chebyshev

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1 Chebyshev center

Find the center and radius of the smallest sphere that encloses the polyhedron defined by the inequalities

$$\{2x - y + 2z \leq 2, \quad -x + 2y + 4z \leq 16, \quad x + 2y - 2z \leq 8, \quad x \geq 0, y \geq 0, z \geq 0\}$$

[ ]:
```
A = [2 -1 2; -1 2 4; 1 2 -2; -1 0 0; 0 -1 0; 0 0 -1];
b = [2; 16; 8; 0; 0; 0]

numinequalities = 1:length(b);
sizex = 1:3;

#If you have not used LinearAlgebra before, make sure to install it with
#using Pkg
#Pkg.add("LinearAlgebra")
using JuMP, HiGHS, LinearAlgebra

println(norm(A[1,:]))

nA = norm(A[1,:])

m = Model(HiGHS.Optimizer)
@variable(m, r >= 0)            # radius
@variable(m, x[sizex])            # coordinates of center
@constraint(m, inequality[i in numinequalities], sum(A[i,j]*x[j] for j in␣
 ↪sizex) + r*norm(A[i,:]) <= b[i])
@objective(m, Max, r)      # maximize radius

status = optimize!(m)
center = value.(x)
radius = value(r)

println("The coordinates of the Chebyshev center are: ", center)
println("The largest possible radius is: ", radius)
```

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3.0
Presolving model
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6 rows, 4 cols, 18 nonzeros
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Presolve : Reductions: rows 6(-0); columns 4(-0); elements 18(-0)
Solving the presolved LP
Using EKK dual simplex solver - serial
  Iteration        Objective     Infeasibilities num(sum)
          0    -9.9999824871e-01 Ph1: 6(11989.4); Du: 1(0.999998) 0s
          6    -7.5000000000e-01 Pr: 0(0) 0s
Solving the original LP from the solution after postsolve
Model   status      : Optimal
Simplex   iterations: 6
Objective value     :  7.5000000000e-01
HiGHS run time      :          0.00
The coordinates of the Chebyshev center are: [0.75, 3.25, 0.75]
The largest possible radius is: 0.75
```

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