Computational Intellgience
Bouns Assignment

Mohamed Ahmed

May 19, 2021

Our Objective:

$$min_x max_y \|x - x^*\| \tag{1}$$

subject To:

$$(y-a)^T D(x-b) + s^T y + q^T x \leq h \tag{2}$$

$$\|Hy + f\| \leq P \tag{3}$$

let:

$$v = Hy + f \tag{4}$$

Thats make our y :

$$y = H^{-1}(v - f) \tag{5}$$

that make our constrain in eq3 be:

$$\|v\| \leq P \tag{6}$$

but our objective function will change too :

$$(H^{-1}(v-f) - a)^T D(x-b) + s^T H^{-1}(v-f) + q^T x \leq h \tag{7}$$

$$v^T H^{-T} D(x-b) - (H^{-1}f + a)^T D(x-b) + v^T H^{-T} s - f^T H^{-T} s + q^T x \leq h \tag{8}$$

$$v^T H^{-T} D(x-b) - (f + Ha)^T H^{-T} D(x-b) + v^T H^{-T} s - f^T H^{-T} s + q^T x \leq h \tag{9}$$

$$v^T H^{-T} D(x-b) - (f + Ha)^T H^{-T} D(x-b) + v^T H^{-T} s - f^T H^{-T} s + q^T x \leq h \tag{10}$$

$$v^T H^{-T}[D(x-b)+s] - (f+Ha)^T H^{-T} D(x-b) - f^T H^{-T} s + q^T x \leq h \tag{11}$$

$$p\frac{[D(x-b)+s]^T H^{-1} H^{-T}[D(x-b)+s]}{\left\|[D(x-b)+s]^T H^{-1}\right\|} - (f+Ha)^T H^{-T} D(x-b) - f^T H^{-T} s + q^T x \leq h \tag{12}$$

$$p\left\|[D(x-b)+s]^T H^{-1}\right\| \leq h + (f+Ha)^T H^{-T} D(x-b) + f^T H^{-T} s - q^T x \tag{13}$$

therefore: Our Objective will be:

$$min_x \left\|x - x^*\right\| \tag{14}$$

subject to:

$$p\left\|[D(x-b)+s]^T H^{-1}\right\| \leq h + (f+Ha)^T H^{-T} D(x-b) + f^T H^{-T} s - q^T x \tag{15}$$