

srfi-27 egg

Sources of Random Bits
Extension for Chicken Scheme
Version 0.3

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1 About this egg

1.1 Version history

- 0.3 MWC pseudo-randomize, better distribution API
- 0.2 More
- 0.1 Initial release

1.2 Requirements

This egg requires the following extensions:

`numbers`, `structures`, `miscmacros`, `misc-extn`

1.3 Usage

Load this egg like so:

```
(require-extension srfi-27)
```

2 Documentation

The `srfi-27` egg is a CHICKEN port of the SRFI-27 reference implementation.

This package follows the specification of SRFI-27. For more information see the documentation for [SRFI-27](#).

Unlike the SRFI-27 specification a `random-structure` is not "open" by default. To use the builtin random structure do the following: `(require-extension structures srfi-27) (open MRG32k3a)`.

All random number generators are randomized using the current entropy source.

2.1 Signatures

```
entropy-source-signature [signature]
  (entropy-source-signature make-entropy-source entropy-source?
   entropy-kind
   entropic-u8vector entropic-f64vector entropic-u8
   entropic-f64)

make-entropy-source
  (-> %entropy-source)

entropy-source?
  (-> any boolean)

entropy-kind
  (-> (or string symbol))

entropic-u8vector
  (-> fixnum #!optional u8vector u8vector)

entropic-f64vector
  (-> fixnum #!optional f64vector f64vector)

entropic-u8
  (-> fixnum)

entropic-f64
  (-> flonum)

random-source-signature [signature]
  (random-source-signature random-integer random-real
   default-random-source make-random-source random-source?
   random-source-kind random-source-log2-period
   random-source-maximum-range random-source-maximum-modulus
   random-source-state-ref random-source-state-set!
   random-source-randomize! random-source-pseudo-randomize!
   random-source-make-integers random-source-make-reals)

random-integer
  (-> (integer exact positive) (integer exact positive (<= 0 ?) (< ? ?1)))
```

```

random-real
    (-> (real inexact (< 0 ? 1)))

default-random-source
    %random-source

make-random-source
    (-> %random-source)

random-source?
    (-> any boolean)

random-source-kind
    (-> %random-source (or string symbol))

random-source-log2-period
    (-> %random-source fixnum)

random-source-maximum-modulus
    (-> %random-source integer)

random-source-maximum-range
    (-> %random-source integer)

random-source-state-ref
    (-> %random-source random-state)

random-source-state-set!
    (-> %random-source random-state void)

random-source-randomize!
    (-> %random-source void)

random-source-pseudo-randomize!
    (-> %random-source integer integer void)

random-source-make-integers
    (-> %random-source (-> (integer exact positive) (integer exact positive)
    (<= 0 ?) (< ? ?1)))

random-source-make-reals
    (-> %random-source #!optional (real inexact (< 0 ? 1)) (-> (real inexact
    (< 0 ? 1)))

```

2.2 Structures

```

current-seconds-entropy [structure]
    (current-seconds-entropy (entropy-source-signature))
    Entropy from (current-seconds).

dev-random-entropy [structure]
    (dev-random-entropy (entropy-source-signature))
    Entropy from /dev/random.

```

- dev-urandom-entropy** [structure]
 (dev-urandom-entropy (entropy-source-signature))
 Entropy from /dev/urandom.
- MRG32k3a** [structure]
 (MRG32k3a (random-source-signature))
 Pierre L'Ecuyer's Multiple Recursive Generator 32k3a.
- MWC** [structure]
 (MWC (random-source-signature))
 George Marsaglia's Multiply With Carry generator.
- random-source-structures** [procedure]
 (random-source-structures)
 Returns a list of the known random-source-structures.
- entropy-source-structures** [procedure]
 (entropy-source-structures)
 Returns a list of the known entropy-source-structures.

2.3 Parameters

- current-entropy-source-structure** [parameter]
 (current-entropy-source-structure [ENTROPY-SOURCE-STRUCTURE])
 Returns or sets the default entropy source structure.
- current-random-source-structure** [parameter]
 (current-random-source-structure [RANDOM-SOURCE-STRUCTURE])
 Returns or sets the default random source structure.

2.4 Distributions

All distributions return 2 values. The first is a procedure of arity 0, the random distribution generator. The second is a procedure of arity 0, returning the configuration arguments as multiple-values, in the order they appear in the 'make-*' argument list. The 'report' procedure can be safely ignored.

- make-uniform-random-integers** [procedure]
 (make-uniform-random-integers [HIGH] [LOW] [UNIT] [SOURCE])
 Returns an integer random number generator.
- SOURCE** A %random-source or a random-source-structure. Default is the 'current-random-source-structure'.
- HIGH** An integer or boolean. The largest desired random integer. Default is one less than maximum range for the source. When boolean the default is used.
- LOW** An integer. The smallest desired random integer. Default is 0.
- UNIT** An integer. The spacing between desired random integers. Default is 1.

- make-uniform-random-reals** [procedure]
 (make-uniform-random-reals [UNIT] [SOURCE])
 Returns a real random number generator.
- SOURCE** A %random-source or a random-source-structure. Default is the 'current-random-source-structure'.
- UNIT** A number in (0 1) or boolean. The spacing, default is a pretty small number. When boolean the default is used.
- make-random-exponentials** [procedure]
 (make-random-exponentials [MEAN 1] [RAND])
 Exponentially distributed random inexact reals.
- make-random-normals** [procedure]
 (make-random-normals [MEAN 0] [STDDEV 1] [RAND])
 Normal distributed random inexact reals.
- make-random-triangles** [procedure]
 (make-random-triangles [SMALLEST 0] [PROBABLE 0.5] [LARGEST 1] [RAND])
 Triangular distributed random inexact reals.
- make-random-poissons** [procedure]
 (make-random-poissons [MEAN 1] [RAND])
 Poisson distributed random inexact reals.
- make-random-bernoullis** [procedure]
 (make-random-bernoullis [P 0.5] [RAND])
 Bernoulli distributed random booleans.
- make-random-binomials** [procedure]
 (make-random-binomials [T 1] [P 0.5] [RAND])
 Binomial distributed random integers.
- make-random-geometrics** [procedure]
 (make-random-geometrics [P 0.5] [RAND])
 Geometric distributed random inexact reals.
- make-random-lognormals** [procedure]
 (make-random-lognormals [MEAN 1] [STDDEV 0] [RAND])
 Log normal distributed random inexact reals.
- make-random-cauchys** [procedure]
 (make-random-cauchys [MEADIAN 0] [STDDEV 1] [RAND])
 Cauchy distributed random inexact reals.
- make-random-gammas** [procedure]
 (make-random-gammas [ALPHA 1] [THETA 1] [RAND])
 Gamma distributed random inexact reals.

random-normal-vector! [procedure]
 (random-normal-vector! VECTOR [MEAN 0] [STDDEV 1] [RAND])

Fills the VECTOR with normal distributed real numbers. When just a random generator is specified it is assumed to be a source of random normals!

VECTOR A vector or 64vector.

RAND A random reals source. Default is 'make-uniform-random-reals'.

MEAN A number.

STDDEV A number.

random-hollow-sphere! [procedure]
 (random-hollow-sphere! VECTOR [MEAN 0] [STDDEV 1] [RAND])

Fills the VECTOR with inexact reals the sum of whose squares is equal to 1.0. When just a random generator is specified it is assumed to be a source of random normals!

VECTOR A vector or 64vector.

RAND A random reals source. Default is 'make-uniform-random-reals'.

MEAN A number.

STDDEV A number.

random-solid-sphere! [procedure]
 (random-solid-sphere! VECTOR [MEAN 0] [STDDEV 1] [RAND])

Fills the VECTOR with inexact reals the sum of whose squares is less than 1.0. When just a random generator is specified it is assumed to be a source of random normals!

VECTOR A vector or 64vector.

RAND A random reals source. Default is 'make-uniform-random-reals'.

MEAN A number.

STDDEV A number.

2.5 Internals

These are only of interest if implementing an entropy or random source.

%entropy-source [record]

%make-entropy-source [procedure]
 (%make-entropy-source kind u8 f64 u8vector f64vector)

kind Description of the entropy source. symbol or string

u8 Procedure to generate an entropic unsigned 8 bit integer. (-> number)

f64 Procedure to generate an entropic 64 bit floating-point. (-> number)

```

u8vector Procedure to generate a vector of entropic unsigned 8 bit integer. (-> fixnum #!optional (u8vector (<= (u8vector-length ?) ?1)) u8vector)

f64vector Procedure to generate a vector of entropic 64 bit floating-point. (-> fixnum #!optional (f64vector (<= (f64vector-length ?) ?1)) f64vector)

%entropy-source? [procedure]
  (%entropy-source? OBJECT)
  Is OBJECT an %entropy-source?

%entropy-source-u8 [procedure]
  (%entropy-source-u8 ENTROPY-SOURCE)
  Returns the u8 procedure.

%entropy-source-f64 [procedure]
  (%entropy-source-f64 ENTROPY-SOURCE)
  Returns the f64 procedure.

%entropy-source-u8vector [procedure]
  (%entropy-source-u8vector ENTROPY-SOURCE)
  Returns the u8vector procedure.

%entropy-source-f64vector [procedure]
  (%entropy-source-f64vector ENTROPY-SOURCE)
  Returns the f64vector procedure.

%random-source [record]
%make-random-source [procedure]
  (%make-random-source kind log2-period maximum-range maximum-modulus state-ref)
  kind The identifier for the random source. symbol or string
  log2-period Period of the random source as a power of 2. fixnum
  maximum-range Maximum range. integer
  maximum-modulus Maximum modulus. integer
  state-ref Procedure to return the random state. (-> random-state)
  state-set! Procedure to set the random state. (-> random-state void)
  randomize! Procedure to randomize the current state. (-> void)

```

```

pseudo-randomize!
    Procedure to randomize current state for substreams. (-> integer
    integer void)

make-integers
    Procedure to return a random integer stream generator. (-> (->
    (integer exact positive) (integer exact positive (<= 0 ?) (< ? ?1))))

make-reals
    Procedure to return a random inexact stream generator. (-> #!op-
    tional (real inexact (< 0 ? 1)) (-> (real inexact (< 0 ? 1))))

%random-source? [procedure]
    (%random-source? OBJECT)
    Is OBJECT a %random-source?

%random-source-kind [procedure]
    (%random-source-kind RANDOM-SOURCE)
    Returns the kind.

%random-source-log2-period [procedure]
    (%random-source-log2-period RANDOM-SOURCE)
    Returns the period base 2 exponent.

%random-source-maximum-range [procedure]
    (%random-source-maximum-range RANDOM-SOURCE)
    Returns the maximum range.

%random-source-maximum-modulus [procedure]
    (%random-source-maximum-modulus RANDOM-SOURCE)
    Returns the maximum modulus.

%random-source-state-ref [procedure]
    (%random-source-state-ref RANDOM-SOURCE)
    Returns the state-ref procedure.

%random-source-state-set! [procedure]
    (%random-source-state-set! RANDOM-SOURCE)
    Returns the state-set! procedure.

%random-source-randomize! [procedure]
    (%random-source-randomize! RANDOM-SOURCE)
    Returns the randomize! procedure.

%random-source-pseudo-randomize! [procedure]
    (%random-source-pseudo-randomize! RANDOM-SOURCE)
    Returns the pseudo-randomize! procedure.

```

<code>%make-random-source-integers</code>	[procedure]
(<code>%make-random-source-integers</code> RANDOM-SOURCE)	
Returns the make-integers procedure.	
<code>%make-random-source-reals</code>	[procedure]
(<code>%make-random-source-reals</code> RANDOM-SOURCE)	
Returns the make-reals procedure.	
<code>entropy:check-u8vector-args</code>	[procedure]
(<code>entropy:check-u8vector-args</code> U8S U8VECTOR)	
Error unless valid arguments.	
<code>entropy:check-f64vector-args</code>	[procedure]
(<code>entropy:check-f64vector-args</code> F64S F64VECTOR)	
Error unless valid arguments.	
<code>entropy-source-structure?</code>	[procedure]
(<code>entropy-source-structure?</code> OBJECT)	
Is OBJECT an entropy-source-structure?	
<code>random-source-structure?</code>	[procedure]
(<code>random-source-structure?</code> OBJECT)	
Is OBJECT a random-source-structure?	
<code>register-random-source-structure?</code>	[procedure]
(<code>register-random-source-structure?</code> OBJECT)	
Assuming OBJECT is a random-source-structure register it as a known source.	
<code>register-entropy-source-structure?</code>	[procedure]
(<code>register-entropy-source-structure?</code> OBJECT)	
Assuming OBJECT is an entropy-source-structure register it as a known source.	

3 Issues

Poor documentation.

The semi-generic nature of the random structure in the specification is odd. A random-structure must be created for every generator, but, except for 'make-random-source', the exported procedures will function with any %random-source.

The entropy structure is opposite of the random structure, mostly specific. Subject to future revision.

Random source using entropy is not provided.

4 Examples

; Please see "conf-test.scm" in this egg.

5 License

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