# COLSUM - Column Computation Tool

0.6.2

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Analyze, compute and transform numerical data tables of unlimited length

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# 3 Module Index

## 3.1 Modules

Here is a list of all modules:



# 4 Data Structure Index

## 4.1 Data Structures

Here are the data structures with brief descriptions:

# 5 File Index

## 5.1 File List

Here is a list of all files with brief descriptions:



# 6 Module Documentation

## 6.1 colsum

Analyze, compute and transform numerical data tables of unlimited length

### 6.1.1 SYNOPSIS

```
Usage: colsum.exe [[-i] <infile>] [-o <outfile>] [-v#] [-r <ini-file>] [-h] [-t] [-d]
    [-s<save-ini-file>] [-k] [-f%<format-specification>] [c|C<column>:#1[:#2]]
    {[<column>] [=[+|-|*|x|/|^|a|&|n|||o][+|-]#.#|S<column>[^]] [+|*]} {...} ...
```

### 6.1.2 DESCRIPTION

Colsum extracts columns with numerical values from an input stream, does some computations on them and outputs the results in a well-defined, formatted form to an output stream.

Colsum is designed to be used as a filter. Input- and output stream can both be a file, pipe or standard I/O channel. You can easily do more complex computations by combining colsum calls with different instructions in a pipeline.

#### 6.1.2.1 Basic operations and options:

1. Compute number of values, sum, maximum, minimum, arithmetic mean and standard deviation based on one result value per non-empty input file row

2. Return a "clean" selection of input columns and/or values computed from them

3. Output format for numerical values is decimal float by default, but can be octal or hexadecimal depending on output option "-v" or specified as "printf"-Style format string (see 'man 3 printf')

4. Every input column can be transformed by one mathematical operation:

- add/substract a constant value or value of another column
- multiply/divide by a constant value or value of another column
- raise to power, given exponent

### 6.1.3 OPTIONS

Use command **"colsum -h"**:

```
option v: verbosity level( 0-10), Default=2
option f: output-format (C-style)
option h: help (set verbosity to 0 for configuration dump!)
option i: infile to read from instead of <stdin>
option o: outfile to write to instead of <stdout>
option r: configuration file
option s: save configuration to given filename or configuration file where configuration
  was read from or default file (when without argument)
option k: collect comments for saved configuration file (see -s)
option t: output current time
option d: output current date
mathematical expression in the form "(expr)" or "=expr" must follow the
  column-no. to apply to, if given
+ (default) or * after col-no. is operator between column's
  result and stack
c: computation and output only for lines where the specified
  column's value is #1 or between #1 and #2
Default column=1, column 0 holds the row no. 1-.. (only significant lines)
blank lines and comments(#) will be ignored (unless -s and -k are set)!
```

### 6.1.4 VERSION

**Version:**

0.6.2 ($Id: colsum.c 46 2009-02-01 20:12:09Z stefan $)

### 6.1.5 AUTHOR

**Author:**

Stefan Habermehl <stefan.habermehl@mcff.de>

### 6.1.6 COPYRIGHT

**Copyright:**

(c) 1994,1995,1996,2000,2004,2008,2009 Stefan Habermehl

**License:**

GNU General Public License v3 or later, see **CFLIB License**

### 6.1.7 SEE ALSO

**Uses:**

Flexible Configuration Library <http://cflib.berlios.de>

## 6.2 Flexible Configuration Library

The open source C library **CFLIB** provides to colsum :

- configuration interface

- command line parsing
- configuration files handling
- user interface
- string utilities

**See also:**

CFLIB Project Homepage http://cflib.berlios.de
CFLIB Library Documentation http://svn.berlios.de/svnroot/repos/cflib/trunk/cflib/doc/htm

We always include the

- CFLIB **header file cf.h** matching the **Patchlevel** of the
- CFLIB **library file *libcf.a*** (or other name) to be linked (see **Compilation and Development** of CFLIB).

Colsum uses the following CFLIB functions and function *macros:*

- **cfinit()**
- **cfsave()**
- **cfputstr()**
- *cfgetstr()*
- *cfgetflag()*
- *cfgetnum()*
- *cfgetres()*
- **cfgeterr()**
- **cfgetusg()**
- **cfdump()**
- **EatWhiteSpace()**
- **RemoveCR()**

## 6.3 User Interface and Error Codes

**Defines**

- #define ERR_HLP 0

  *Detailed HeLP on options.*

- #define ERR_USG 1

  *USaGge Error.*

- #define ERR_VERB 2

*Unknown VERBosity Level.*

- #define ERR_MATH 3
  *MATHematical Error.*
- #define ERR_LIM 4
  *LIMit Violation Error.*
- #define ERR_ACC 5
  *ACCess Error.*
- #define ERR_ARG 6
  *ARGument Error.*
- #define USG_DEFAULT 0
  *Default Usage Message.*
- #define USG_VERSION 1
  *Show Version.*
- #define USG_LICENSE 2
  *Show License.*
- #define USG_ERRORS 4
  *Show errors.*
- #define USG_DUMP 8
  *Dump configuration.*

### Functions

- void usage (int code, char *str, int modemask)
  *Output a command line usage message and* **end program execution**.

## 6.3.1 Define Documentation

### 6.3.1.1 #define ERR_HLP 0

Detailed HeLP on options.

Definition at line 123 of file colsum.h.

### 6.3.1.2 #define ERR_USG 1

USaGge Error.

Definition at line 124 of file colsum.h.

#### 6.3.1.3 #define ERR_VERB 2

Unknown VERBosity Level.
Definition at line 125 of file colsum.h.

#### 6.3.1.4 #define ERR_MATH 3

MATHematical Error.
Definition at line 126 of file colsum.h.

#### 6.3.1.5 #define ERR_LIM 4

LIMit Violation Error.
Definition at line 127 of file colsum.h.

#### 6.3.1.6 #define ERR_ACC 5

ACCess Error.
Definition at line 128 of file colsum.h.

#### 6.3.1.7 #define ERR_ARG 6

ARGument Error.
Definition at line 129 of file colsum.h.

#### 6.3.1.8 #define USG_DEFAULT 0

Default Usage Message.
Definition at line 132 of file colsum.h.

#### 6.3.1.9 #define USG_VERSION 1

Show Version.
Definition at line 133 of file colsum.h.

#### 6.3.1.10 #define USG_LICENSE 2

Show License.

Definition at line 134 of file colsum.h.

#### 6.3.1.11 #define USG_ERRORS 4

Show errors.

Definition at line 135 of file colsum.h.

#### 6.3.1.12 #define USG_DUMP 8

Dump configuration.

Definition at line 136 of file colsum.h.

### 6.3.2 Function Documentation

#### 6.3.2.1 void usage (int *code*, char * *str*, int *modemask*)

Output a command line usage message and **end program execution**.

**Parameters:**

***code*** **Colsum** or **CFLIB** error code

***str*** Error message

***modemask*** Bitmask with output features selection

- Init CFLIB Error Code
- Init I/O String Buffer of maximum length **CF_MAXERRSTR**
- Set Output Mode Mask to USG_DEFAULT if required
- Output all errors in list
- Program Version and License
- Always show Usage Synopsis and ...
- ERR_USG nothing more
- ERR_HLP Detailed HeLP on options.

- Trigger USG_DUMP with option **"-v0"** or **"-v+"**
- ERR_ACC ACCess Error.
- ERR_VERB Unknown VERBosity Level.
- ERR_MATH MATHematical Error.
- ERR_LIM LIMit Violation Error.
- ERR_ARG ARGument Error.
- Configuration error <0 from Flexible Configuration Library
- Dump configuration. if USG_DUMP is set

Definition at line 57 of file colmod.c.

References CF_MAXERRSTR, cfdump(), cfgeterr(), cfgetnum, cfgetstr, cfgetusg(), DEF_VERB, ERR_ACC, ERR_ARG, ERR_HLP, ERR_LIM, ERR_MATH, ERR_USG, ERR_VERB, USG_DEFAULT, USG_DUMP, USG_ERRORS, USG_LICENSE, USG_VERSION, VERSION, VMAX, and VMIN.

## 6.4 Parse Mathematical Operation Instructions

**Defines**

- #define OP_DIV -2
  *Divide.*
- #define OP_MUL -1
  *Multiply.*
- #define OP_NONE 0
  *No Operation.*
- #define OP_ADD 1
  *Add.*
- #define OP_SUB 2
  *Substract.*
- #define OP_POWE 3
  *Raise to Power, Exponent.*
- #define OP_POWB 4
  *Raise to Power, Base.*
- #define OP_ABS 5
  *Absolute.*

- #define OP_AND 6

  *Bitwise And.*

- #define OP_OR 7

  *Bitwise Or.*

**Functions**

- void parse_mathexp (int sind, char *expr, COLUMN *C, int *max_column)

### 6.4.1 Define Documentation

#### 6.4.1.1 #define OP_DIV -2

Divide.

Definition at line 143 of file colsum.h.

#### 6.4.1.2 #define OP_MUL -1

Multiply.

Definition at line 144 of file colsum.h.

#### 6.4.1.3 #define OP_NONE 0

No Operation.

Definition at line 145 of file colsum.h.

#### 6.4.1.4 #define OP_ADD 1

Add.

Definition at line 146 of file colsum.h.

#### 6.4.1.5 #define OP_SUB 2

Substract.

Definition at line 147 of file colsum.h.

#### 6.4.1.6 #define OP_POWE 3

Raise to Power, Exponent.

Definition at line 148 of file colsum.h.

#### 6.4.1.7 #define OP_POWB 4

Raise to Power, Base.

Definition at line 149 of file colsum.h.

#### 6.4.1.8 #define OP_ABS 5

Absolute.

Definition at line 150 of file colsum.h.

#### 6.4.1.9 #define OP_AND 6

Bitwise And.

Definition at line 151 of file colsum.h.

#### 6.4.1.10 #define OP_OR 7

Bitwise Or.

Definition at line 152 of file colsum.h.

### 6.4.2 Function Documentation

#### 6.4.2.1 void parse_mathexp (int *sind*, char * *expr*, COLUMN * *C*, int * *max_column*)

**Parameters:**

***sind*** Index

***expr*** Expression

***C*** Column object

***max_column*** Max Column

- Refuse wrongly placed or empty expressions

- Detect kind of mathematical operation
- Get factor's sign
- Get value for operation

Definition at line 176 of file colmod.c.

References ERR_MATH, COLUMN::faktor, NULL, OP_ABS, OP_ADD, OP_AND, OP_DIV, OP_MUL, OP_OR, OP_POWB, OP_POWE, OP_SUB, COLUMN::operation, usage(), USG_DEFAULT, COLUMN::valsp, and COLUMN::value.

# 7 Data Structure Documentation

## 7.1 COLRESULT Struct Reference

Colsum Result Structure for an input column or aggregate.

`#include <colsum.h>`

### Data Fields

- int count
  *count significant lines*
- int scount
  *count ?*
- double sum
  *stack sum*
- double qsum
  *stack square sum*
- double max
  *stack maximum*
- double min
  *stack minimum*
- int limcol
  *no.*
- double limlow
  *lower limit*
- double limupp
  *upper limit*

### 7.1.1 Detailed Description

Colsum Result Structure for an input column or aggregate.

An input table will be represented by an array of SPAMAX COLUMN structures.

Definition at line 183 of file colsum.h.

### 7.1.2 Field Documentation

#### 7.1.2.1 int COLRESULT::count

count significant lines

Definition at line 184 of file colsum.h.

#### 7.1.2.2 int COLRESULT::scount

count ?

Definition at line 185 of file colsum.h.

#### 7.1.2.3 double COLRESULT::sum

stack sum

Definition at line 186 of file colsum.h.

#### 7.1.2.4 double COLRESULT::qsum

stack square sum

Definition at line 187 of file colsum.h.

#### 7.1.2.5 double COLRESULT::max

stack maximum

Definition at line 188 of file colsum.h.

#### 7.1.2.6 double COLRESULT::min

stack minimum

Definition at line 189 of file colsum.h.

#### 7.1.2.7 int COLRESULT::limcol

no.

of column to check for limiting condition

Definition at line 190 of file colsum.h.

#### 7.1.2.8 double COLRESULT::limlow

lower limit

Definition at line 191 of file colsum.h.

#### 7.1.2.9 double COLRESULT::limupp

upper limit

Definition at line 192 of file colsum.h.

## 7.2 COLUMN Struct Reference

Column Structure.

`#include <colsum.h>`

### Data Fields

- int column
  *input column-no.*
- char * spoi
  *pointer to input column in line string*
- int operation
  *kind of operation to apply to that column*
- double value
  *constant value for operation*
- int valsp
  *no.*
- double faktor
  *factor for operation*
- double item

*column's result*

- char * sop

  *kind of stack operation: C[0].item=C[0].item +|* C[i].item*

### 7.2.1 Detailed Description

Column Structure.

An input table will be represented by an array of SPAMAX column structures (see define above).

The first element (index `0`) of the columns array holds the current/last result of computations for one row, while all the others (`index` = `1` - SPAMAX) refer to corresponding columns in input.

Definition at line 166 of file colsum.h.

### 7.2.2 Field Documentation

#### 7.2.2.1 int COLUMN::column

input column-no.

Definition at line 167 of file colsum.h.

#### 7.2.2.2 char* COLUMN::spoi

pointer to input column in line string

Definition at line 168 of file colsum.h.

#### 7.2.2.3 int COLUMN::operation

kind of operation to apply to that column

Definition at line 169 of file colsum.h.

#### 7.2.2.4 double COLUMN::value

constant value for operation

Definition at line 170 of file colsum.h.

#### 7.2.2.5 int COLUMN::valsp

no.

of column to use instead of constant value for operation

Definition at line 171 of file colsum.h.

#### 7.2.2.6 double COLUMN::faktor

factor for operation

Definition at line 172 of file colsum.h.

#### 7.2.2.7 double COLUMN::item

column's result

Definition at line 173 of file colsum.h.

#### 7.2.2.8 char* COLUMN::sop

kind of stack operation: C[0].item=C[0].item +|* C[i].item

Definition at line 174 of file colsum.h.

# 8 File Documentation

## 8.1 colmod.c File Reference

Utility functions for colsum.c.

```
#include "colsum.h"
```

### Functions

- void usage (int code, char *str, int modemask)
  *Output a command line usage message and* **end program execution**.
- void parse_mathexp (int sind, char *expr, COLUMN *C, int *max_column)

### 8.1.1 Detailed Description

Utility functions for colsum.c.

**Version:**

0.6.2
SVN: $Id: colmod.c 46 2009-02-01 20:12:09Z stefan $

**Author:**

Stefan Habermehl <stefan.habermehl@mcff.de>

**Copyright:**

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**License:**

http://www.gnu.org/licenses GNU General Public License v3 or later

**Uses:**

Flexible Configuration Library <http://cflib.berlios.de>

Definition in file colmod.c.

## 8.2 colsum.c File Reference

Main Program colsum.

```
#include "colsum.h"
```

### Functions

- int main (int argc, char *argv[ ])

### 8.2.1 Detailed Description

Main Program colsum.

Definition in file colsum.c.

### 8.2.2 Function Documentation

#### 8.2.2.1 main (int *argc*, char * *argv*[ ])

**Parameters:**

***argc*** Command Line Argument Count

***argv*** Command Line Argument Array

**Returns:**

- 0 : on normal, error free execution
- CFLIB Error Code, see **Error Handling**
- Colsum Error Code, see User Interface and Error Codes
- **verbosity** = 0 : Numerical Result of Computation (e.g. for use in shell scripts!)

Declare Array of COLUMN objects

Declare Global Result Structure COLRESULT

Set up CFLIB **Configuration Initializer**

Call **cfinit()** to initialize configuration database

Call usage() on error or help request

Initialize COLUMN and COLRESULT structures

Check output **verbosity** level

Get configuration parameters **infile**, **outfile**, **COLSUM_FORMAT**, **COLSUM_DEFCOL**, **save_comments** and **COLSUM_SAVEINI** from cofiguration

Get residual command line arguments (Colsum instructions)

- operator between actual column's result and stack
- mathematical expression to apply to current column to give this column's result
- numerical range condition for the specified column

Open input and output files unless `stdin` or `stdout` are used

Only one column: assume stack mode "adding". No stack operation at all: "for all"

Main loop over input stream:

- Comment line:
  - no computations
  - include in configuration if program parameter **save_comments** has been set, will be dumped on **cfsave()** call
- Get column pointers and put a string-end behind each column
- Go through list of columns appying operations and add to or multiply with stack
- Ignore line when specified column's value is outside range limits
- Loop over columns in current line
  - Check column's existence
  - Get column's value
  - Apply operation if required
  - Update Stack value
- Update Result Stack
- Line output

Result Output

Save configuration to file (new or private setfile)

Definition at line 137 of file colsum.c.

References CF_CONCAT, CF_DATE, CF_FLAG, CF_FLAG_OFF, CF_IGN_ENV, CF_INT, CF_LAST, CF_NOSAVE, CF_SET_ENV, CF_SET_PUT, CF_SETFILE, CF_SYS_SETFILE, CF_TIME, CF_USAGE, CFE_RNF, cfgetflag, cfgetnum, cfgetres, cfgetstr, cfinit(), cfputstr(), cfsave(), COLUMN::column, COLRESULT::count, DEF_COLUMN, DEF_FORMAT, DEF_USAGE, DEF_VERB, EatWhiteSpace(), ERR_ACC, ERR_ARG, ERR_HLP, ERR_LIM, ERR_VERB, COLUMN::faktor, FALSE, COLUMN::item, COLRESULT::limcol, COLRESULT::limlow, COLRESULT::limupp, COLRESULT::max, MAXFORM, MAXLINE, COLRESULT::min, NULL, OP_ABS, OP_ADD, OP_AND, OP_DIV, OP_MUL, OP_NONE, OP_OR, OP_POWB, OP_POWE, OP_SUB, COLUMN::operation, parse_mathexp(), COLRESULT::qsum, RemoveCR(), COLRESULT::scount, COLUMN::sop, SPAMAX, COLUMN::spoi, COLRESULT::sum, TRUE, usage(), USG_DEFAULT, USG_DUMP, USG_ERRORS, USG_LICENSE, USG_VERSION, COLUMN::valsp, COLUMN::value, VMAX, and VMIN.

## 8.3 colsum.h File Reference

Header file for colsum.c and colmod.c.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <strings.h>
#include <ctype.h>
#include <math.h>
#include "cf.h"
```

### Data Structures

- struct COLUMN

  *Column Structure.*

- struct COLRESULT

  *Colsum Result Structure for an input column or aggregate.*

### Defines

- #define VERSION "colsum 0.6.2\n(c) Stefan Habermehl 1995-2009"

  *Colsum Version String.*

- #define MAXLINE 10240

  *Maximum Input Line Length.*

- #define MAXFORM 100

  *Maximum Format Length.*

- #define MAXARG 60

  *Maximum Argument Length.*

- #define SPAMAX 50

  *Maximum Column Number.*

- #define VMIN 0

  *Minimal Verbosity Level.*

- #define VMAX 10

  *Maximal Verbosity Level.*

- #define DEF_VERB "2"

  *Default Verbosity Level.*

- #define DEF_COLUMN "1"

  *Default Column No.*

- #define DEF_FORMAT "%-15.15g"

  *Default Output Format.*

- #define DEF_USAGE "Usage: %s \[[-i] <infile>] [-o <outfile>] [-v#] [-r <ini-file>] [-h] [-t] [-d]\n\\t[-s<save-ini-file>] [-k] [-f%%<format-specification>] [c|C<column>:#1[:#2]]\n\\t{[<column>] [=[+|-|∗|x|/|^|a|&|n|||o][+|-]#.#|S<column>[^]] [+|∗]} {...} ...\n"

  *Usage Message Format String.*

- #define TRUE '\1'

  *Boolean True as Char 1 (1 Byte).*

- #define FALSE '\0'

  *Boolean False as Char 0 (1 Byte).*

- #define ERR_HLP 0

  *Detailed HeLP on options.*

- #define ERR_USG 1

  *USaGge Error.*

- #define ERR_VERB 2

  *Unknown VERBosity Level.*

- #define ERR_MATH 3

  *MATHematical Error.*

- #define ERR_LIM 4

  *LIMit Violation Error.*

- #define ERR_ACC 5

  *ACCess Error.*

- #define ERR_ARG 6
  *ARGument Error.*
- #define USG_DEFAULT 0
  *Default Usage Message.*
- #define USG_VERSION 1
  *Show Version.*
- #define USG_LICENSE 2
  *Show License.*
- #define USG_ERRORS 4
  *Show errors.*
- #define USG_DUMP 8
  *Dump configuration.*
- #define OP_DIV -2
  *Divide.*
- #define OP_MUL -1
  *Multiply.*
- #define OP_NONE 0
  *No Operation.*
- #define OP_ADD 1
  *Add.*
- #define OP_SUB 2
  *Substract.*
- #define OP_POWE 3
  *Raise to Power, Exponent.*
- #define OP_POWB 4
  *Raise to Power, Base.*
- #define OP_ABS 5
  *Absolute.*
- #define OP_AND 6
  *Bitwise And.*
- #define OP_OR 7
  *Bitwise Or.*

### Functions

- void usage (int code, char *str, int modemask)

  *Output a command line usage message and* **end program execution**.

- void parse_mathexp (int sind, char *expr, COLUMN *C, int *max_column)

### 8.3.1 Detailed Description

Header file for colsum.c and colmod.c.

- Include Flexible Configuration Library Header
- General Settings
- Error Codes
- Output Modes for usage()
- Mathematical Operation Instruction Codes
- Data Structure Definitions
- Function Prototypes

**Version:**

0.6.2
SVN: $Id: colsum.h 46 2009-02-01 20:12:09Z stefan $

**Author:**

Stefan Habermehl <stefan.habermehl@mcff.de>

**Copyright:**

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**License:**

http://www.gnu.org/licenses GNU General Public License v3 or later

**Uses:**

Flexible Configuration Library <http://cflib.berlios.de>

Definition in file colsum.h.

### 8.3.2 Define Documentation

#### 8.3.2.1 #define VERSION "colsum 0.6.2\n(c) Stefan Habermehl 1995-2009"

Colsum Version String.

Definition at line 95 of file colsum.h.

#### 8.3.2.2 #define MAXLINE 10240

Maximum Input Line Length.
Definition at line 97 of file colsum.h.

#### 8.3.2.3 #define MAXFORM 100

Maximum Format Length.
Definition at line 98 of file colsum.h.

#### 8.3.2.4 #define MAXARG 60

Maximum Argument Length.
Definition at line 99 of file colsum.h.

#### 8.3.2.5 #define SPAMAX 50

Maximum Column Number.
Definition at line 100 of file colsum.h.

#### 8.3.2.6 #define VMIN 0

Minimal Verbosity Level.
Definition at line 102 of file colsum.h.

#### 8.3.2.7 #define VMAX 10

Maximal Verbosity Level.
Definition at line 103 of file colsum.h.

#### 8.3.2.8 #define DEF_VERB "2"

Default Verbosity Level.
Definition at line 104 of file colsum.h.

#### 8.3.2.9 #define DEF_COLUMN "1"

Default Column No.

Definition at line 105 of file colsum.h.

#### 8.3.2.10 #define DEF_FORMAT "%-15.15g"

Default Output Format.

Definition at line 106 of file colsum.h.

#### 8.3.2.11 #define DEF_USAGE "Usage: %s \[[-i] <infile>] [-o <outfile>] [-v#] [-r <ini-file>] [-h] [-t] [-d]\n\\t[-s<save-ini-file>] [-k] [-f%%<format-specification>] [c|C<column>:#1[:#2]]\n\\t{[<column>] [=[+|-|*|x|/|^|a|&|n||o][+|-]#.#|S<column>[^]] [+|*]} {...} ...\n"

Usage Message Format String.

Definition at line 108 of file colsum.h.

#### 8.3.2.12 #define TRUE '\1'

Boolean True as Char 1 (1 Byte).

Definition at line 115 of file colsum.h.

#### 8.3.2.13 #define FALSE '\0'

Boolean False as Char 0 (1 Byte).

Definition at line 116 of file colsum.h.

# Index