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Index

Notation

Sets, matrices and linear operators

$\mathbb{N}$	natural numbers $\{0, 1, 2, \ldots\}$
$\mathbb{R}$, $\mathbb{C}$	field of real, complex numbers
$\mathbb{K}$	$\mathbb{R}$ or $\mathbb{C}$
$\operatorname{Re} z$	real part of a complex number z
$\operatorname{Im} z$	imaginary part of a complex number z
i	imaginary unit or index, depending on context
$\mathbb{K}^{m\times n}$	vector space of matrices with m rows and n columns
$\mathbb{K}^m$	equal to $\mathbb{K}^{m\times 1}$
$\bar{A}$	complex conjugate of a matrix (or a number) A
A^T	transpose of a matrix A over $\mathbb{K}$
A^*	conjugate transpose of a matrix A over $\mathbb{K}$
$\mathcal{H}^n$	ordered Hilbert space of $n \times n$ Hermitian matrices over $\mathbb{K}$
$\mathcal{H}^n_+$	cone of positive semidefinite matrices in $\mathcal{H}^n$
$\mathcal{H}^n_-$	equal to $-\mathcal{H}^n_+$
$\mathcal{B}, \mathcal{B}_i$	basis of $\mathcal{H}^n$ (see Section 3.4)
$>, \geq, <, \leq$	order relations in $\mathbb{R}$, or in ordered vector spaces
I_m	$m \times m$ unit matrix
I	unit matrix, whose dimension is clear by context
$e_i^{(m)}$	i-th unit vector in $\mathbb{K}^m$
$E_{ij}^{(mn)}$	equal to $e_i^{(m)}(e_j^{(n)})^T$
$(I_{pq} \otimes T)(E^{(mn)})$	see equation (3.2)
Ker	kernel of a matrix or an operator
im	image of a matrix or an operator
rk	rank of a matrix or an operator
$\sigma(T)$	spectrum of an operator or a matrix T
$\rho(T)$	spectral radius of T, equal to $\max\{\lvert\lambda\rvert \bigm\vert \lambda \in \sigma(T)\}$
$\beta(T)$	spectral bound of T, equal to $\max\{\operatorname{Re}(\lambda) \bigm\vert \lambda \in \sigma(T)\}$
trace	trace of a matrix
$\langle X, Y\rangle$	equal to $\operatorname{trace} XY$ for $X, Y \in \mathcal{H}^n$
det	determinant
In	inertia (see appendix)
$\mathcal{S}(M/Q)$	Schur-complement (see appendix)
vec	rearranges $m \times n$-matrix in mn-vector (see Def. 3.3.1)
$\otimes$	Kronecker product (see Def. 3.3.1)
$\mathcal{L}_A$	Lyapunov operator $\mathcal{L}_A : X \mapsto A^*X + XA$
$\mathit{\Pi}_{A_0}$	the operator $\mathit{\Pi}_{A_0} : X \mapsto \sum_{j=1}^N A_0^{j*} X A_0^j$, for given $A_0^1, \ldots, A_0^N$.
$\mathcal{S}_A$	Stein operator $\mathcal{S}_A : X \mapsto A^*XA - X$
$\mathcal{S}_{A,B}$	Sylvester operator $\mathcal{S}_{A,B} : X \mapsto AX - XB$
$\mathbb{L}$	perturbation operator (see Section 2.2)

Stochastic analysis (see Section 1.1)

$(\Omega, \mathcal{F}, \mu)$	probability space
$L^2(\Omega, \mathbb{K}^k)$	Hilbert space of square integrable k-dimensional random variables
w	(normed) Wiener process
$\mathcal{E}$	expectation
$(\mathcal{F}_t)_{t\in\mathbb{R}_+}$	increasing sequence of σ-algebras
L^2_w	L^2-space of non-anticipating processes (with respect to $\mathcal{F}_t$)
C_w	almost surely continuous processes in L^2_w

Banach spaces and nonlinear operators

$\mathrm{int}, \mathrm{cl}$	topological interior, closure of a set
$\mathcal{B}(x_0, \varepsilon)$	ball with center x_0 and radius ε
X^*	dual space of a Banach space X
$\langle x, v\rangle$	duality product of $x \in X$ and $v \in X^*$, equal to $v(x)$
$T^* : X^* \to X^*$	adjoint of a linear operator $T : X \to X$
C^*	dual cone of a cone in a Banach space (see Section 3.1)
$[x, y]$, $]x, y[$	closed, open order interval, respectively (see Section 3.1)
$f : X \to X$	nonlinear mapping on a Banach space X
$\mathrm{dom}\, f$	domain of f
f'_x	derivative of f at x (see Section 4.1)
$\mathcal{R} : \mathcal{H}^n \to \mathcal{H}^n$	Riccati operator (see Section 5.1)
$\mathcal{G} : \mathcal{H}^n \to \mathcal{H}^n$	dual Riccati operator (see Section 5.1.6)
$\mathrm{dom}_+, \mathrm{dom}_\pm$	target sets (see Sections 5.1.1 and 5.1.2)