Package ‘ROI.plugin.ecos’

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Version 1.0-2

Title 'ECOS' Plugin for the 'R' Optimization Infrastructure

Description Enhances the 'R' Optimization Infrastructure ('ROI') package
with the Embedded Conic Solver ('ECOS') for solving conic optimization problems.

Imports methods, slam, Matrix, ROI (>= 1.0-0), ECOSolveR (>= 0.5.4)

URL https://roigrp.gitlab.io,
https://gitlab.com/roigrp/solver/ROI.plugin.ecos

NeedsCompilation no

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Repository CRAN

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`Example-1` *SOCP 1*

Description

$$maximize\ \ x + y$$
$$subject\ to\ \ x^2 + y^2 \leq 1$$
$$x \geq 0, y \geq 0$$

Examples

```
library(ROI)
obj <- L_objective(c(1, 1))
## NOTE: chol(diag(2)) == diag(2)
con <- C_constraint(L = rbind(0, -diag(2)),
                    cones = K_soc(3),
                    rhs = c(1, 0, 0))
op <- OP(obj, con, maximum=TRUE)
x <- ROI_solve(op, solver="ecos")
x
## Optimal solution found.
## The objective value is: 1.414214e+00
solution(x)
## [1] 0.7071068 0.7071068
```

Example-2 *SOCP 2*

Description

The following example is also known as `Problem 10` from the Hock-Schittkowski-Collection `Hock and Schittkowski (1981)`.

$$minimize \;\; x - y$$
$$subject\ to \;\; -3x^2 + 2xy + 1 \geq 0$$

References

W. Hock, K. Schittkowski (1981): Test Examples for Nonlinear Programming Codes, Lecture Notes in Economics and Mathematical Systems, Vol. 187, Springer

Examples

```
library(ROI)
obj <- L_objective(c(1, -1))
L <- chol(rbind(c(3, -1), c(-1, 1)))
con <- C_constraint(L = rbind(0, -L),
                    cones = K_soc(3),
                    rhs = c(1, 0, 0))
op <- OP(objective = obj, constraints = con,
         bounds = V_bound(li=1:2, lb=rep(-Inf, 2)))
x <- ROI_solve(op, solver="ecos")
x
## Optimal solution found.
## The objective value is: -1.000000e+00
```

```
solution(x)
## [1] 1.996387e-10 1.000000e+00
```

`Example-3` *SOCP 3*

Description

The following example is originally from the CVXOPT (http://cvxopt.org/userguide/coneprog.html) homepage.

$$minimize \quad -2x_1 + x_2 + 5x_3$$

subject to

$$\left\| \begin{array}{c} -13x_1 + 3x_2 + 5x_3 - 3 \\ -12x_1 + 12x_2 - 6x_3 - 2 \end{array} \right\|_2 \le -12x_1 - 6x_2 + 5x_3 - 12$$

$$\left\| \begin{array}{c} -3x_1 + 6x_2 + 2x_3 \\ x_1 + 9x_2 + 2x_3 + 3 \\ -x_1 - 19x_2 + 3x_3 - 42 \end{array} \right\|_2 \le -3x_1 + 6x_2 - 10x_3 + 27$$

References

[CVXOPT] Andersen, Martin S and Dahl, Joachim and Vandenberghe, Lieven (2016) CVXOPT: A Python package for convex optimization, version 1.1.8, http://cvxopt.org/

Examples

```
library(ROI)
lo <- L_objective(c(-2, 1, 5))
lc1 <- rbind(c(12, 6, -5), c(13, -3, -5), c(12, -12, 6))
lc2 <- rbind(c(3, -6, 10), c(3, -6, -2), c(-1, -9, -2), c(1, 19, -3))
lc <- C_constraint(L = rbind(lc1, lc2), cones = K_soc(c(3, 4)),
                   rhs=c(c(-12, -3, -2), c(27, 0, 3, -42)))
vb <- V_bound(li=1:3, lb=rep(-Inf, 3))
op <- OP(objective = lo, constraints = lc, bounds = vb)
x <- ROI_solve(op, solver="ecos")
x
## Optimal solution found.
## The objective value is: -3.834637e+01
solution(x)
## [1] -5.014767 -5.766924 -8.521796
```

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