Chapter-4

Friday, May 14, 2021 10:43 AM

4.11

(a) $\min \|Ax-b\|_\infty$

$\Rightarrow \min c^Tx+d \quad s.t. \quad Ax=b$
$c^Tx+d \geq \|Ax-b\|_\infty$

(b) $\min \|Ax-b\|_1$

$\Rightarrow \min c^Tx+d \quad s.t. \quad Ax=b$
$c^Tx+d \geq \|Ax-b\|$

(c) $\min \|Ax-b\|_1, \ s.t. \ \|x\|_\infty \leq 1$

$\Rightarrow \min c^Tx+d \quad s.t. \quad \|x\|_\infty \leq 1$
$\|Ax-b\|_1 \leq c^Tx+d$

4.16 $x(t) \in \mathbb{R}^n$.

$x(t+1) = Ax(t) + bu(t)$.

$u(t) \in \mathbb{R}$. $\Rightarrow u(t) = \frac{x(t+1) - Ax(t)}{b}$.

$\min F = \sum_{t=0}^{N-1} f(u(t)) \quad s.t. \ x(N) = x_{des}$.

$$f(a) = \begin{cases} |a| & ; \ |a| \leq 1 \\ 2|a|-1 & ; \ |a| > 1 \end{cases}$$

Thus,

$\min 1^Tt \quad s.t. \ Nu = x_{des}$.
$-y \leq u \leq y$
$t \geq y$
$t \geq 2y-1$

4.21

(a) $\min c^Tx \quad s.t. \ x^TAx \leq 1 \quad , A \in S^n_{++}, \ c \neq 0$

Let $y = A^{\frac{1}{2}}x$, $\tilde{c} = A^{-\frac{1}{2}}c$.

$\min \tilde{c}^Ty \quad s.t. \ y^Ty \leq 1$

$y^* = -\frac{\tilde{c}}{\|\tilde{c}\|_2} \Rightarrow x^* = -\frac{A^{-1}c}{\sqrt{c^TA^{-1}c}}$.