Package 'goalprog'

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Description A collection of functions to solve weighted and
lexicographical goal programming problems as specified by Lee (1972) and Ignizio (1976).

Title Weighted and lexicographical goal programming and optimization

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R topics documented:

`achievements` *Ignizio (1976) Example Data Sets*

Description

The data set is a data frame that defines the achievement goals $g_1(n,p), g_2(n,p), ..., g_K(n,p)$. The columns depend on the formulation of the goal programming problem.

For a lexicographical goal programming problem, the data frame has four named columns. The first column is called 'objective' and it contains the index for a particular problem object. The second column is called 'priority' and it is the level to which the row (i.e. objective) is assigned. The third column is called 'p' and it contains the weight associated with the positive deviation variable. The fourth column is called 'n' and it contains the weight associated with the negative deviation variable. An objective can appear in two rows if each deviation variable is to be assigned to a different priority level.

For a weighted goal programming problem, the data frame has five named columns. The first four columns are identical to the columns in the data frame for a lexicgraphical goal programming problem. The fifth column is called 'w' and it is the weight associated with the specified priority level.

Format

The data set is a data frame.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books.

See Also

ignizio.datasets

`calc.ta` *Calculate achievement function for the k-th priority level*

Description

This function calculcates the achievement function for the k-th priority level.

Usage

```
calc.ta(tab, k)
```

Arguments

`tab`	An object of class 'llgptab' that is the modified simplex tableau
`k`	an integer priority level

Value

None.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

llgptab

calc.ta.k — *Calculate the achievement for the highest k priority levels*

Description

This function calcultes the achievement function for priority levels 1 through k.

Usage

```
calc.ta.k(tab, k)
```

Arguments

tab	An object of class 'llgptab' that is the modified simplex tableau
k	An integer priority level

Value

An object of class 'llgptab' in which the index rows have been updated.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

calc.ta, llgptab

calc.ti — *Calculate the k-th index row*

Description

This function calculates the index row for the k-th priority level.

Usage

```
calc.ti(tab, k)
```

Arguments

tab	An object of class 'llgptab' that is the modified simplex tableau
k	An integer priority level

Value

None.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

llgptab

---

calc.ti.k *Calculate index rows for levels 1 through k*

Description

This function calculcates the index rows for the highest k priority levels

Usage

```
calc.ti.k(tab, k)
```

Arguments

tab	An object of class 'llgptab' that is the modified simplex tableau
k	An integer priority level

Value

An object of class 'llgptab' in which the index rows have been updated.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

calc.ti, llgptab

---

check.ev.cp *Check entering variable for complementary pivoting*

Description

This function determines if the candidate non-basic variable can enter the solution basis based on complementary pivoting.

Usage

```
check.ev.cp(tab, s)
```

Arguments

tab	A list of named components that are the augmented modified simplex tableau
s	An integer index for the candidate non-basic variable

Details

This test only applies to decision variables and not to the deviation variables. It determines if there is a basic decision variable in the current solution that is in the same complementary class as the candidate decision variable. If there is, then the function returns FALSE to indicate that the candidate variable cannot be added. Otherwise, the function returns true.

Value

A boolean value TRUE or FALSE.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

check.tb *Check for negative RHS values and repair tableau*

Description

This function examines the b vector (i.e. target values). If any negative values are found, then the elements matrix is repaired and appropriate labels and vectors are exchanged.

Usage

```
check.tb(tab)
```

Arguments

tab	An object of class 'llgptab' that is the modified simplex tableau

Value

An object of class 'llgptab' in which the index rows have been updated.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

llgptab

coefficients *Ignizio (1976) Example Data Sets*

Description

The data set is a matrix of coefficients for the linear objective functions for a linear goal programming problem. The number of rows equals the number of objectives and the number columns equals the number of decision variables.

Format

The data set is a matrix.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books.

See Also

ignizio.datasets

---

dv.llgp *Determine subscript of departing variable for a LLGP problem*

Description

Determine subscript of departing variable for a lexicographical linear goal programming (LLGP) problem.

Usage

```
dv.llgp(tab, sp)
```

Arguments

tab	An object of class 'llgptab' the modified simplex tableau
sp	An integer index of non-basic variable to enter the basis

Details

Determine the row associated with the minimum $b_i/e_(i, s'$. In the event of a tie, select the row having the basic variable with the higher priority level. Designate this row as i'. The basic variable associated with row i' is the departing variable.

Value

An integer index for the variable departing the basis.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

llgptab, dv.tie

---

dv.tie *Resolve tie for departing variables*

Description

This function returns the row index of the departing variable based on which of the corresponding variables has a higher priority level.

Usage

```
dv.tie(tab, i, ip)
```

Arguments

tab	An object of class 'llgptab' that is the modified simplex tableau
i	An integer index for a departing variable
ip	An integer index for a departing variable

Value

An integer index for a departing variable.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

dv.llgp, llgptab

ev.llgp *Determine subscript of entering variable*

Description

This function returns the subscript of the non-basic variable entering the basis at the k-th priority level.

Usage

```
ev.llgp(tab, k)
```

Arguments

tab	An object of class 'llgptab' the modified simplex tableau
k	An integer priority level

Value

An integer value.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

llgptab, dv.llgp

fix.fp *Round floating point values that are with tolerance of integer*

Description

This function returns a numeric value that is integer if it is within the specified tolerance of being integer. Otherwise, the given argument value is returned.

Usage

```
fix.fp(z, tol = 1e-04)
```

Arguments

z	A numeric floating or integer value
tol	The tolerance used to determine how close argument z is an integer

Value

A numeric value.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

llgptab

Examples

```
fix.fp( 1.01 )
fix.fp( 1.001 )
fix.fp( 1.0001 )
fix.fp( 1.00001 )
fix.fp( 1.000001 )
```

---

get.variable.class *Get the variable complementarity class*

Description

This function returns an integer complementarity class for the given variable name.

Usage

```
get.variable.class(tab, variable)
```

Arguments

tab	A list of named components with the augmented modified simplex tableau
variable	A character string with the name of the variable

Details

The function uses the variable.classes component of the tableau to determine the complementarity class for the given variable. If the variable is not found then a zero value is returned.

Value

A positive integer if the variable is found; zero otherwise.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

See Also

check.ev.cp

---

ignizio.datasets *Ignizio (1976) Sample Data Sets*

Description

A collection and description of data sets that are examples found in Ignizio (1976). These are examples of goal programming problems solved using the methods described by Ignizio.

Format

Each data set is an R file that creates the coefficients matrix, the vector of target values and the data frame of achievement goals.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books.

See Also

ignizio.example.3.1, ignizio.example.3.2, ignizio.example.3.3, ignizio.example.3.5, ignizio.example.3.6, llgp

ignizio.example.3.1 *Ignizio (1976) Example Data Sets*

Description

The data set that corresponds to Example 3-1 found in Ignizio (1976). These are examples of goal programming problems solved using the methods described by author.

Find $\mathbf{x}' = [x_1, x_2]$, $\mathbf{n}' = [n_1, n_2, n_3]$ and $\mathbf{p}' = [p_1, p_2, p_3]$ that minimize $\mathbf{a} = [(2p_1), (n_2), (n_3)]$
The objectives are as follows
$10x_1 + 15x_2 + n_1 - p_1 = 40$
$100x_1 + 100x_2 + n_2 - p_2 = 1000$
$x_2 + n_3 - p_3 = 7$
$\mathbf{x}, \mathbf{n}, \mathbf{p} \geq \mathbf{0}$
The solution is $\mathbf{x}' = [4, 0]$ and $\mathbf{a} = [0, 600, 7]$

Format

The data set is an R file that creates the coefficients matrix, the vector of target values and the data frame of achievement goals.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books.

See Also

ignizio.datasets

Examples

```
data( ignizio.example.3.1 )
soln <- llgp( coefficients, targets, achievements )
```

`ignizio.example.3.2` *Ignizio (1976) Example Data Sets*

Description

The data set that corresponds to Example 3-2 found in Ignizio (1976). These are examples of goal programming problems solved using the methods described by author.

Find $\mathbf{x}' = [x_1, x_2]$, $\mathbf{n}' = [n_1, n_2, n_3, n_4]$ and $\mathbf{p}' = [p_1, p_2, p_3, p_4]$ that minimize $\mathbf{a} = [(2p_1), (n_2), (n_3)]$
The objectives are as follows
$x_1 + x_2 + n_1 - p_1 = 40$
$x_1 + x_2 + n_2 - p_2 = 100$
$x_1 + n_3 - p_3 = 30$
$x_2 + n_4 - p_4 = 15$
$\mathbf{x}, \mathbf{n}, \mathbf{p} \geq \mathbf{0}$
The solution is $\mathbf{x}' = [4, 0]$ and $\mathbf{a} = [25, 0, 60, 5]$

Format

The data set is an R file that creates the coefficients matrix, the vector of target values and the data frame of achievement goals.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books.

See Also

`ignizio.datasets`

Examples

```
data( ignizio.example.3.2 )
soln <- llgp( coefficients, targets, achievements )
```

`ignizio.example.3.3` *Ignizio (1976) Example Data Sets*

Description

The data set that corresponds to Example 3.3 found in Ignizio (1976). These are examples of goal programming problems solved using the methods described by author.

Find $\mathbf{x}' = [x_1, x_2]$, $\mathbf{n}' = [n_1, n_2, n_3, n_4]$ and $\mathbf{p}' = [p_1, p_2, p_3, p_4]$ that minimize $\mathbf{a} = [(2p_1 + 3p_2), (n_3), (p_4)]$
The objectives are as follows
$x_1 + x_2 + n_1 - p_1 = 10$
$x_1 + n_2 - p_2 = 4$
$5x_1 + 3x_2 + n_3 - p_3 = 56$
$x_1 + x_2 + n_4 - p_4 = 12$
$\mathbf{x}, \mathbf{n}, \mathbf{p} \geq \mathbf{0}$
The solution is $\mathbf{x}' = [4, 6]$ and $\mathbf{a} = [0, 18, 0]$

Format

The data set is an R file that creates the coefficients matrix, the vector of target values and the data frame of achievement goals.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books.

See Also

`ignizio.datasets`

Examples

```
data( ignizio.example.3.3 )
soln <- llgp( coefficients, targets, achievements )
```

`ignizio.example.3.5` *Ignizio (1976) Example Data Sets*

Description

The data set that corresponds to Example 3-5 found in Ignizio (1976). These are examples of goal programming problems solved using the methods described by author.

Find $\mathbf{x}' = [x_1, x_2]$, $\mathbf{n}' = [n_1, n_2, n_3, n_4]$ and $\mathbf{p}' = [p_1, p_2, p_3, p_4]$ that minimize $\mathbf{a} = [(2p_1), (n_2), (n_3)]$
The objectives are as follows
$8x_1 + 12x_2 + n_1 - p_1 = 10000$
$x_1 + 2x_2 + n_2 - p_2 = 40$
$x_1 + n_3 - p_3 = 30$
$x_2 + n_4 - p_4 = 15$
$\mathbf{x}, \mathbf{n}, \mathbf{p} \geq \mathbf{0}$
The solution is $\mathbf{x}' = [30, 15]$ and $\mathbf{a} = [0, 580, 20, 0]$

Format

The data set is an R file that creates the coefficients matrix, the vector of target values and the data frame of achievement goals.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books.

See Also

`ignizio.datasets`

Examples

```
data( ignizio.example.3.5 )
soln <- llgp( coefficients, targets, achievements )
```

`ignizio.example.3.6` *Ignizio (1976) Example Data Sets*

Description

The data set that corresponds to Example 3-6 found in Ignizio (1976). These are examples of goal programming problems solved using the methods described by author.

Find $\mathbf{x}' = [x_1, x_2, x_3, x_4]$, $\mathbf{n}' = [n_1, n_2, n_3, n_4, n_5, n_6, n_7]$ and $\mathbf{p}' = [p_1, p_2, p_3, p_4, p_5, p_6, p_7]$ that minimize $\mathbf{a} = [(2p_1), (n_2), (n_3)]$
The objectives are as follows
$x_1 + x_2 + n_1 - p_1 = 50000$
$x_1 + n_2 - p_2 = 20000$
$x_2 + n_3 - p_3 = 5000$
$x_2 + n_4 - p_4 = 15000$
$x_3 + n_5 - p_5 = 10000$
$x_4 + n_6 - p_6 = 30000$
$0.06x_1 + 0.05x_2 + 0.08x_3 + 0.07x_4 + n_7 - p_7 = 4000$
$\mathbf{x}, \mathbf{n}, \mathbf{p} \geq \mathbf{0}$
The solution is $\mathbf{x}' = [20000, 5000, 0, 25000]$ and $\mathbf{a} = [0, 0, 5000, 10800]$

Format

The data set is an R file that creates the coefficients matrix, the vector of target values and the data frame of achievement goals.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books.

See Also

`ignizio.datasets`

Examples

```
data( ignizio.example.3.6 )
soln <- llgp( coefficients, targets, achievements )
```

`llgp` *Solve an LLGP problem*

Description

Solve a lexicographical linear goal programming (LLGP) problem using a modified primal simplex algorithm.

Usage

```
llgp(coefficients, targets, achievements, maxiter = 1000, verbose = FALSE)
```

Arguments

`coefficients`	A matrix of coefficients for the linear objective functions
`targets`	A vector of target values for the objective functions
`achievements`	A data frame with the deviation variables for each objective together with the priority level
`maxiter`	The maximum number of interations with a default value of 1000
`verbose`	A logical value that determines if intermediate tableaus are to be printed

Details

The function implements the Ignizio (1976) modified simplex algorithm. When the user selects verbose=TRUE, the modified simplex tableau is printed at each iteration.

Value

An object of class 'llgp' which is a list with three named components

`tab`	An object of type 'llgptab' for the modified simplex tableau
`solution`	An object of typel 'llgpout' for the optimal solution
`converged`	A logical value that determines if the algorithm converged to the optimal solution

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

`check.tb`, `calc.ti.k`, `calc.ta.k`, `ev.llgp`, `dv.llgp`, `piv.llgp`, `llgptab`, `llgpout`

Examples

```
data( ignizio.example.3.3 )
soln <- llgp( coefficients, targets, achievements )
```

`llgpcp` *Solve an LLGP problem with complementary pivoting*

Description

Solve a lexicographical linear goal programming (LLGP) problem using a modified primal simplex algorithm with complementary pivoting of the decision variables.

Usage

```
llgpcp(coefficients, targets, achievements, variable.classes, maxiter = 1000, verbose = FALSE)
```

Arguments

`coefficients`	A matrix of coefficients for the linear objective functions
`targets`	A vector of target values for the objective functions
`achievements`	A data frame with the deviation variables for each objective together with the priority level
`variable.classes`	A data frame with the complementary class assignments for the decision variables
`maxiter`	The maximum number of interations with a default value of 1000
`verbose`	A logical value that determines if intermediate tableaus are to be printed

Details

The function implements the Ignizio (1976) modified simplex algorithm. When the user selects verbose=TRUE, the modified simplex tableau is printed at each iteration.

Value

An object of class 'llgpcp' which is a list with three named components

`tab`	An object of type 'llgpcptab' for the augmented modified simplex tableau
`solution`	An object of typel 'llgpout' for the optimal solution
`converged`	A logical value that determines if the algorithm converged to the optimal solution

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

check.tb, check.ev.cp, calc.ti.k, calc.ta.k, ev.llgp, dv.llgp, piv.llgp, llgpcptab, llgpout

---

llgpcptab *Create lexicographical LGP tableau*

Description

This function returns the initial modified simplex tableau as an object of type 'llgpcptab' for a lexicographical linear programming problem with complementary pivoting and for the given objectives and achievement goals

Usage

```
llgpcptab(coefficients, targets, achievements, variable.classes)
```

Arguments

coefficients	A matrix with the coefficients of the linear objective functions
targets	A vector of target values for the objective functions
achievements	A data frame with the weights of the deviation variables for each objective along with the corresponding priority level
variable.classes	A data frame that defines the complementarity classes for each of the variables

Details

The modified simplex tableau contains a top stub matrix, a left stub matrix, an elements matrix, index rows and achievement vector as specified in Ignizio (1976). The tableau is augmented with the variable classes frame.

Value

An object of class 'llgpcptab' which is a list with the following named components

iter	Current iteration number initially set to zero
variables	Number of decision variables
levels	Number of priority levels in the achievement function
objectives	Number of objective functions
nonbasics	Number of non basic variables = variables + objectives

level	Current priority level
te	Elements matrix
tb	Vector b initially the target values
tw	Top stub matrix
tu	Left stub matrix
ti	Matrix of index rows
ta	Achievement vector
row.headings	Vector of row headings initially the negative deviation variables
col.headings	Vector of column headings initially the decision and positive deviation variables
variable.classes	Data frame with the complementary classes of the decision variables

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

Examples

```
data( ignizio.example.3.3 )
tab <- llgptab( coefficients, targets, achievements )
```

---

llgpout *Obtain solution to the LLGP problem*

Description

This function returns the optimal decision variables, negative deviation variables, positive deviation variables, objective function values, objective target values and the achievement function values.

Usage

```
llgpout(tab, coefficients, targets)
```

Arguments

tab	a list of named components that specifies the modified simplex tableau
coefficients	a matrix with the coefficients of the linear objective functions
targets	A vector of target values for the objective functions

Value

An object of class 'llgpout' that is a list with five named components

x	A numeric vector with the values of the decision variables
n	A numeric vector with the values of the negative deviation variables
p	A numeric vector with the values of the positive deviation variables
f	A numeric vector with the values of the linear objective functions
a	A numeric vector with the values of the achievement functions

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

llgptab

Examples

```
data( ignizio.example.3.3 )
soln <- llgp( coefficients, targets, achievements )
out <- llgpout( soln$tab, coefficients, targets )
```

---

llgptab *Create lexicographical LGP tableau*

Description

This function returns the initial modified simplex tableau as an object of type 'llgptab' for a lexicographical linear programming problem for the given objectives and achievement goals

Usage

```
llgptab(coefficients, targets, achievements)
```

Arguments

coefficients	A matrix with the coefficients of the linear objective functions
targets	A vector of target values for the objective functions
achievements	A data frame with the weights of the deviation variables for each objective along with the corresponding priority level

Details

The modified simplex tableau contains a top stub matrix, a left stub matrix, an elements matrix, index rows and achievement vector as specified in Ignizio (1976).

Value

An object of class 'llgptab' which is a list with the following named components

`iter`	Current iteration number initially set to zero
`variables`	Number of decision variables
`levels`	Number of priority levels in the achievement function
`objectives`	Number of objective functions
`nonbasics`	Number of non basic variables = variables + objectives
`level`	Current priority level
`te`	Elements matrix
`tb`	Vector b initially the target values
`tw`	Top stub matrix
`tu`	Left stub matrix
`ti`	Matrix of index rows
`ta`	Achievement vector
`row.headings`	Vector of row headings initially the negative deviation variables
`col.headings`	Vector of column headings initially the decision and positive deviation variables

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

Examples

```
data( ignizio.example.3.3 )
tab <- llgptab( coefficients, targets, achievements )
```

neg.ind.rows *Count number of negative index values*

Description

This function returns a count of the number of negative index values (i.e. rows) above I[k,s].

Usage

```
neg.ind.rows(tab, k, s)
```

Arguments

tab	An object of class 'llgptab' that is the modified simplex tableau
k	An integer priority level
s	An integer index for a non-basic variable

Value

An integer value.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

llgptab

piv.llgp *Modified simplex pivot to change basis variables*

Description

This function updates the elements matrix and vector to reflect the change in basis variable.

Usage

```
piv.llgp(tab, nevc, ndvr, verbose)
```

Arguments

tab	An object of class 'llgptab' that is the modified simplex tableau
nevc	The integer column index of the entering variable
ndvr	The integer row index of the departing variable
verbose	A logical value which if true prints the basis change

Value

An object of class 'llgptab' that is the updated modified simplext tableau.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

llgptab

---

pos.ind.rows *Count number of positive index values above I(k,s)*

Description

This function returns the number of positive index values (i.e. rows) above I(k,s)

Usage

```
pos.ind.rows(tab, k, s)
```

Arguments

tab	A object of class 'llgptab' that is the modified simplex tableau
k	An integer priority level
s	An integer index for a non-basic variable

Value

An integer value.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

llgptab

`print.llgpcptab` *Print the LLGP tableau at the current priority level and iteration*

Description

This function implements the print generic function for an object of class 'llgpcptab' and does a pretty print of the object of the lexicographical linear goal programming (LLGP) problem with complementary pivoting.

Usage

```
print.llgpcptab(x, ...)
```

Arguments

`x`	An object of class 'llgpcptab' which is the modified simplex tableau
`...`	Other arguments as they may apply to the generic S3 print function

Details

The function prints the various stubs in the row and column orders described in Ignizio (1976).

Value

No value but a report is printed.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

dv.llgp, llgptab

Examples

```
data( ignizio.example.3.3 )
tab <- llgptab( coefficients, targets, achievements )
tab
print( tab )
```

`print.llgpout` *Print the solution*

Description

This function prints the current solution to a lexicographical linear goal programming (LLGP) problem.

Usage

```
print.llgpout(x, ...)
```

Arguments

`x`	An object of class 'llgpout' that contains the current solution
`...`	Other arguments as can be applied to the S3 generic print function

Value

No value is returned but a report showing the decision variables, the goals or objectives and the achievement function.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

`llgpout`

Examples

```
data( ignizio.example.3.3 )
soln <- llgp( coefficients, targets, achievements )
soln$out
print( soln$out)
```

print.llgptab *Print the LLGP tableau at the current priority level and iteration*

Description

This function implements the print generic function for an object of class 'llgptab' and does a pretty print of the object of the lexicographical linear goal programming (LLGP) problem.

Usage

```
print.llgptab(x, ...)
```

Arguments

x	An object of class 'llgptab' which is the modified simplex tableau
...	Other arguments as they may apply to the generic S3 print function

Details

The function prints the various stubs in the row and column orders described in Ignizio (1976).

Value

No value but a report is printed.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

dv.llgp, llgptab

Examples

```
data( ignizio.example.3.3 )
tab <- llgptab( coefficients, targets, achievements )
tab
print( tab )
```

swp.headings *Swap row and column headings*

Description

This function swaps row and column headings to reflect changes in the basis.

Usage

```
swp.headings(tab, nr, nc)
```

Arguments

tab	An object of class 'llgptab' that is the modified simplex tableau
nr	An integer row index
nc	An integer column index

Value

An object of class 'llgptab' in which the index rows have been updated.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

llgptab

swp.vec *Swap row and column vectors*

Description

This function swaps row and column vectors in the top and left stub matrices.

Usage

```
swp.vec(tab, nr, nc)
```

Arguments

tab	An object of class 'llgptab' that is the modified simplex tableau
nr	An integer row subscript in the left stub matrix
nc	An integer column subscript in the top stub matrix

Value

None.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

llgptab

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targets *Ignizio (1976) Example Data Sets*

Description

The data set is a vector of target values for the objectives. The number of elements is equal to the number of objectives.

Format

The data set is a vector.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books.

See Also

ignizio.datasets

`zero.ind.rows` *Count zero index values in column s*

Description

This function returns a count of the number of zero index values in column s of index rows I.

Usage

```
zero.ind.rows(tab, s)
```

Arguments

`tab`	An object of class 'llgptab' that is the modified simplex tableau
`s`	An integer index value for a non-basic variable

Value

An integer value for the number of zero index values in the given column.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Ignizio, J. P. (1976). Goal Programming and Extensions, Lexington Books, D. C. Heath and Company.

See Also

`llgptab`

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