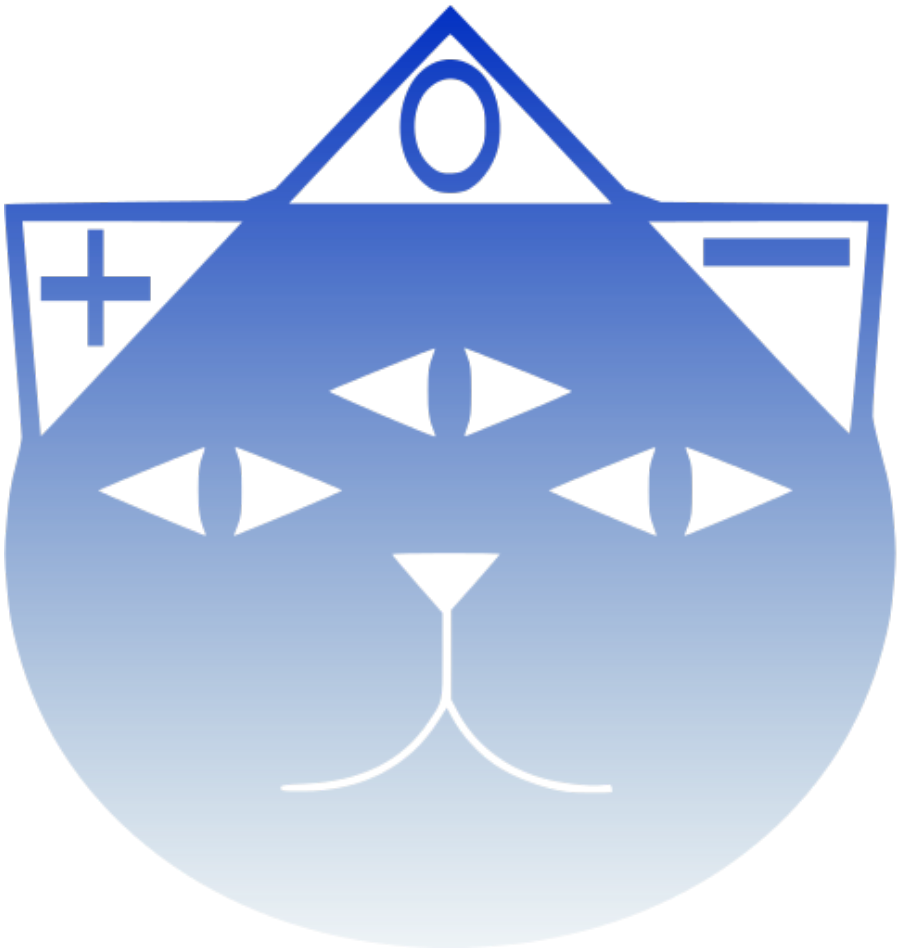

libbaltcalc Usage and API Manual

libbaltcalc v3.3.0

And companion libraries.

Part of the SBTCVM Project.

Originally Written By:

Thomas Leathers

Table of Contents

History

v1.0 initial version of manual

v1.1 updates and clarifications.

v1.2 document tritchop & tritmerge functions

v1.3 document libbal27.py companion library.

v1.4 document libbal9.py Nonary companion library.

Introduction

libbaltcalc is the mathematics backbone of the SBTCVM project. It provides the very core mathematics operations that make everything from the assembler, to the calculator, to the virtual machine itself, work at all. In this manual, you will find the official formal documentation for this ever important component.

Libbaltcalc API

Older string-based Functions:

Note: BTTODEC and DECTOBT are also used by the newer btint API.

BTTODEC(btinteger)	Convert Balanced ternary integer string to decimal
DECTOBT(decinteger)	Convert Decimal integer to balanced ternary string
btmul(numA, numB)	Multiply two balanced ternary integer strings
btadd(numA, numB)	Add two balanced ternary integer strings
btsub(numA, numB)	Subtract two balanced ternary integer strings
btdivcpu(numA, numB)	Divide two balanced ternary integer strings. Returns “ZDIV” upon zero division.
btdiv(numA, numB)	Divide two balanced ternary integer strings.
BTINVERT(numtoinvert)	Invert balanced ternary integer string to its opposite. i.e. “-+” would invert to “+-”
progbiasand(polarset, inpA, inpB)	A "programmable" biased and gate. returns a positive if: input a (inpA) = input b (inpB) = polarity line (polarset) else it returns zero
polarityand(inpA, inpB)	A polarized and gate returns + if both input A (inpA) and input B (inpB) = + returns - if both input A (inpA) and input B (inpB) = - otherwise it returns zero
progbiasor(polarset, inpA, inpB)	A programmable biased or gate returns "+" if either or both inputs equal the polarity line (polarset) else it returns "0"
progbiasnor(polarset, inpA, inpB)	A programmable biased orn gate returns "+" if either equal the polarity line (polarset) returns "0" either if neither or both inputs equal the polarity line (polarset)

Decimal int functions:

These functions work with decimal integers, in both input and output:

mpi(length_of_trits)	`mpi=(((3^n)-1)/2)`	Calculate Maximum Positive Integer of a given length of trits
mni(length_of_trits)	`mni=-(((3^n)-1)/2)`	Calculate Maximum Negative Integer of a given length of trits
mcv(length_of_trits)	`mcv=(3^n)`	Calculate Maximum Combinations Value of a given length of trits

tritchop(decimal_int, split_point)	`print(tritchop(40), 3) → [13, 1]`
	
	`Converted to Ternary:`
	`input is ++++`
	`output is [+++, +]`
		Returns a list of two decimal ints, split logically at the given split_point… e.g.
		
		(split_point refers to what the first trit-index of the length)

tritmerge(decimal_int_upper, decimal_int_lower, length_of_lower)	`print(tritmerge(1, 13, 3) → 40`
	
	`Converted To ternary:`
	`upper Input is +`
	`lower Input is +++,`
	`with length of 3`
	`output is ++++`
		When given two decimal integers, and the logical trit length of the ‘lower’ integer, (the one you want to be least-significant in the resulting integer), it returns the merged value as a decimal int.

btint class:

Syntax:

int1=btint("+-")	+0- notation is supported, and used by default.
int2=btint("pn")	p0n notation is supported.
int3=btint(2)	
int4=btint(int2)	passing a btint instance to copy the value from is supported.

methods

method	example/description	notes
invert()		returns the balanced ternary inversion. i.e. -+0- becomes +-0+
dec()		explicitly returns a normal python integer
bt()		explicitly returns balanced ternary integer in string form, using the +0- notation.
p0n()		explicitly returns balanced ternary integer in string form using the p0n notation. useful for operations needing an alphanumeric string, or where + and - cant be used.
copy()	btintC=btintA.copy()	return a new btint instance with an identical value.
changeval(newval)	btintC.changeval("+-") btintC.changeval("pn") btintC.changeval(2) btintC.changeval(btintA)	changes the internal value of a btint class instance.
bttrunk(tritlen)	print btintA.bttrunk(12)	preforms string-based ternary trit truncation and also pads resulting balanced ternary integer string with zeros. primarily useful for logic simulations.
dectrunk(tritlen)	btintC=btintA.dectrunk(12)	preforms mpi/mni limiting truncation

Supported built-in methods:

Note: mixed operations with python integers are supported, and will return a btint object.

method	example/description	notes
string	str(btintA) print(btintA)	(returns balanced ternary integer in string form.)
integer	int(btintA)	(returns a normal python integer)
add	btintC=btintA+btintB btintA+=btintB	
subtract	btintC=btintA-btintB btintA-=btintB	
Floor division	btintC=btintA//btintB btintA//=btintB	(limited to integers only as floating point operations are not yet supported)
multiply	btintC=btintA*btintB btintA*=btintB	
absolute	btintC=abs(btintA)	
negative	btintC=-btintA	
positive	btintC=+btintA	
invert	btintC=~btintA	(returns the tritwise inversion. i.e. -+0- becomes +-0+)
Length	len(btintA)	get the length in trits of a balanced ternary integer.
Comparisons (works with both python 2 AND 3.	supports common comparison operators (i.e. ==, >=, >, <=, <, !=) if btintA>=btintB:	

Libbal27 API

Libbal27.py Implements some basic functions for working with Balanced Heptavigesimal/Balanced Septemvigesimal, or Balanced Base 27. Its main use in balanced ternary is more efficient display of ternary data in text formats. Such as memory dump utilities.

Balanced Base 27 Notation Symbol Table

Balanced 27	Decimal	Balanced Ternary p0n	Balanced Ternary	Balanced 27	Decimal	Balanced Ternary p0n	Balanced Ternary
D	13	ppp	+++	Z	-1	n	-
C	12	pp0	++0	Y	-2	np	-+
B	11	ppn	++-	X	-3	n0	-0
A	10	p0p	+0+	W	-4	nn	--
9	9	p00	+00	V	-5	npp	-++
8	8	p0n	+0-	U	-6	np0	-+0
7	7	pnp	+-+	T	-7	npn	-+-
6	6	pn0	+-0	S	-8	n0p	-0+
5	5	pnn	+--	R	-9	n00	-00
4	4	pp	++	Q	-10	n0n	-0-
3	3	p0	+0	P	-11	nnp	--+
2	2	pn	+-	N	-12	nn0	--0
1	1	p	+	M	-13	nnn	---
0	0	0	0			0	

Functions

b27toint(b27_string)	Accepts a Balanced Base 27 string using the above notation, returns decimal integer.
inttob27(decimal_int)	Accepts a decimal integer, returns a Balanced Base 27 string using the above notation.
b27chop(decimal_int, split_point)	split_point is where to split the number in base 27 digit position.
b27merge(decimal_int_upper, decimal_int_lower, length_of_lower)	Upper is merged with lower (with upper being most significant mathematically). length_of_lower is a base 27 digit position.

Libbal9 API

Libbal9.py Implements some basic functions for working with Balanced Nonary, or Balanced Base 9. While it is lesser used than Septemvigesimal, its supported.

Balanced Nonary Notation Symbol Table

Balanced Nonary	Decimal	Balanced Ternary (n0p)	Balanced Ternary (-0+)
4	4	pp	++
3	3	p0	+0
2	2	pn	+-
1	1	p	+
0	0	0	0
Z	-1	n	-
Y	-2	np	-+
X	-3	n0	-0
W	-4	nn	--

Functions

b9toint(b9_string)	Accepts a Balanced Nonary string using the above notation, returns decimal integer.
inttob9(decimal_int)	Accepts a decimal integer, returns a Balanced Nonary string using the above notation.
b9chop(decimal_int, split_point)	split_point is where to split the number in Nonary digit position.
b9merge(decimal_int_upper, decimal_int_lower, length_of_lower)	Upper is merged with lower (with upper being most significant mathematically). length_of_lower is a Nonary digit position.

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