

E-LETTER of the Numerics in Control Network NICONET
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CONTENTS:

- 1 Welcome to the NICONET E-letter number 9!
- 2 New additions to SLICOT since July 2000
- 3 SLICOT developments
- 4 New NICONET Reports since July 2000
- 5 NICONET events
- 6 (Forthcoming) Meetings and symposia attended by NICONET partners

1 Welcome to the NICONET E-letter number 9!

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

The next issue of this E-letter is planned for February 2000. Please send contributions before January 25. 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 additions to SLICOT since July 2000

Communicated by Vasile Sima:

A new SLICOT Library update took place on September 21, 2000. Known bugs have been corrected out, involving changes in six routines (AB07ND, IB01AD, IB01MD, IB01OD, SB04MD, and SB04QD). Details are given in the file Release.Notes, located in the directory pub/WGS/SLICOT/ of the ftp site. Few changes have also occurred in the documenting comments of some routines.

Two new computational routines have been then made available on the ftp site, performing the following tasks:

- computation of the upper triangular factor in the QR factorization of the concatenated block-Hankel matrices, using a fast QR algorithm;
- construction of a hyperbolic plane rotation.

A new directory called contrib (under the subdirectory MatlabTools) has been added. It contains externally contributed Matlab files and mexfiles based on SLICOT library. Included are a Fortran program, two routines, and other associated files for calling SLICOT TB03AD routine from a Matlab environment, developed by Dr. P.-O. Malaterre and used to compare SLICOT results with the Polynomial Toolbox results. The codes are described in the NICONET Newsletter, 5, pp. 13-20, July 2000.

Known bugs in the m-files have been also corrected and several new m-files have been added. Details are given in the file Release.Notes. Moreover, the mexfile linmeq can now also solve discrete-time Sylvester equations, as well as Sylvester equations with $op(A) = 'N'$, $op(B) = 'T'$, or $op(A) = 'T'$, $op(B) = 'N'$. Another new option enables to select between the Bartels-Stewart and Hessenberg-Schur methods.

Several new changes have been performed during October 2000. A bug has been removed from the routine AB13CD. Also, the LYAPACK collections, developed by Dr. Thilo Penzl, for both Unix and Windows platforms have been added in the subdirectory MatlabTools/contrib. LYAPACK is an efficient MATLAB toolbox (based on MATLAB m-functions) for the solution of certain large scale problems in control theory, which are closely related to Lyapunov equations. It can solve Lyapunov and Riccati equations, and do model reduction. LYAPACK uses iterative algorithms and is intended for large, sparse problems.

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.

3. SLICOT developments

Communicated by Sabine Van Huffel:

A new SLICOT toolbox on structured matrix decompositions is being finalized and will be available on the website in January 2001.

4 New NICONET Reports since July 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: Nic1999-19.ps.Z

REPORT NUMBER: 1999-19

FORMAT: Compressed postscript.

AUTHORS: Ad van den Boom, Ton Backx and Yucai Zhu

TITLE: Benchmarks for Identification

ABSTRACT: This report describes the preliminary steps for setting up a benchmark collection for identification.

The identification protocol is described, where aspects as experiment set-up, signal pre-processing, modelling, parametrization, estimation methods and model validation are reviewed briefly. The relation of identification and control is stipulated. An analysis is given of requirements for good benchmarks for identification and some relevant organisational issues are addressed.

STATUS: available since July 2000

FILE NAME: SLWN2000-3.ps.Z
REPORT NUMBER: 2000-3
FORMAT: Compressed postscript.
AUTHORS: Vicente Hernandez, Ignacio Blanquer, Enrique Arias and Pedro Ruiz
TITLE: Definition and Implementation of a SLICOT Standard Interface and the associated MATLAB Gateway for the Solution of Nonlinear Control Systems by using ODE and DAE Packages.
ABSTRACT: In this report an interface system for the execution of several widely-used integrator packages for the solving of Ordinary Differential Equations and Differential Algebraic Equations is presented. This package offers a SLICOT-compliant unique interface to the packages ODEPACK (LSODE, LSODA, LSODES, LSODI, LSODIB), DASSL, RADAU5, DASPK and GELDA. All the parameters have been standarised to allow a quick change from one package to another and to take profit of the different capabilities of the different packages. The interface has also been migrated to MATLAB offering the possibility of defining the system functions as MATLAB m-files, using the FORTRAN compiled solver packages instead of the MATLAB functions. The source code of the system can be downloaded from the SLICOT repository.
STATUS: available since July 2000

FILE NAME: SLWN2000-4.ps.Z
REPORT NUMBER: 2000-4
FORMAT: Compressed postscript.
AUTHORS: Vasile Sima
TITLE: SLICOT Linear Systems Identification Toolbox
ABSTRACT: This report summarizes the achievements and deliverables of the Task III.A of the NICONET Project. After a short description of the linear system identification problem and of the available subspace-based techniques to solve it, the numerical algorithms implemented in SLICOT Linear Systems Identification Toolbox - SLIDENT - are surveyed. The associated Fortran routines are then listed and their functional abilities are outlined. The developed interfaces to MATLAB or Scilab, as well as examples of use are presented. Comparisons with the available MATLAB codes are included, illustrating the efficiency and accuracy of the SLIDENT components.
STATUS: available since July 2000

FILE NAME: SLWN2000-5.ps.Z
REPORT NUMBER: 2000-5
FORMAT: Compressed postscript.
AUTHORS: Vicente Hernandez, Ignacio Blanquer, Enrique Arias, Victor Garcia, Lourdes Penalver and Pedro Ruiz
TITLE: Nonlinear control systems simulation toolbox in SLICOT
ABSTRACT: This report presents the SLICOT implementation of the nonlinear control systems toolbox. A common interface to several ODE and DAE libraries is prepared. This interface is the entry point to the SLICOT solvers and enables users to test the advantages of different approaches. In addition, an implementation of a Matlab gateway to the nonlinear

control systems simulation interface is developed which enables the user to define the problems using matlab code, including the definition of the system functions and Jacobians. Also, the performance of the toolbox using benchmark problems, as well as industrial test cases is described.

STATUS: available since August 2000

FILE NAME: SLWN2000-6.ps.Z

REPORT NUMBER: 2000-6

FORMAT: Compressed postscript.

AUTHORS: D.-W. Gu, P.Hr. Petkov and M.M. Konstantinov

TITLE: On Discrete H_{∞} Loop Shaping Design Procedure Routines

ABSTRACT: This report briefly introduces the H_{∞} loop shaping design procedure (LSDP) in the discrete-time case as well as its implementation in the software package SLICOT. Solution formulae are presented with the exposure of a relationship between the solutions to the three discrete-time, algebraic Riccati equations (DARE) required in the construction of an LSDP controller. These SLICOT routines also produce estimates of the condition numbers of the DARE solutions, which reveals the accuracy and reliability of the computational results. The developed routines are tested in a design example, and are included as appendices.

STATUS: available since December 2000

5 NICONET events

Communicated by Sabine Van Huffel:

Our third NICONET workshop will be held in Louvain-la-Neuve, Belgium, in December 2000.

Third NICONET WORKSHOP ON

NUMERICAL CONTROL SOFTWARE

a useful tool in industry

Friday, January 19, 2001

Hotel Le Relais Mercure, Louvain-la-Neuve, Belgium.

Second 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. Wohlgemuth.

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 Dr. Pepijn Wortelboer (Philips Research Laboratory Eindhoven).

Introductory presentations of the newly developed SLICOT toolboxes

``Structured matrix decompositions''
presented by Prof. P. Van Dooren (Universite Catholique de Louvain)
``Subspace identification''
presented by Prof. M. Verhaegen (Twente University of Technology)
``Nonlinear systems for Robotics''
presented by Prof. V. 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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URL: <http://www.auto.ucl.ac.be/~vdooren/register.html>

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

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.

7th SIAM conference on Applied Linear Algebra, North Carolina State
University, Raleigh, NC, U.S.A., October 23-26, 2000

END OF THE NICONET E-LETTER
