.g. append your day, your month and your year of birth.
  \item \texttt{order} a positive integer for the order of the characteristic polynomial. see details
  \item \texttt{temper} a logical if you want to do a tempering stage. see details
  \item \texttt{version} a character either "a", "b" or "c". see details
  \item \texttt{state} the state as output of \texttt{putRngWELL, getRngWELL}.
\end{itemize}

Details

The currently available generator are given below.

\textbf{WELL generator:} The WELL (which stands for Well Equidistributed Long-period Linear) is in a sentence a generator with better equidistribution than Mersenne Twister algorithm but this gain of quality has to be paid by a slight higher cost of time. See Paneton et al. (2006) for details.

The order argument of WELL generator is the order of the characteristic polynomial, which is denoted by \( k \) in Paneton F., L’Ecuyer P. and Matsumoto M. (2006). Possible values for \texttt{order} are 512, 521, 607, 1024 where no tempering are needed (thus possible). Order can also be 800, 19937, 21071, 23209, 44497 where a tempering stage is possible through the \texttt{temper} argument. Furthermore a possible 'b' version of WELL RNGs are possible for the following order 521, 607, 1024, 800, 19937, 23209 with the \texttt{version} argument.

All the C code for WELL generator used in this package is the code of P. L’Ecuyer (cf. \url{http://www.iro.umontreal.ca/~lecuyer/}), except some C code, we add, to interface with R.

See the pdf vignette for details.

Value

\texttt{WELL2test} generates random variables in \([0,1]\). It returns a \texttt{nxdim} matrix, when \texttt{dim}\(\neq\)1 otherwise a vector of length \texttt{n}.

\texttt{setSeed4WELL} set the seed of the \texttt{rngWELL} package (i.e. for the \texttt{WELL2test} functions).
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Author(s)

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References

Paneton F., L’Ecuyer P. and Matsumoto M. (2006), Improved Long-Period Generators Based on Linear Recurrences Modulo 2, ACM Transactions on Mathematical Software. (preprint available online)

See Also

.random.seed for what is done in R about random number generation.

Examples

# (1) WELL generator
#
#
# 'basic' calls
# WELL512
WELL2test(10, order = 512)
# WELL1024
WELL2test(10, order = 1024)
# WELL19937
WELL2test(10, order = 19937)
# WELL44497
WELL2test(10, order = 44497)
# WELL19937 with tempering
WELL2test(10, order = 19937, temper = TRUE)
# WELL44497 with tempering
WELL2test(10, order = 44497, temper = TRUE)

# tempering vs no tempering
setSeed4WELL(00082008)
WELL2test(10, order =19937)
setSeed4WELL(00082008)
WELL2test(10, order =19937, temper=TRUE)

# (2) other tests
#
doinitMT2002(1, 10, 10)
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