

## Mersenne Twister Random Number Generator

### 1 Overview

1.1 **Location** `$(AMDAPPSDKSAMPLESROOT)\samples\opencl\cl\app`

1.2 **How to Run** See the *Getting Started* guide for how to build samples. You first must compile the sample.

Use the command line to change to the directory where the executable is located. The pre-compiled sample executable is at `$(AMDAPPSDKSAMPLESROOT)\samples\opencl\bin\x86\` for 32-bit builds, and `$(AMDAPPSDKSAMPLESROOT)\samples\opencl\bin\x86_64\` for 64-bit builds.

Type the following command(s).

1. `MersenneTwister`  
Runs with default options;  $x = 4096$ ,  $y = 2$ .
2. `MersenneTwister -h`  
This prints the help file.

1.3 **Command Line Options** Table 1 lists, and briefly describes, the command line options.

**Table 1 Command Line Options**

Short Form	Long Form	Description
-h	--help	Shows all command options and their respective meaning.
	--device	Devices on which the program is to be run. Acceptable values are <code>cpu</code> or <code>gpu</code> .
-q	--quiet	Quiet mode. Suppresses all text output.
-e	--verify	Verify results against reference implementation.
-t	--timing	Print timing.
	--dump	Dump binary image for all devices.
	--load	Load binary image, and execute on device.
	--flags	Specify compiler flags to build the kernel.
-p	--platformId	Select platformId to be used (0 to N-1, where N is the number of available platforms).
-d	--deviceId	Select deviceId to be used (0 to N-1, where N is the number of available devices).
-x	--numRands	Number of random numbers to be generated.
-y	--factor	Each seed generates a 'factor' random numbers (total number of random numbers generated = $\text{factor} * \text{numRands}$ ).
-i	--iterations	Number of iterations for kernel execution.

## 2 Implementation Details

This SIMD-oriented Fast Mersenne Twister (SFMT) generates random numbers and a Box-Muller used to convert the random numbers to Gaussian random numbers. See reference [1] for more details on the SFMT algorithm. See reference [2] for details about the Box-Muller Transformation.

Each work-item calculates the “factor” Gaussian random numbers from a given seed.

## 3 Recommended Input Option Settings

For best results, enter the following on the command line: `-x 8388608 -i 10 -q -t`

## 4 References

1. <http://www.math.sci.hiroshima-u.ac.jp/~m-mat/MT/SFMT/index.html>
2. <http://mathworld.wolfram.com/Box-MullerTransformation.html>

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