
E-LETTER of the Numerics in Control Network NICONET
Issue no. 8, July 31, 2000

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1 Welcome to the NICONET E-letter number 8!

This E-letter is sent out quarterly and informs you about the newest
updates of the SLICOT Library. Also, new NICONET reports and important
NICONET activities are announced in this E-letter. In particular,

we announce our new workshop to be held in Louvain-la-Neuve, Belgium, on January 19, 2001, and especially invite you to submit a paper.

The next issue of this E-letter is planned for October 2000. Please send contributions before October 10. In particular, we encourage contributors to provide information on the use of the SLICOT library (performance, improvements, new suggestions).

Sabine Van Huffel
Chairperson of WGS and Coordinator of NICONET.

2 New issue of the NICONET Newsletter available

Communicated by Sabine Van Huffel:

The fifth issue of our NICONET Newsletter is now available and can be downloaded as compressed postscript file from the World Wide Web URL:

<http://www.win.tue.nl/niconet/> and choose: Newsletters

or from the WGS ftp site:

<ftp://wgs.esat.kuleuven.ac.be> (directory pub/WGS/NEWSLETTER/)
(filename: issue-2-00.ps.Z)

Contents:

1. Editorial
2. The SLICOT benchmark library
3. Basic numerical SLICOT tools for control
4. SLICOT tools for model reduction
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6. SLICOT tools for robust control
7. SLICOT tools for nonlinear systems in robotics
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10. NICONET information corner
11. Upcoming third NICONET workshop in Louvain-la-Neuve, Belgium

3 New additions to SLICOT since April 2000

Communicated by Vasile Sima:

A major SLICOT Library update took place on July 1. The updated files included in the intermediate update on April, mentioned in the previous issue of this e-letter, have now been incorporated in the compressed library files. Known bugs have been corrected out, and some routines have been improved. Details are given in the files Release.Notes and Release.History, located in the directory pub/WGS/SLICOT/ of the ftp site. Few changes have also occurred in the documenting comments of some routines.

Several new user-callable and computational routines for basic control problems, as well as for linear system identification have been made

available on the ftp site in July 2000. They include Analysis Routines, Identification Routines, Mathematical Routines, and Synthesis Routines, performing the following main computational tasks:

- inverse (A_i, B_i, C_i, D_i) of a given system (A, B, C, D) ;
- preprocessing the input-output data for estimating the matrices of a linear time-invariant dynamical system and finding an estimate of the system order; optionally, the input-output data can be processed sequentially;
- estimating the system matrices A , C , B , and D , the noise covariance matrices Q , R_y , and S , and the Kalman gain matrix K of a linear time-invariant state space model, using the processed triangular factor R of the concatenated block-Hankel matrices;
- estimating the initial state and, optionally, the system matrices B and D of a linear time-invariant discrete-time system, given the system matrices (A, B, C, D) , or only the matrix pair (A, C) , and the input and output trajectories of the system;
- upper triangular factor in the QR factorization of the concatenated block-Hankel matrices built from input-output data;
- singular value decomposition giving the system order, using the triangular factor of the concatenated block-Hankel matrices;
- system order, using the singular value decomposition;
- system matrices and covariance matrices of a linear time-invariant state space model;
- estimating B and D matrices using Kronecker products;
- estimating B and D matrices using a structure-exploiting technique;
- estimating the initial state and B and D matrices, given the matrix pair (A, C) and the input and output trajectories;
- estimating the initial state, given the system matrices (A, B, C, D) and the input and output trajectories;
- efficient calculation of the Kronecker product of two matrices;
- solution of $X*A = B$ or $X*A' = B$;
- solution of continuous-time Riccati equations by the matrix sign function method (with condition number and forward error bound estimates);
- solution of either continuous-time or discrete-time general Sylvester equations, using the reduction to real Schur form;
- solution of discrete-time Sylvester equations with matrices in real Schur form (LAPACK-style codes);
- solution of discrete-time Sylvester equations using the Hessenberg-Schur method.

In addition, three new mexfiles and about ten Matlab m files have been added in the subdirectories ./SLmex and ./SLTools, respectively. They are useful for performing system identification using subspace techniques (MOESP, N4SID, or their combination).

The latest changes in the library contents or routine updates - till the next SLICOT Release - are announced in the file Release.Notes, located in directory /pub/WGS/SLICOT/ on the WGS ftp site. Previous updates are described, in reverse chronological order, in the file Release.History, located in the same directory.

SLICOT routines can be downloaded from the WGS ftp site:

<ftp://wgs.esat.kuleuven.ac.be>

(directory /pub/WGS/SLICOT/ and its subdirectories) in compressed (gzipped) tar files. On line .html documentation files are also provided there. The library and its documentation are also accessible from the WGS homepage at the World Wide Web URL:

<http://www.win.tue.nl/wgs/>

after linking from there to the SLICOT web page and clicking on the FTP site link in the freeware SLICOT section.

4 New NICONET Reports since April 2000

Communicated by Sabine Van Huffel:

The following NICONET reports can be downloaded as compressed postscript files from the World Wide Web URL:

<http://www.win.tue.nl/niconet> and choose: reports

or from the WGS ftp site:

<ftp://wgs.esat.kuleuven.ac.be> (directory pub/WGS/REPORTS/)

FILE NAME: SLWN2000-2.ps.Z
REPORT NUMBER: 2000-2
FORMAT: Compressed postscript.
AUTHORS: D. Kressner and P. Van Dooren
TITLE: Factorizations and linear system solvers for matrices with Toeplitz structure
ABSTRACT: In this report we describe new routines for several factorizations of matrices with Toeplitz or block Toeplitz structure and show how this can be used to solve the corresponding systems of equations or least squares systems of equations. We also describe certain implementation details and show how to handle matrices of low rank or of low bandwidth.
STATUS: available since June 2000

5 NICONET events

Communicated by Sabine Van Huffel:

Third NICONET WORKSHOP ON
NUMERICAL CONTROL SOFTWARE
a useful tool in industry

Friday, January 19, 2001
Hotel Le Relais Mercure, Louvain-la-Neuve, Belgium.

First Announcement and Call for Posters

This workshop organized by the European Numerics in Control thematic Network (NICONET) aims to bring together engineers, mathematicians, computer scientists and practitioners from industry and academia dealing with numerical software in systems and control and their implementation and use in industrial practice.

Recent advances on the use of numerical software libraries especially designed for solving systems and control engineering problems in a numerically reliable and efficient way will be discussed. The current status of the freely available SLICOT library will be extensively discussed, as well as industrial control applications and future extensions, comprising parallel versions and practically oriented benchmarks.

SLICOT is a valuable tool for the reliable solution of many control problems, and for large-scale, computer-intensive control problems and real-time applications, SLICOT can lead to significant performance improvements.

Chairpersons: Paul Van Dooren (local organizer) and Sabine Van Huffel (project coordinator).

Organizing Committee:

T. Backx,
P. Benner,
A. van den Boom,
J. De Cuyper,
F. Delebecque,
D.W. Gu,
S. Hammarling,
V. Hernandez,
B. Kagstrom,
M. Konstantinov,
V. Mehrmann,
A. Moner,
P. Petkov,
V. Sima,
A. Stoorvogel,
A. Varga,
M. Verhaegen,
R. Wohlgenuth.

Workshop Program:

Plenary session (9h-12h30):}

"Matching prediction error identification and robust control"

by Prof. Michel Gevers (Dept. CESAME, Universite Catholique de Louvain).

"Model reduction within control systems design"

by Prof. Maarten Steinbuch (Eindhoven University of Technology).

Introductory presentations of the newly developed SLICOT toolboxes

``Structured matrix decompositions'' presented by Prof. Paul Van Dooren (Universite Catholique de Louvain)

``Subspace identification'' presented by Prof. Michel Verhaegen (Twente University of Technology)

``Nonlinear systems for Robotics'' presented by Prof. Vicente Hernandez (Universidad Politecnica de Valencia).

Demo and poster session (14h-16h30)} on new developments and performance presentations of control software in engineering practice and industrial applications.

Closing discussion (16h30-17h)}

The preliminary, as well as the final program, will be announced on the NICONET website.

Participants of the workshop receive:

- A copy of the workshop program and proceedings book
- A copy of the last version of the SLICOT Software Library and Toolboxes (upon request)
- Documentation on SLICOT and NICONET.

Prospective authors are invited to submit two copies of a camera-ready paper (1 to 6 pages long), describing the contents of the poster contribution, to the workshop secretariat (see address below) for review. Address and e-mail should be provided if possible. All accepted contributions, as well as documentation for the plenary session, will be published in the workshop proceedings.

Author's Schedule:

Submission of camera-ready paper (1-6 pages):	December 1, 2000
Notification of acceptance as poster presentation	December 15, 2000

Registration Information:

Please register to the workshop at the address below before December 15, 2000. The registration fee is 1500 BEF and covers the attendance to the workshop, the coffee breaks, the lunch, the workshop proceedings, the documentation and the software.

Third NICONET Workshop Registration Form, Friday January 19, 2001:

Name:
Title:
Company/Institution:
Area:
Address:
Phone:
Fax:
e-mail:

Rooms at the conference hotel are available at reduced rates when booked through the workshop secretariat : 2550 BEF for a single room, 2900 BEF for a double room.

Jan. 18 to 19	: single room	y/n	double room	y/n
Jan. 19 to 20	: single room	y/n	double room	y/n

to be sent to
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Phone: +32-10-478040 (or +32-10-478034)

URL: <http://www.auto.ucl.ac.be/~vdooren/register.html>

E-mail: vdooren@csam.ucl.ac.be (or hissette@csam.ucl.ac.be)

6 (Forthcoming) Meetings and symposia attended by NICONET partners

Communicated by Vasile Sima and Sabine Van Huffel:

Conferences related to the NICONET areas of interest, where NICONET partners presented or will present NICONET/SLICOT-related talks and papers, and/or disseminate information and promote SLICOT, are the following:

Mathematical Theory of Networks and Systems (MTNS2000), Perpignan, France, June 19-23, 2000

UKACC International Conference CONTROL 2000,
University of Cambridge, United Kingdom, 4 - 7 September 2000

IEEE International Symposium on Computer-Aided Control System Design, CACSD'2000, Anchorage, Alaska, Sept.25-27 2000.

END OF THE NICONET E-LETTER
