Model reduction for controller design for infinite-dimensional systems

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List of Notation

Symbol	Short description	Page
A	state operator	8
A	state function	10
$\mathfrak{A}$	resolvent of a discrete-time system	12
$\mathfrak{a}$	pseudoresolvent (of a continuous-time system)	124
B	input operator	8
$\mathscr{B}$	Banach space	
$\mathbb{B}$	behavior	7
$\mathcal{B}$	input map	8
B	input function	10
$\mathfrak{B}$	incoming wave function of a discrete-time system	12
$\mathfrak{b}$	incoming wave function of a continuous-time system	124
$\vec{B}(\cdot,\cdot)$	directed gap ball	95
$B(\cdot,\cdot)$	gap ball	95
C	output operator	8
$\mathbb{C}$	set of complex numbers	
$\mathbb{C}_\sigma^+$	open right half-plane $\{s \in \mathbb{C} : \mathrm{Re} s > \sigma\}$	
$\mathcal{C}$	output map	8
C	output function	10
$\mathfrak{C}$	outgoing wave function of a discrete-time system	12
$\mathfrak{c}$	outgoing wave function of a continuous-time system	124

Symbol	Short description	Page
d	Dirichlet form	133
D	feedthrough operator	8
$\mathbb{D}$	open unit disc $\{z \in \mathbb{C} : \lvert z\rvert < 1\}$	
$\mathbb{D}_r$	open disc $\{z \in \mathbb{C} : \lvert z\rvert < r\}$	
$\overline{\mathbb{D}}$	closed unit disc $\{z \in \mathbb{C} : \lvert z\rvert \leq 1\}$	
$\overline{\mathbb{D}}_r$	closed disc $\{z \in \mathbb{C} : \lvert z\rvert \leq r\}$	
$\mathcal{D}$	input-output map	9
D	transfer function	11
$\mathfrak{D}$	characteristic function of a discrete-time system	13
$\mathfrak{d}$	characteristic function of a continuous-time system	124
F	component of an admissible feedback pair	33
F	feedback operator associated with the Riccati equation	49
$\mathfrak{f}$	component of an admissible feedback pair	147
$F^{\min}$	optimal cost feedback operator	47
G	component of an admissible feedback pair	33
$\mathfrak{g}$	component of an admissible feedback pair	147
G	holomorphic function	
$\mathscr{H}$	(separable) Hilbert space	
$\mathcal{H}$	Hankel map	9
H^2	Hardy space	169
H^∞	Hardy space	169
H^s	Sobolev space (only in Chapter 12)	
H_0	Space of functions holomorphic at zero	61
$\mathcal{I}^+$	minimizing operator	45
J	cost function	43
$\mathscr{K}$	subspace of a Hilbert space	
K	admissible feedback function	81

Symbol	Short description	Page
L	strongly elliptic operator	133
L_{F}	Laurent operator of the function F	172
$\mathcal{L}(\mathscr{B}_1, \mathscr{B}_2)$	set of bounded linear operators from $\mathscr{B}_1$ to $\mathscr{B}_2$	
$\mathcal{L}(\mathscr{B})$	set of bounded linear operators from $\mathscr{B}$ to itself	
$l^2(J, \mathscr{H})$	set of square summable sequences $J \subset \mathbb{Z} \to \mathscr{H}$	
$L^2(J, \mathscr{H})$	set of square summable functions $J \subset \mathbb{R} \to \mathscr{H}$	
M	Möbius operator	140
M	component of a right factor	62
$\tilde{\mathsf{M}}$	component of a left factor	62
N	component of a right factor	62
$\tilde{\mathsf{N}}$	component of a left factor	62
q	component of a control Riccati triple	49
$q^{\min}$	optimal cost sesquilinear form	46
Q	solution of the control algebraic Riccati equation	49
$Q^{\min}$	optimal cost operator	47
$\mathbb{R}$	set of real numbers	
$\mathbb{R}^+$	set of nonnegative real numbers $\{x \in \mathbb{R} : x \geq 0\}$	
$\mathbb{R}^-$	set of negative real numbers $\{x \in \mathbb{R} : x < 0\}$	
$r(T)$	spectral radius of the operator T	
r_{A}	radius of convergence of series for A	10
r_{B}	radius of convergence of series for B	10
r_{C}	radius of convergence of series for C	10
r_{D}	radius of convergence of series for D	11
s	component of a control Riccati triple	49
S	(often) system operator	8
S	sensitivity operator associated with the Riccati equation	49

Symbol	Short description	Page
$\mathbb{T}$	unit circle $\{z \in \mathbb{C} : \|z\| = 1\}$	
T_{F}	Toeplitz operator of the function F	172
$\mathscr{U}$	input space (a separable Hilbert space)	7
$\mathscr{V}(x_0)$	set of stable input-output pairs	44
$\mathscr{X}$	state space (a separable Hilbert space)	7
X	component of a left Bezout factor	62
$\tilde{\mathsf{X}}$	component of a right Bezout factor	62
$\mathscr{Y}$	output space (a separable Hilbert space)	7
Y	component of a left Bezout factor	62
$\tilde{\mathsf{Y}}$	component of a right Bezout factor	62
$\mathbb{Z}$	set of integers	
$\mathbb{Z}^+$	set of non-negative integers $\{n \in \mathbb{Z} : n \geq 0\}$	
$\mathbb{Z}^-$	set of negative integers $\{n \in \mathbb{Z} : n < 0\}$	
δ	gap metric	89,92
$\vec{\delta}$	directed gap	89,92
Λ	set of definition of a resolvent linear system	124
Λ_E	exponential region	126
Σ	system	
$\dagger$	$f^\dagger(s) := f(\bar{s})^*$	16
$\wedge$	$\hat{h}$ is the Z-transform or Laplace transform of h	