$$\Sigma$$ A Library for ANSI Common Lisp

Christopher Mark Gore cgore@cgore.com http://cgore.com/programming/lisp/sigma/ https://github.com/cgore/sigma

May 3, 2013

Contents

1	Cop	yright		9
2	$Th\epsilon$	Behave	e Package	11
	2.1		S	12
		2.1.1	The Behavior Macro	12
		2.1.2	The Spec Macro	12
		2.1.3	The Should Macro	12
		2.1.4	The Should-Not Macro	12
		2.1.5	The Should-Be-Null Macro	12
		2.1.6	The Should-Be-A Macro	12
		2.1.7	The Should= Macro	12
		2.1.8	The Should/= Macro	12
		2.1.9	The Should Macro	12
		2.1.10	The Should> Macro	12
		2.1.11	The Should<= Macro	12
		2.1.12	The Should>= Macro	12
		2.1.13	The Should-Eq Macro	12
		2.1.14	The Should-Not-Eq Macro	12
		2.1.15		12
		2.1.16		12
		2.1.17	The Should-Equal Macro	12
			The Should-Not-Equal Macro	12
		2.1.19	The Should-EqualP Macro	12
		2.1.20		12
		2.1.21	The Should-String= Macro	12
		2.1.22	The Should-Not-String= Macro	12
		2.1.23	The Should-String/= Macro	12
		2.1.24	The Should-Not-String/= Macro	12
		2.1.25		12
		2.1.26	The Should-Not-String Macro	12
			The Should-String> Macro	12
			The Should-Not-String> Macro	12
			The Should-String<= Macro	12
		2 1 30	The Should-Not-String<= Macro	12

		2.1.31	The Should-String>= Macro	12
		2.1.32	The Should-Not-String>= Macro	12
		2.1.33	The Should-String-Equal Macro	12
		2.1.34	The Should-Not-String-Equal Macro	12
		2.1.35	The Should-String-Not-Equal Macro	12
		2.1.36	The Should-Not-String-Not-Equal Macro	12
			The Should-String-LessP Macro	12
			The Should-Not-String-LessP Macro	12
			The Should-String-GreaterP Macro	12
			The Should-Not-String-GreaterP Macro	12
			The Should-String-Not-GreaterP Macro	12
			The Should-Not-String-Not-GreaterP Macro	12
			The Should-String-Not-LessP Macro	12
			The Should-Not-String-Not-LessP Macro	12
			Ŭ	
3	The	Contro	ol Package	13
	3.1	Macros	s	14
		3.1.1	The AIf Macro	14
		3.1.2	The A?If Macro	14
		3.1.3	The AAnd Macro	14
		3.1.4	The A?And Macro	14
		3.1.5	The ALambda Macro	14
		3.1.6	The A?Lambda Macro	14
		3.1.7	The ABlock Macro	14
		3.1.8	The A?Block Macro	14
		3.1.9	The ACond Macro	14
		3.1.10		14
		3.1.11	The AWhen Macro	14
		3.1.12	The A?When Macro	14
		3.1.13		14
		3.1.14		14
		3.1.15		14
		3.1.16		14
		3.1.17		14
		3.1.18	The For Macro	14
		3.1.19		14
		3.1.20	The Multicond Macro	14
			The OpF Macro	14
		3.1.22	The Swap Macro	14
		3.1.23	The Swap-Unless Macro	14
		3.1.24	The Swap-When Macro	14
		3.1.25	The Until Macro	14
				14
	3.2	Function		14
		3.2.1	The Compose Function	14
		3.2.2	The Conjoin Function	14

		3.2.3	The Curry Function	14
		3.2.4	The Disjoin Function	14
		3.2.5	The Function-Alias Function	14
		3.2.6	The Operator-To-Function Function	14
		3.2.7	The RCompose Function	14
		3.2.8	The RCurry Function	14
		3.2.9	The Unimplemented Function	14
	3.3	Generi	ics	14
		3.3.1	The Duplicate Generic	14
4	The	Hash 1	Package	15
	4.1	Functi	ons	15
		4.1.1	The IncHash Function	15
		4.1.2	The DecHash Function	15
5	The	Numer	ic Package	17
	5.1		8	17
		5.1.1	The DivF Macro	17
		5.1.2	The MultF Macro	17
	5.2	Functi	ons	17
		5.2.1	The Bit? Function	17
		5.2.2	The Factorial Function	17
		5.2.3	The Fractional-Part Function	18
		5.2.4	The Fractional-Value Function	18
		5.2.5	The Integer-Range Function	18
		5.2.6	The Nonnegative? Function	18
		5.2.7	The Nonnegative-Integer? Function	18
		5.2.8	The Positive-Integer? Function	18
		5.2.9	The Product Function	18
		5.2.10	The Sum Function	18
		5.2.11	The Unsigned-Integer? Function	18
	5.3	Types		18
		5.3.1	The Nonnegative-Float Type	18
		5.3.2	The Nonnegative-Integer Type	18
		5.3.3	The Positive-Float Type	18
		5.3.4	The Positive-Integer Type	18
6	The	os Pa	ckage	19
	6.1	Functi	_	19
		6.1.1	The Perl Function	19
		6.1.2	The Python Function	19
		6.1.3	The Read-File Function	19
		6.1.4	The Read-Lines Function	19
		6.1.5	The Ruby Function	19
	6.2	Param	•	19
	~· -		The *Perl-Path* Parameter	10

		6.2.2	The *Python-Path* Parameter						19
		6.2.3	The *Ruby-Path* Parameter						19
7	The	Probal	bility Package						21
•	7.1		S						21
	1.1	7.1.1							21
	7.2		The Decaying-Probabiliity? Macro						$\frac{21}{21}$
	1.2		Ons						
	7.0	7.2.1	The Probability? Function						21
	7.3								21
		7.3.1	The Probability Type	•	٠	•	•	•	21
8	The	Rando	m Package						23
	8.1	Macro	s						23
		8.1.1	The NShuffle Macro						23
	8.2	Functi							23
		8.2.1	The Gauss Function						23
		8.2.2	The Random-Argument Function						23
		8.2.3	The Coin-Toss Function						23
		8.2.4	The Random-In-Range Function						23
		8.2.5	The Random-In-Ranges Function						23
		8.2.6	The Random-Range Function						23
		8.2.7	The Randomize-Array Function						23
		8.2.8	The Random-Array Function						$\frac{23}{23}$
	8.3	-							23
	0.5	8.3.1	The Random-Element Generic						$\frac{23}{23}$
		8.3.2	The Shuffle Generic						$\frac{23}{23}$
		0.0.2	The biulife denote	•	•	•	•	•	20
9	The	-	nce Package						25
	9.1	Macro	s						26
		9.1.1	The Arefable? Macro						26
		9.1.2	The NConcF Macro						26
		9.1.3	The Nthable? Macro						26
		9.1.4	The Set-NthCdr Macro						26
	9.2	Functi	ons						26
		9.2.1	The Array-Values Function						26
		9.2.2	The Nth-From-End Function						26
		9.2.3	The Sequence? Function						26
		9.2.4	The Empty-Sequence? Function						26
		9.2.5	The Join-Symbol-To-All-Following Function.						26
		9.2.6	The Join-Symbol-To-All-Preceeding Function						26
		9.2.7	The List-To-Vector Function						26
		9.2.8	The Set-Equal Function						26
		9.2.9	The Simple-Vector-To-List Function						26
		9.2.10	The Sort-Order Function						26
		9.2.11	The The-Last Function						26
			The Vector-To-List Function						26
		U							

	9.3	Generi	cs	26
		9.3.1	The Best Generic	26
		9.3.2	The Minimum Generic	26
		9.3.3	The Minimum? Generic	26
		9.3.4	The Maximum Generic	26
		9.3.5	The Maximum? Generic	26
		9.3.6	The Sort-On Generic	26
		9.3.7	The Slice Generic	26
		9.3.8	The Split Generic	26
		9.3.9	The Worst Generic	26
10	The	String	g Package 2	7
	10.1	Function	ons	27
		10.1.1	The Character-Range Function	27
		10.1.2	The Character-Ranges Function	27
		10.1.3	The Escape-Tildes Function	8
		10.1.4	The Replace-Char Function	89
		10.1.5	The StrCat Function	8
		10.1.6	The StrMult Function	89
		10.1.7	The String-Join Function	8
		10.1.8	The Stringify Function	8
				8
	10.2			8
		10.2.1	The Split Methods	89
11	The	Time-S	Series Package 2	9
	11.1	Macros	s	29
		11.1.1	The Snap-Index Macro	29
	11.2	Function	ons	29
				20
				29
		11.2.3	The Norm Function	29
		11.2.4	The Raster-Line Function	20
				20
		11.2.6	The Time-Series? Function	29
		11.2.7	The Time-Multiseries? Function	20
				29
				29
		11.2.10	The TMS-Raster-Line Function	29
		11.2.11	The TMS-Values Function	29
	11.3	${\rm Types}$		29
		11.3.1	The Time-Multiseries Type	29

12	The	Truth Package	31
	12.1	Functions	31
		12.1.1 The [?] Function	31
		12.1.2 The Toggle Function	31
	12.2	Generics	31
		12.2.1 The ? Generic	31
13	The	Sigma Package	33
	13.1	Variables	33
		13.1.1 The *Sigma-Packages* Variable	33
	13.2	Functions	33
		13.2.1 The Use-All-Sigma Function	33

Copyright

Copyright © 2005 - 2013, Christopher Mark Gore, Soli Deo Gloria, All rights reserved.

8729 Lower Marine Road, Saint Jacob, Illinois 62281 USA.

Web: http://cgore.com Email: cgore@cgore.com

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- Neither the name of Christopher Mark Gore nor the names of other contributors may be used to endorse or promote products derived from this software without specific prior written permission.

This software is provided by the copyright holders and contributors "as is" and any express or implied warranties, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose are disclaimed. In no event shall the copyright holder or contributors be liable for any direct, indirect, incidental, special, exemplary, or consequential damages (including, but not limited to, procurement of substitute goods or services; loss of use, data, or profits; or business interruption) however caused and on any theory of liability, whether in contract, strict liability, or tort (including negligence or otherwise) arising in any way out of the use of this software, even if advised of the possibility of such damage.

The Behave Package

2.1	Macro	- ~
Z	Macro	15

- 2.1.1 The Behavior Macro
- 2.1.2 The Spec Macro
- 2.1.3 The Should Macro
- 2.1.4 The Should-Not Macro
- 2.1.5 The Should-Be-Null Macro
- 2.1.6 The Should-Be-A Macro
- 2.1.7 The Should= Macro
- 2.1.8 The Should/= Macro
- 2.1.9 The Should Macro
- 2.1.10 The Should> Macro
- 2.1.11 The Should<= Macro
- 2.1.12 The Should>= Macro
- 2.1.13 The Should-Eq Macro
- 2.1.14 The Should-Not-Eq Macro
- 2.1.15 The Should-Eql Macro
- 2.1.16 The Should-Not-Eql Macro
- 2.1.17 The Should-Equal Macro
- 2.1.18 The Should-Not-Equal Macro
- 2.1.19 The Should-EqualP Macro
- 2.1.20 The Should-Not-EqualP Macro
- 2.1.21 The Should-String= Macro
- 2.1.22 The Should-Not-String= Macro
- 2.1.23 The Should-String/= Macro

The Control Package

3.1	Macros
-----	--------

- 3.1.1 The Alf Macro
- 3.1.2 The A?If Macro
- 3.1.3 The AAnd Macro
- 3.1.4 The A?And Macro
- 3.1.5 The Alambda Macro
- 3.1.6 The A?Lambda Macro
- 3.1.7 The ABlock Macro
- 3.1.8 The A?Block Macro
- 3.1.9 The ACond Macro
- 3.1.10 The A?Cond Macro
- 3.1.11 The AWhen Macro
- 3.1.12 The A?When Macro
- 3.1.13 The AWhile Macro
- 3.1.14 The A?While Macro
- 3.1.15 The DeleteF Macro
- 3.1.16 The Do-While Macro
- 3.1.17 The Do-Until Macro
- 3.1.18 The For Macro
- 3.1.19 The Forever Macro
- 3.1.20 The Multicond Macro
- 3.1.21 The OpF Macro
- 3.1.22 The Swap Macro
- 3.1.23 The Swap-Unless Macro

The Hash Package

4.1 Functions

4.1.1 The IncHash Function

The IncHash function will increment the value in key of the hash, initializing it to 1 if it isn't currently defined.

4.1.2 The DecHash Function

The DecHash function will decrement the value in key of the hash, initializing it to -1 if it isn't currently defined.

The Numeric Package

- 5.1 Macros
- 5.1.1 The DivF Macro
- 5.1.2 The MultF Macro
- 5.2 Functions
- 5.2.1 The Bit? Function
- 5.2.2 The Factorial Function

The Factorial function computes n! for positive integers. NB, this isn't intelligent, and uses a loop instead of better approaches.

- 5.2.3 The Fractional-Part Function
- 5.2.4 The Fractional-Value Function
- 5.2.5 The Integer-Range Function
- 5.2.6 The Nonnegative? Function
- 5.2.7 The Nonnegative-Integer? Function
- 5.2.8 The Positive-Integer? Function
- 5.2.9 The Product Function
- 5.2.10 The Sum Function
- 5.2.11 The Unsigned-Integer? Function
- 5.3 Types
- 5.3.1 The Nonnegative-Float Type
- 5.3.2 The Nonnegative-Integer Type
- 5.3.3 The Positive-Float Type
- 5.3.4 The Positive-Integer Type

The OS Package

- 6.1 Functions
- 6.1.1 The Perl Function
- 6.1.2 The Python Function
- 6.1.3 The Read-File Function
- 6.1.4 The Read-Lines Function
- 6.1.5 The Ruby Function
- 6.2 Parameters
- 6.2.1 The *Perl-Path* Parameter
- 6.2.2 The *Python-Path* Parameter
- 6.2.3 The *Ruby-Path* Parameter

The Probability Package

- 7.1 Macros
- 7.1.1 The Decaying-Probabiliity? Macro
- 7.2 Functions
- 7.2.1 The Probability? Function
- 7.3 Types
- 7.3.1 The Probability Type

The Random Package

- 8.1.1 The NShuffle Macro
- 8.2 Functions
- 8.2.1 The Gauss Function
- 8.2.2 The Random-Argument Function
- 8.2.3 The Coin-Toss Function
- 8.2.4 The Random-In-Range Function
- 8.2.5 The Random-In-Ranges Function
- 8.2.6 The Random-Range Function
- 8.2.7 The Randomize-Array Function
- 8.2.8 The Random-Array Function

8.3 Generics

- 8.3.1 The Random-Element Generic
- 8.3.2 The Shuffle Generic

The Sequence Package

- 9.1.1 The Arefable? Macro
- 9.1.2 The NConcF Macro
- 9.1.3 The Nthable? Macro
- 9.1.4 The Set-NthCdr Macro

9.2 Functions

- 9.2.1 The Array-Values Function
- 9.2.2 The Nth-From-End Function
- 9.2.3 The Sequence? Function
- 9.2.4 The Empty-Sequence? Function
- 9.2.5 The Join-Symbol-To-All-Following Function
- 9.2.6 The Join-Symbol-To-All-Preceeding Function
- 9.2.7 The List-To-Vector Function
- 9.2.8 The Set-Equal Function
- 9.2.9 The Simple-Vector-To-List Function
- 9.2.10 The Sort-Order Function
- 9.2.11 The The-Last Function
- 9.2.12 The Vector-To-List Function

9.3 Generics

- 9.3.1 The Best Generic
- 9.3.2 The Minimum Generic
- 9.3.3 The Minimum? Generic
- 9.3.4 The Maximum Generic

The String Package

The String package contains useful tools for working with strings.

10.1 Functions

10.1.1 The Character-Range Function

The character-range function returns a list of characters from the *start* to the *end* character. Note that this is returning a list, not a string.

Syntax

```
(character-range start\ end) \Longrightarrow '(start\ ...\ end)
```

Arguments and Values

Start The character to start the range with, inclusive.

End The character to end the range with, inclusive.

Examples

```
(character-range #\a #\e) \Longrightarrow '(#\a #\b #\c #\d #\e) (character-range #\e #\a) \Longrightarrow '(#\a #\b #\c #\d #\e)
```

10.1.2 The Character-Ranges Function

The character-ranges function is a convenience wrapper for character-range function, concatenating several calls and making the resultant list contain only unique instances.

Syntax

```
(character-ranges start_1 \ end_1 \ldots \Longrightarrow '(character_1 \ldots)
```

Arguments and Values

 $Start_n$ The character to start the nth range with, inclusive.

 End_n The character to end the nth range with, inclusive.

Examples

```
(character-ranges #\a #\c #\x #\z) \Longrightarrow '(#\a #\b #\c #\x #\y #\z) (character-ranges #\a #\c #\a #\c) \Longrightarrow '(#\a #\b #\c)
```

- 10.1.3 The Escape-Tildes Function
- 10.1.4 The Replace-Char Function
- 10.1.5 The StrCat Function
- 10.1.6 The StrMult Function
- 10.1.7 The String-Join Function
- 10.1.8 The Stringify Function
- 10.1.9 The To-String Function
- 10.2 Methods
- 10.2.1 The Split Methods

The Time-Series Package

11.1	Ma	cros
	7 21	_

- 11.1.1 The Snap-Index Macro
- 11.2 Functions
- 11.2.1 The Array-Raster-Line Function
- 11.2.2 The Distance Function
- 11.2.3 The Norm Function
- 11.2.4 The Raster-Line Function
- 11.2.5 The Similar-Points? Function
- 11.2.6 The Time-Series? Function
- 11.2.7 The Time-Multiseries? Function
- 11.2.8 The TMSref Function
- 11.2.9 The TMS-Dimensions Function
- 11.2.10 The TMS-Raster-Line Function
- 11.2.11 The TMS-Values Function
- 11.3 Types
- 11.3.1 The Time-Multiseries Type

The Truth Package

- 12.1 Functions
- 12.1.1 The [?] Function
- 12.1.2 The Toggle Function
- 12.2 Generics
- 12.2.1 The? Generic

The Sigma Package

- 13.1 Variables
- 13.1.1 The *Sigma-Packages* Variable
- 13.2 Functions
- 13.2.1 The Use-All-Sigma Function