Title  Parallel Pseudo Random Number Generator (PPRNG) 'sitmo' Header Files

Version  2.0.1

Description  Provided within are two high quality and fast PPRNGs that may be used in an 'OpenMP' parallel environment. In addition, there is a generator for one dimensional low-discrepancy sequence. The objective of this library to consolidate the distribution of the 'sitmo' (C++98 & C++11), 'threefry' and 'vandercorput' (C++11-only) engines on CRAN by enabling others to link to the header files inside of 'sitmo' instead of including a copy of each engine within their individual package. Lastly, the package contains example implementations using the 'sitmo' package and three accompanying vignette that provide additional information.

Depends  R (>= 3.2.0)

URL  https://github.com/coatless/sitmo,  
     http://thecoatlessprofessor.com/projects/sitmo/,  
     https://github.com/stdfin/random/

BugReports  https://github.com/coatless/sitmo/issues

License  MIT + file LICENSE

LazyData  true

LinkingTo  Rcpp

Imports  Rcpp (>= 0.12.13)

RoxygenNote  6.1.1

Suggests  knitr, rmarkdown, ggplot2

VignetteBuilder  knitr

Encoding  UTF-8

NeedsCompilation  yes

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R topics documented:

- sitmo-package
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- sitmo_draws
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**sitmo-package**

**sitmo: Parallel Pseudo Random Number Generator (PPRNG) 'sitmo'**

*Header Files*

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Description

Provided within are two high quality and fast PPRNGs that may be used in an ‘OpenMP’ parallel environment. In addition, there is a generator for one dimensional low-discrepancy sequence. The objective of this library to consolidate the distribution of the ‘sitmo’ (C++98 & C++11), ‘threefry’ and ‘vandercorput’ (C++11-only) engines on CRAN by enabling others to link to the header files inside of ‘sitmo’ instead of including a copy of each engine within their individual package. Lastly, the package contains example implementations using the ‘sitmo’ package and three accompanying vignette that provide additional information.

Author(s)

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runif_r

Random Uniform Number Generator using base R

Description
The function provides an alternative implementation of random uniform distribution sampling using R’s rng scope.

Usage
runif_r(n, min = 0, max = 1)

Arguments
- **n**: An unsigned integer denoting the number of realizations to generate.
- **min**: A double indicating the minimum $a$ value in the uniform’s interval $[a, b]$
- **max**: A double indicating the maximum $b$ value in the uniform’s interval $[a, b]$

Examples
set.seed(134)
b = runif_r(10)

runif_sitmo

Random Uniform Number Generator with sitmo

Description
The function provides an implementation of sampling from a random uniform distribution

Usage
runif_sitmo(n, min = 0, max = 1, seed = 1L)
Arguments

\( n \)  
An unsigned integer denoting the number of realizations to generate.

\( \text{min} \)  
A double indicating the minimum \( a \) value in the uniform's interval \([a, b]\)

\( \text{max} \)  
A double indicating the maximum \( b \) value in the uniform's interval \([a, b]\)

\( \text{seed} \)  
A special unsigned integer containing a single seed.

Value

A numeric vector containing the realizations.

Examples

\[
a = \text{runif}_\text{sitmo}(10)
\]
**sitmo_engine_reset**

Example Seed Set and RNG Draws with sitmo

**Description**

Shows how to set a seed in sitmo.

**Usage**

sitmo_engine_reset(n, seed)

**Arguments**

<table>
<thead>
<tr>
<th>n</th>
<th>An unsigned int that dictates how many realizations occur.</th>
</tr>
</thead>
<tbody>
<tr>
<td>seed</td>
<td>An unsigned int that controls the rng seed.</td>
</tr>
</tbody>
</table>

**Value**

A matrix with random sequences.

**Examples**

```
n = 10
a = sitmo_engine_reset(n, 1337)
isTRUE(all.equal(a[,1],a[,2]))
```

**sitmo_engine_seed**

Example Seed Set and RNG Draws with sitmo

**Description**

Shows how to set a seed in sitmo.

**Usage**

sitmo_engine_seed(n, seed)

**Arguments**

<table>
<thead>
<tr>
<th>n</th>
<th>An unsigned int that dictates how many realizations occur.</th>
</tr>
</thead>
<tbody>
<tr>
<td>seed</td>
<td>An unsigned int that controls the rng seed.</td>
</tr>
</tbody>
</table>

**Value**

A vector with random sequences.
Examples

\[
\begin{align*}
n &= 10 \\
a &= \text{sitmo_engine_seed}(n, \text{1337}) \\
b &= \text{sitmo_engine_seed}(n, \text{1337}) \\
c &= \text{sitmo_engine_seed}(n, \text{1338}) \\
\text{isTRUE(all.equal(a,b))} \\
\text{isTRUE(all.equal(a,c))}
\end{align*}
\]

---

**sitmo_parallel**  
*Test Generation using sitmo and C++11*

**Description**

The function provides an implementation of creating realizations from the default engine.

**Usage**

\[
\text{sitmo_parallel}(n, \text{seeds})
\]

**Arguments**

- \(n\): An unsigned integer denoting the number of realizations to generate.
- \(\text{seeds}\): A vec containing a list of seeds. Each seed is run on its own core.

**Details**

The following function’s true power is only accessible on platforms that support OpenMP (e.g. Windows and Linux). However, it does provide a very good example as to how to make ones code applicable across multiple platforms.

With this being said, how we determine how many cores to split the generation to is governed by the number of seeds supplied. In the event that one is using OS X, only the first seed supplied is used.

**Value**

A vec containing the realizations.

**Examples**

\[
\begin{align*}
a &= \text{sitmo_parallel}(10, c(1)) \\
b &= \text{sitmo_parallel}(10, c(1,2)) \\
c &= \text{sitmo_parallel}(10, c(1,2)) \\
\text{# True on only OS X or systems without openmp} \\
\text{isTRUE(all.equal(a,b))}
\end{align*}
\]
Description

Shows how to create two separate RNGs and increase them together.

Usage

sitmo_two_seeds(n, seeds)

Arguments

n An unsigned int that dictates how many realizations occur.

seeds A vec containing two integers greater than 0.

Value

A matrix with random sequences.

Examples

n = 10
a = sitmo_two_seeds(n, c(1337, 1338))
b = sitmo_two_seeds(n, c(1337, 1337))

isTRUE(all.equal(a[,1], a[,2]))
isTRUE(all.equal(b[,1], b[,2]))
isTRUE(all.equal(a[,1], b[,1]))

isTRUE(all.equal(b[,1], b[,2]))
isTRUE(all.equal(a[,1], b[,1]))
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