Package 'ROI.plugin.osqp'

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Version 1.0-2

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

Description Enhances the 'R' Optimization Infrastructure ('ROI') package with the quadratic solver 'OSQP'. More information about 'OSQP' can be found at <https://osqp.org>.

Imports methods, slam, ROI (>= 1.0-1), osqp, Matrix

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

NeedsCompilation no

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`ROI.plugin.osqp-package`

osqp

Description

This package provides an interface to `OSQP`. The `OSQP` solver is a numerical optimization package or solving convex quadratic programs written in `C` and based on the alternating direction method of multipliers.

Control Arguments

The following description of the control parameters is mostly copied from the **osqp** manual.

- [] `rho` ADMM step rho
- [] `sigma` ADMM step sigma
- [] `max_iter` maximum iterations
- [] `abs_tol` absolute convergence tolerance
- [] `rel_tol` relative convergence tolerance
- [] `eps_prim_inf` primal infeasibility tolerance
- [] `eps_dual_inf` dual infeasibility tolerance
- [] `alpha` relaxation parameter
- [] `linsys_solver` which linear systems solver to use, 0=QDLDL, 1=MKL Pardiso
- [] `delta` regularization parameter for polish
- [] `polish` boolean, polish ADMM solution
- [] `polish_refine_iter` iterative refinement steps in polish
- [] `verbose` boolean, write out progress
- [] `scaled_termination` boolean, use scaled termination criteria
- [] `check_termination` integer, check termination interval. If 0, termination checking is disabled
- [] `warm_start` boolean, warm start
- [] `scaling` heuristic data scaling iterations. If 0, scaling disabled
- [] `adaptive_rho` cboolean, is rho step size adaptive?
- [] `adaptive_rho_interval` Number of iterations between rho adaptations rho. If 0, it is automatic
- [] `adaptive_rho_tolerance` Tolerance X for adapting rho. The new rho has to be X times larger or 1/X times smaller than the current one to trigger a new factorization
- [] `adaptive_rho_fraction` Interval for adapting rho (fraction of the setup time)

References

Bartolomeo Stellato and Goran Banjac and Paul Goulart and Alberto Bemporad and Stephen Boyd. `OSQP`: An Operator Splitting Solver for Quadratic Programs https://arxiv.org/abs/1711.08013, 2017

Bartolomeo Stellato and Goran Banjac. `OSQP` "webpage" https://osqp.org/, 2019

Example-1 *Quadratic Problem 1*

Description

$$maximize \;\; x_1^2 + x_2^2 + x_3^2 - 5x_2$$
$$subject\ to:$$
$$-4x_1 - 3x_2 + \geq -8$$
$$2x_1 + x_2 + \geq 2$$
$$-2x_2 + x_3 \geq 0$$
$$x_1, x_2, x_3 \geq 0$$

Examples

```
require("ROI")
require("ROI.plugin.osqp")

A <- cbind(c(-4, -3, 0),
           c( 2,  1, 0),
           c( 0, -2, 1))
x <- OP(Q_objective(diag(3), L =  c(0, -5, 0)),
        L_constraint(L = t(A),
                     dir = rep(">=", 3),
                     rhs = c(-8, 2, 0)))

opt <- ROI_solve(x, solver = "osqp", abs_tol = 1e-8, rel_tol = 1e-8)
opt
## Optimal solution found.
## The objective value is: -2.380952e+00
solution(opt)
## [1] 0.4761905 1.0476191 2.0952381
```

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