information brochure 2019-2020 interuniversitary graduate school

systems and control

colofon

Scientific director	Prof.dr. H. Nijmeijer
Office manager	M. (Martha) Otte
Secretariat	Secretariat DISC, Delft Center for Systems and Control, Delft University of Technology, Mekelweg 2, 2628 CD Delft, The Netherlands
Telephone	(+31)-40-2473203 (Scientific director) (+31)-15-2785572 (Office manager)
E-mail	secr@disc.tudelft.nl
Website	http://www.disc.tudelft.nl
Board	dr. J.W. Polderman (UT), chairman prof.dr. R. Babuška (TUD) prof.dr. ir. J.M.A. Scherpen (RUG) dr.ir. J.D. Stigter (WUR) prof.dr. S. Weiland (TU/e) prof.dr. H.J. Zwart (UT)

Publication date Novemer 2019

The Dutch Institute of Systems and Control DISC has been established on January 1, 1995, by the Delft and Eindhoven Universities of Technology and the University of Twente. The administrative responsibility rests with the Faculty of Mechanical, Maritime and Materials Engineering of the Delft University of Technology.
DISC's graduate school is formally accredited by the Royal Dutch Academy of Sciences.

contents

disc – general introduction	**4**
introduction	4
goals	4
research program	4
teaching program	5
msc education	5
organization	5
participation and relationships	6
systems and control	**7**
systems and control field	7
research program	7
research themes	8
the graduate school of systems and control	**10**
introduction	10
teaching program	10
admission	10
the course program	11
fees and registration	12
grades, credits and certificate	12
summer school	12
winter course	12
benelux meeting on systems and control	13
best thesis award	13
nwo graduate programme	13
course location	13
course program 2019-2020	**15**
course descriptions 2019-2020	**16**
multi-agent network dynamics and games	17
mathematical models of systems	19
nonlinear control systems	21
system identification	22
linear matrix inequalities in control	23
design methods for control systems	25
modelling and control of hybrid systems	27
stability, relative stability and synchronization of dynamical systems with time-delay	29
unit disc	**30**
addresses disc departments	**31**
scientific staff, researchers, phd students	**34**

disc – general introduction

introduction

Research school DISC is an interuniversity research institute and graduate school that unites all academic groups in the Netherlands that are active in systems and control theory and engineering. It offers a nationally organized graduate programme for PhD students in this field.
Founded by the Delft and Eindhoven Universities of Technology and the University of Twente, a majority of participants in the school is affiliated with the faculties of electrical engineering, mechanical engineering, and mathematics of these three universities. A large number of other departments and institutes participate in DISC under various agreements.

goals

The ambitions of DISC are:

- To provide a PhD programme of high quality and internationally recognized level;
- To provide PhD students with a national and international network and to support them in their development towards independent researchers that are part of the international community and whose research is recognized according to international standards;
- To develop the field of systems and control through coordinated research in both fundamental and technology directed programs, and to represent this field of science in national and international networks, consortia and boards;
- To use the position of DISC as center of expertise for dissemination of knowledge on systems and control theory and engineering in the widest sense.

research program

The research program of DISC consists of fundamental and applied scientific research in the domain of systems and control theory and engineering.
By exploiting the fundamental principle of feedback, control systems enable the realization of high-tech systems in all domains of engineering science with fascinating performance in terms of speed, accuracy, autonomy and adaptability to varying circumstances.
Modelling tools are essential in analysing and designing optimal control strategies. Mathematical System Theory provides insight in the formulation of mathematical models, in the derivation of models from experimental data, and in the design of control and feedback signals.

The research program of DISC is divided in three main areas, each of which contains several themes.

1. **System and control theory**
   - System theory, nonlinear, distributed, hybrid and embedded systems;
   - Control theory for nonlinear, robust, adaptive and optimal control.
2. **Theory and application of system modelling**
   - System identification, estimation and signal processing; detection and diagnosis;
   - Modelling tools: discrete events, hybrid systems, network theory, variational and geometric methods, fuzzy logic/neural networks.

3. **Applications of control engineering**
   - Mechatronics, robotics, precision technology, motion control systems, biomedical, aerospace and transportation systems;
   - Process control and optimization in (petro)-chemical and agricultural systems; analysis and control of biological systems.

teaching program

Through its graduate school DISC provides a program for graduate studies in systems and control offered to PhD students of the participating departments. Completing the 4-year programme of the graduate school leads to a PhD degree awarded by one of the participating universities. This programme is generally composed of a course program and a research project, leading to a PhD thesis to be defended in front of a thesis defense committee.

Educational activities of disc include:

Graduate courses on systems and control, organized in Utrecht, on a weekly basis (4 hrs/week), and lectured by national and international top lecturers.

A yearly 4-day international summer school on a particular topic or research field addressing recent developments within or relevant for systems and control.

A yearly winter course on a particular topic or research field lectured by an international lecturer.

Regular scientific DISC meetings where PhD students present their research results. The most important one is the yearly Benelux Meeting on Systems and Control, organized in cooperation with our Belgian colleagues.

msc education

Besides the PhD program in systems and control, DISC is represented in two interuniversity/national MSc programs: the national MSc program in Mathematics, and the 4TU MSc program in Systems and Control.

organization

DISC is governed by a board

consisting of representatives of the three technical universities and the other universities. The daily operation of DISC is directed by the scientific director, who is assisted by the DISC secretariat.
The DISC advisory board, composed of leading representatives from industrial, university and societal bodies, meets once a year with the DISC board to discuss issues concerning strategy and policy.
The scientific director is supported by a management team consisting of all heads of DISC departments.

participation and relationships

Research groups of DISC participate in many consortia and networks with academic, institutional and industrial partners.

In conjunction with the Royal Institution of Engineers in The Netherlands (KIVI), DISC has the status of national member organization (NMO) of IFAC, the International Federation of Automatic Control.

systems and control

Systems theory and control technology forms an academic discipline that originates from the fields of electrical and mechanical engineering and mathematics. The field has also found its way in other technical areas, in biology, medical technology, agricultural science, economics, and computer science.

systems and control field

DISC unites all academic research in the Netherlands in the field of systems and control, ranging from mathematical systems theory research to technology-driven control engineering. Mechanical manipulation of hard-disk heads, developing energy-efficient greenhouses, designing cars that drive-by-wire, autonomously walking or flying robots, operational strategies in process industry .... in all these examples systems and control theory plays a crucial role.

By exploiting the fundamental principle of feedback, control systems enable the realization of high-tech systems in all domains of engineering science with fascinating performance in terms of speed, accuracy, autonomy and adaptability to varying circumstances. Without feedback man would literally fall down.
As a field of generic tools that facilitate modelling, control, design and optimization of technological dynamical systems, the systems and control field is providing a strong enabling technology that plays a central role in very many disciplines in science and engineering.

research program

The research program of DISC consists of fundamental and applied scientific research in the domain of systems and control theory and engineering. The research domain employs modern techniques from information and computer technology to analyse, control and optimize dynamical processes, machines and (high-tech) systems. Modelling tools are essential in analysing and designing optimal control strategies, e.g. by exploiting optimization theory. Mathematical System Theory provides insight in the formulation of mathematical models, in the derivation of mathematical models from experimental data, and in the design of control and feedback signals.

The orientation towards a variety of technological application domains is important for the interplay between theoretical possibilities on the one side, and the urge to advance high-tech applications on the other side, thereby providing a fruitful stimulus for further evolution and development of the scientific area.

research themes

The three main areas in the research programme of DISC are further divided into several themes. Within each theme research lines and topics are sketched together with the acronyms of the DISC groups that participate.

1. System and control theory

System theory, nonlinear, distributed, hybrid and embedded systems

- Behavioural systems and control theory (RUG-JBI, UT-AM, TU/e-EE)
- Infinite-dimensional systems (UT-AM, WU, TU/e-EE, RUG-JBI)
- Hybrid systems (RUG-JBI, CWI, TU/e-ME, TUD-DCSC, UT-AM)
- Embedded systems (TU/e-ME, RUG-JBI)
- Nonlinear systems and control theory (RUG-ENTEG, TU/e-ME, TUD-DCSC, RUG-JBI)
- Model reduction (RUG-ENTEG, MU, TU/e-EE)

Control theory for nonlinear, robust, adaptive and optimal control

- Optimization-based control and LMI's (TUD-DCSC, TU/e-EE)
- Distributed sensing and control (TUD-DCSC, TU/e-EE, TU/e-ME)
- Adaptive control and learning (TUD-DCSC, TU/e-ME, TUD-AE)
- Nonlinear control (TU/e-ME, RUG-JBI)

2. Theory and application of system modelling

System identification, estimation and signal processing; detection and diagnosis

- System identification (TUD-DCSC, TU/e-EE, WU, CWI, MU)
- Fault detection (TUD-DCSC, TUD-AE)
- Parameter and state estimation (TUD-DCSC, WU, TUD-DIAM, TUD-AE)

Modelling tools: discrete events, hybrid systems, network theory, variational and geometric methods, fuzzy logic/neural networks

- Discrete event and hybrid systems (TU/e-ME, TUD-DCSC, TUD-DIAM, MU)
- Fuzzy systems and neural networks (TUD-DCSC)
- Physical modelling (RUG-JBI, TUD-DIAM, RUG-ENTEG)
- Financial engineering (TiU, UT-AM)

3. Applications of control engineering

Mechatronics, robotics, precision technology, motion control systems, biomedical, aerospace and transportation systems

- Mechatronics (TU/e-ME, TU/e-EE, TUD-DCSC, UT-EE, UT-ME, RUG-ENTEG)
- Aerospace systems (TUD-AE, TUD-DCSC)
- Transportation systems (TU/e-EE, TUD-DCSC)
- Smart optics systems (TUD-DCSC, TU/e-ME)
- Automotive systems (TU/e-ME, TUD-DCSC, TU/e-EE)
- Robotics (UT-EE, TUD-DCSC, TU/e-ME, UT-BE)
- Biomedical systems (TU/e-ME, UT-BE)
- Precision technology (TU/e-ME, TU/e-EE)
- Wind energy systems (TUD-DCSC)

Process control and optimization in (petro)-chemical and agricultural systems; analysis and control of biological systems

- Process control and optimization (TU/e-EE, TUD-DCSC, WU)
- Experiment design and monitoring (TUD-DCSC, WU)
- Biological systems (CWI, WU, TUD-DCSC, MU, RUG-JBI, RUG-ENTEG)
- Agricultural systems (WU, UT-AM)
- Nuclear fusion (TU/e-ME)

the graduate school of systems and control

introduction

Through its graduate school DISC provides a program for graduate studies in systems and control offered to PhD students of the participating departments.
This graduate program runs since 1987 and is formally accredited by the Royal Dutch Academy of Sciences (KNAW), and since 2010 supported by NWO, in the scope of the NWO Graduate Programme.

PhD students are offered a course program of weekly lectures that are given by top specialists in a central location in Utrecht. The courses cover a wide range of topics from mathematical systems theory to control engineering and intend to bring PhD students in short time to an internationally recognized research level.

Currently 171 scientific staff members, 48 post-docs and 301 PhD students in 18 DISC departments participate in DISC.

teaching program

DISC offers a graduate program in systems and control that leads to a doctorate degree of one of the participating universities. The requirements are:

Completion of a course program of 27 ECTS credits (21 ECTS, per 01-01-2020).
Completion of a doctoral dissertation, to be approved by the adviser and to be defended in front of an academic committee.

admission

Applications for PhD-membership of DISC are open to all PhD students that are supervised by an advisor who is a member of DISC. Admission to DISC requires an MSc degree in engineering, mathematics or science (to be approved by the university that grants the doctoral degree), an excellent academic record and a good motivation. PhD students are usually employed by the departments that participate in DISC and have a standard government appointment (research assistantship) for 4 years. PhD students of DISC groups should register for DISC by completing the student registration form.

International students that are interested in a graduate program in systems and control in the Netherlands have the following options:

- Apply for an advertized PhDposition in one of the DISC departments. Check the websites of the several DISC departments and the DISC site. These positions provide full financial support for

the DISC graduate program.
- For students that already have a scholarship with full financial support it is advised to contact one of the DISC departments for admission to the graduate program.

Institutions that provide scholarships for graduate studies in the Netherlands are e.g.:
nuffic http://www.nuffic.nl/.
There is no tuition fee for PhD students in the Netherlands.

For certain EU-funded research projects EU citizenship is required. International PhD students usually manage very well in The Netherlands provided that they speak the English language sufficiently well.

DISC does not have a centralized application procedure. Recruitment of PhD students is done locally by the various DISC groups. There are continuously openings for PhD positions. Potential applicants are advized to approach any research group of their interest directly to enquire about any openings.

the course program

The course program of each DISC PhD student is arranged in consultation with the student's adviser and supervisory committee and is formalized in each student's education and supervision plan. It may consist of courses offered by DISC and of suitable graduate courses provided by related graduate schools and institutes.

Yearly organized summer schools and winter courses are part of the DISC graduate program, as well as yearly participation in the Benelux Meeting on Systems and Control, that offers PhD students a platform for presentation and discussion of their results in an international setting.

At the Benelux Meeting on Systems and Control special attention is given to the presentation skills of students, through the competition for the Best Junior Presentation Award.

The course program of DISC is organized in 3 periods (trimesters). All courses are offered as independent modules, so that PhD students can start in any of the three trimesters. The course programme consists of a set of basic courses (6 ECTS) and a number of specialized short courses (3 ECTS). Usually, the basic courses are scheduled yearly, while the specialized short courses vary each year.

Examples of basic courses are:
- *Mathematical Models of Systems*
- *Design Methods for Control Systems*
- *System Identification for Control*

Examples of specialized courses that have been provided regularly in the past are
- *Linear Matrix Inequalities in Control*
- *Modeling and Control of Hybrid Systems*
- *Nonlinear Control Systems*

The course program may be completed in 12 months. It consists of three or four basic courses and a number of specialized courses.

This year's course program with schedule and timetable can be found on page 14. The descriptions of the courses you can find on page 16 and further.

The course program of DISC is (roughly) organized in three 8-week trimesters per year In these periods courses are organized one day a week on Mondays in a central location in Utrecht. In general two courses run in parralel: one morning course (10.15h-12.30h) and one afternoon course (13.45h-16.00h).

All courses provide the students with homework sets that have to be handed in timely for formal completion of the course and for obtaining a grade. Full credit points are only awarded to students that have attended the lectures of the course (auditing) and that have completed the homework sets with a sufficient grade. Auditing a course only (without handing in the homework sets) is rewarded with a reduced-rate ECTS: 1 credit for a 4-week course and 1,5 credit for a 8-week course. In order to receive credits all lectures should be attended. Exemption can only be made by informing the DISC secretariat in writing. All courses are taught in English.

course location

DISC courses are given in Cursus- en Vergadercentrum Domstad in Utrecht. It is located near the Utrecht-CS central railway station. For route descriptions see website www.accommodatiedomstad.nl.

fees and registration

The fee for taking or auditing a 3 ECTS DISC course is €250 and auditing or taking a 6 ECTS DISC course is € 450,-. The fee is waived for DISC students/members. Participants can register on the DISC course platform (http://disc-courseplatform.nl) or send an email to the DISC secretariat at secr@disc.tudelft.nl. Information about the DISC courses can be found on the DISC website: www.disc.tudelft.nl.

grades, credits and certificate

For each completed course participants receive a written acknowledgement of participation that includes the obtained grade and the awarded credits. Per January 1, 2020 a DISC-certificate is handed out when at least 21 ECTS are completed, of which at least 16 ECTS are obtained on the basis of DISC-courses. Maximally 5 ECTS may be obtained through courses of other graduate schools and / or (MSc) courses that are approved by the research supervisor. Students can also receive 1 ECTS for presenting at the Benelux Meeting for Systems and Control. Maximally 2 ECTS will count towards the DISC certificate.

Students who wish to obtain DISC

credits for non-DISC courses are advised to contact the DISC secretariat beforehand so that the course(s) can be pre-approved.

summer school

Every year DISC organizes a Summer School to familiarize students with a research topic of current interest. International specialists are invited to lecture in these summer schools. Recently organized schools are " "Machine Learning for Control" (2018) and "When game Theory meets Systems and Control" (2019).

winter course

Since 2009 DISC organizes a Winter Course, lectured by an international guest lecturer on a particular topic or research field relevant for systems and control. The course is typically scheduled in the winter trimester and can be organized in one or more university locations. The topic of the Winter Course 2019 was "Reinforcement Learning " and it was hosted by Delft University of technology

benelux meeting on systems and control

The annual Benelux Meetings on Systems and Control are held alternately in The Netherlands and Belgium. They provide graduate students and researchers with a podium to present and discuss research results. The program includes keynote talks by invited international speakers and one or two mini-courses by senior researchers.

Since 1996 the Best Junior Presentation Award is anually awarded for the best presentation by a PhD student. The Benelux Meeting 2020 will take place from March 10-12.

best thesis award

The DISC PhD Thesis Award is awarded anually to the PhD candidate that has defended a PhD thesis under supervision of one of the professors of DISC, and that has been selected as the best thesis by a qualified jury. The award consists of a framed certificate and a monetary present, and is announced during the Benelux Meeting. Eligible candidates have completed their thesis defense within 54 months after the start of their project, have obtained a DISC certificate of the graduate programme, and are nominated by their supervisor.

course program 2019 – 2020

term	dates	morning	afternoon
Fall 2019	7/10* 28/10*	**Multi-Agent Network Dynamics and Games** S. Grammatico G. Giordano	
Winter 2020	20/1 27/1 3/2 10/2 17/2 24/2 2/3 9/3	**Mathematical Models of Systems** J.W. Polderman H. Trentelman K. Camlibel	**Nonlinear Control Systems** B. Jayawardhana B. Besselink
Spring 2020	23/3 30/3 6/4 20/4	**System Identification** P. Van den Hof J. Schoukens G. Bottegal	**Linear Matrix Inequalities in Control** S. Weiland T. Donkers
	4/5 11/5 18/5 25/5		**Design Methods for Control Systems** T. Oomen J. van Wingerden
	8/6 15/6 22/6 29/6	**Modelling and Control of Hybrid Systems** M. Mazo R. Postoyan	**Stability, Relative Stability and Synchronization of Dynamical Systems with Time-delay** E. Steur W. Michiels

Time table			Location
Morning	10.15 - 11.15 11.30 - 12.30	*lecture scheduled in the morning and afternoon	Cursus- en Vergadercentrum Domstad Koningsbergerstraat 9 3531 AJ Utrecht www.accommodatiedomstad.nl
Afternoon	13.45 - 14.45 15.00 - 16.00		

course descriptions
2019 - 2020

multi-agent network dynamics and games

lecturers

Dr. Sergio Grammatico, Delft University of Technology
Dr. Giulia Giordano, Delft University of Technology

objectives

The aim of the course is to introduce the mathematical tools for analyzing the dynamics of autonomous, rational agents that interact over and evolve on networks.
Application examples will be drawn from several domains, such as biological systems, power systems, smart grids, network congestion control, social networks, robotic and sensor networks.
The selected mathematical tools are within linear algebra, graph theory, fixed point and monotone operator theory.

contents

Introduction to network systems - Networks as graphs
Elements of graph theory: directed and undirected graphs; node degrees; weighted, balanced and regular graphs; node centrality measures; paths, walks and connectivity. Elements of algebraic graph theory: matrices defined over graphs, adjacency matrix, Laplacian matrix, incidence matrix.

Dynamics over networks
Linear dynamics defined over networks: flow dynamics and distributed averaging. Positive and compartmental systems, flow optimisation over networks, flow control. Consensus and multi-agent coordination problems.

Multi-agent systems - An operator-theoretic perspective
Elements of operator theory: fixed points, zeros, contraction, averaged and nonexpansive mappings. Fixed point algorithms: Banach iteration, Krasnoselskij iteration. Zero finding algorithms: splitting, forward–backward algorithm.

Multi-agent games
Nash equilibrium problem, best response mapping, decentralized and distributed equilibrium seeking algorithms. Generalized Nash equilibrium problem, preconditioned forward–backward equilibrium seeking, forward–backward–forward equilibrium seeking. Application to network congestion control.

course material

Lecture and notes; selected topics in Bullo, "Lectures on network systems", and Bauschke, and Combettes, "Convex analysis and monotone operator theory in Hilbert spaces. A list of references can be found on the DISC course platform.

prerequisites

The prerequisite knowledge consists of linear algebra, calculus and optimization at a graduate level.

homework assignments

Grading by two take-home exams.

mathematical models of systems

lecturers

Dr. J.W. Polderman, University of Twente
Prof. dr. H. Trentelman, University of Groningen
Prof. dr. K. Camlibel, University of Groningen

objective

The purpose of this course is to discuss the ideas and principles behind modelling using the behavioral approach, and to apply these ideas to control system design. In the behavioral approach, dynamical models are specified in a different way than is customary in transfer function or state space models. The main difference is that it does not start with an input/output representation. Instead, models are simply viewed as relations among certain variables. The collection of all time trajectories which the dynamical model allows is called the behavior of the system. Specification of the behavior is the outcome of a modelling process. Models obtained from first principles are usually set-up by tearing and zooming. Thus the model will consist of the laws of the subsystems on the one hand, and the interconnection laws on the other. In such a situation it is natural to distinguish between two types of variables: the manifest variables which are the variables which the model aims at, and the latent variables which are auxiliary variables introduced in the modelling process. Behavioral models easily accommodate static relations in addition to the dynamic ones. A number of system representation questions occur in this framework, among others:

- the elimination of latent variables
- input/output structures
- state space representations

We will also introduce some important system properties as controllability and observability in this setting.
In the first part of the course, we will review the main representations, their interrelations, and their basic properties. In the context of control, we will view interconnection as the basic principle of design. In the to-be-controlled plant there are certain control terminals and the controller imposes additional laws on these terminal variables. Thus the controlled system has to obey the laws of both the plant and the controller. Control design procedures thus consist of algorithms that associate with a specification of the plant (for example, a kernel, an image, or a hybrid representation involving latent variables) a specification of the controller, thus passing directly from the plant model to the controller. We will extensively discuss the notion of implementability as a concept to characterize the limits of performance of a plant to be controlled. We will discuss how the

problems of pole-placement and stabilization look like in this setting.

contents

1. General ideas. Mathematical models of systems. Dynamical systems. Examples from physics and economics. Linear time-invariant systems. Differential equations. Polynomial matrices.
2. Minimal and full row rank representation. Autonomous systems. Inputs and outputs. Equivalence of representations.
3. Differential systems with latent variables. State space models. I/S/O models.
4. Controllability. Controllable part. Observability.
5. Elimination of latent variables. Elimination of state variables.
6. From I/O to I/S/O models. Image representations.
7. Interconnection. Control in a behavioral setting. Implementability
8. Stability. Stabilization and pole placement.

course materials

The main reference is Introduction to Mathematical Systems Theory: A Behavioral Approach by J.W. Polderman and J.C. Willems (Springer 1998 as e-book).

prerequisites

The course is pretty much self-contained. Basic linear algebra and calculus should suffice.

nonlinear control systems

lecturers

Prof. dr. B. Jayawardhana, University of Groningen
Dr. B. Besselink, University of Groningen

objective

The course aims at introducing methods for the analysis and control of nonlinear systems, including fundamental results on stability and dissipativity, geometric control theory as well as a set of self-contained results on the control design of nonlinear systems.

contents

Stability and dissipativity of nonlinear control systems
Lecture 1 Introduction to nonlinear systems, nonlinear differential equations, Lyapunov stability theory, LaSalle's invariance principle
Lecture 2 Dissipativity theory, passivity, L_2 gain stability, input-to-state stability
Lecture 3 Interconnected systems, passivity theorem, small-gain theorem, circle criterion

Analysis of nonlinear control systems
Lecture 4 Introduction to nonlinear control systems and fundamentals of geometric control theory
Lecture 5 Feedback linearization (relative degree, zero dynamics)
Lecture 6 (High-gain) Observer design

Nonlinear control design
Lecture 7 Control Lyapunov functions and backstepping
Lecture 8 Nonlinear output regulation theory and internal model principle

course materials

The lecture notes will be distributed during the course.

prerequisites

The students are expected to be familiar with linear control systems, functional analysis and algebraic topology.

homework assignments

There are four homework assignments (once every two lectures) that will be distributed during the lectures. Each assignment must be handed in within two weeks.

system identification

lecturers

Prof.dr.ir. P.M.J. Van den Hof, Eindhoven University of Technology
Prof.dr.ir. J. Schoukens, VUB, Brussels, Belgium and Eindhoven University of Technology
Dr. G. Bottegal, ASML, Eindhoven

objective

System Identification is involved with data-driven modeling of dynamical systems. The objective of this course is to present the important system identification techniques with a special attention to prediction error methods. Time- and frequency-domain methods will be covered, as well as parametric and non-parametric approaches, with particular attention for recently developed techniques in the domain of machine learning. While the focus will be on linear time-invariant systems, extensions will be made to nonlinear systems also. We will consider both the cases of open-loop and closed-loop data as well as further extensions towards dynamic networks.

contents

1. Introduction; concepts; discrete-time signal and system analysis; estimation
2. Parametric (prediction error) identification methods - model sets, identification criterion, statistical properties
3. Parametric (prediction error) identification methods - model validation, approximate modelling, Maximum likelihood and CRLB
4. Regularization and non-parametric kernel-based identification; machine learning
5. Frequency-domain identification, parametric and non-parametric
6. Nonlinear models
7. Closed-loop identification
8. Identification in dynamic networks

course materials

The lecture notes will be distributed during the course.

prerequisites

Calculus and linear algebra. Some knowledge of statistics and linear systems theory and/or time series analysis is helpful, but not required. The lecture notes contain useful summaries of the important notions used during the course.

homework assignments

The assessment of this course will be in the form of three homework assignments.

linear matrix inequalities in control

lecturers

Prof.dr. S. Weiland, Eindhoven University of Technology
Dr. M.C.F. Donkers, Eindhoven University of Technology

objective

Linear matrix inequalities (LMIs) have proven to be a powerful tool to approach control problems that appear hard, if not impossible, to solve in an analytic fashion. The history of LMIs goes back to the forties and their role in control became emphasized in the sixties (Kalman, Yakubovich, Popov, Willems). Contemporary numerical interior-point methods and semi-definite programming techniques are increasingly powerful and allow solving LMIs in a practically efficient manner (Nesterov, Nemirovskii 1994). Several Matlab software packages are available that allow a simple coding of general LMI problems that arise in typical control problems.
Because of the availability of fast and efficient solvers for semi-definite programs, the research in robust control has experienced a paradigm shift towards reformulating control problems in terms of feasibility tests of systems of LMIs, where properties of convexity and semi-definite programs are fully exploited to solve relevant problems in systems and control.
The main emphasis of the course is:

- To reveal the basic principles of formulating desired properties of a control system using LMIs
- To demonstrate techniques that convert a controller synthesis problem into an LMI problem.
- To get familiar with the use of software packages for performance analysis and controller synthesis using LMI techniques.

The power of this approach is illustrated by several fundamental robustness and performance problems in analysis and design of linear control systems.

contents

1. Some facts from convex analysis. Linear Matrix Inequalities: Introduction. History. Algorithms for their solution.
2. The role of Lyapunov functions to ensure invariance, stability, performance, robust performance. Considered criteria: Dissipativity, integral quadratic constraints, H2-norm, H∞-norm, upper bound of peak-to-peak norm. LMI stability regions.
3. Frequency domain techniques for the robustness analysis of a control system. Integral Quadratic Constraints. Multipliers. Relations to classical tests and to μ-theory.
4. A general technique to proceed from LMI analysis to LMI synthesis. State feedback and output feedback synthesis algorithms for robust stability, nominal performance and

robust performance using general scaling.
5. A choice of extensions to mixed control problems and to linear parameter-varying controller design, robust estimation problems or the use of multiplier techniques in control system design.

course material

The main reference material for the course will be an extensive set of lecture notes by Carsten Scherer and Siep Weiland. Additional reference material:
1. S. Boyd, L. El Ghaoui, E. Feron and V. Balakrishnan, Linear Matrix Inequalities in System and Control Theory, SIAM studies in Applied Mathematics, Philadelphia, 1994.
2. L. El Ghaoui and S.I.Niculescu (Editors), Advances in Linear Matrix Inequality Methods in Control, SIAM, Philadelphia, 2000.
3. A. Ben-Tal, A. Nemirovski, Lectures on Modern Convex Optimization: Analysis, Algorithms, and Engineering Applications, SIAM-MPS Series in Optimizaton, SIAM, Philadelphia, 2001.
4. G. Balas, R. Chiang, et al. (2006). Robust Control Toobox (Version 3.1), The MathWorks Inc.
5. J. Löfberg, YALMIP, http://control.ee.ethz.ch/˜joloef/yalmip.php.

prerequisites

Linear algebra, calculus, basic system theory, MATLAB.

homework assignments

We plan to issue 4 homework sets that include choices of theoretical and practical assignments. Full credit is received for successfully solving the assigned take-home sets.that include choices of theoretical and practical assignments. Full credit is received for successfully solving the assigned take-home sets.

design methods for control systems

lecturers

Dr. ir. T. A. E. Oomen, Eindhoven University of Technology
Prof. dr. ir. J.W. van Wingerden, Delft University of Technology

objective

The course presents "classical," "modern" and "postmodern" notions about linear control system design. First the basic principles, potentials, advantages, pitfalls and limitations of feedback control are presented. An effort is made to explain the fundamental design aspects of stability, performance and robustness. Next, various well-known classical single-loop control system design methods are reviewed and their strengths and weaknesses are analyzed. The course includes a survey of design aspects that are characteristic for multivariable systems, such as interaction, decoupling and input-output pairing. Further LQ, LQG and some of their extensions are reviewed. After a presentation of uncertainty, model design methods based on H-infinity-optimization and mu-synthesis are presented.

contents

1. INTRODUCTION TO FEEDBACK THEORY.
   Basic feedback theory, closed-loop stability,
   stability robustness, loop shaping, limits of performance.
2. CLASSICAL CONTROL SYSTEM DESIGN.
   Design goals and classical performance criteria, integral control,
   frequency response analysis, compensator design, classical methods
   for compensator design.
3. MULTIVARIABLE CONTROL.
   Multivariable poles and zeros, interaction, interaction measures,
   decoupling, input-output pairing.
4. LQ, LQG AND CONTROL SYSTEM DESIGN.
   LQ basic theory, LQG basic theory.
5. UNCERTAINTY MODELS AND ROBUSTNESS.
   Parametric robustness analysis, the small-gain theorem, stability robustness of feedback systems, numerator-denominator, structured singular value robustness analysis, combined
   performance and stability robustness.
6. H-INFINITY OPTIMIZATION AND MU-SYNTHESIS.
   The mixed sensitivity problem, loop shaping, the standard H-infinity
   control problem, state space solution, optimal and suboptimal solutions,

integral control and HF roll-off, mu-synthesis, application.

A. Appendix on Matrices

B. Appendix on norms of signals and systems.

course material

A full set of lecture notes will be made available on the DISC course platform.

prerequisites

Basic undergraduate courses in systems and control. Some familiarity with MATLAB is helpful for doing the homework exercises

homework assignments

Homework is graded on a scale from 1 to 10. Missing sets receive the grade 1. The final grade for the course is a weighted average of the grades for the homework sets

modelling and control of hybrid systems

lecturers

Dr.ir. Manuel Mazo Jr., Delft University of Technology
Dr.ir. Romain Postoyan, CNRS - CRAN, Université de Lorraine

objective

Recent technological innovations have caused a considerable interest in the study of dynamical processes of a mixed continuous and discrete nature. Such processes are called hybrid systems and are characterized by the interaction of continuous-time models (governed by differential or difference equations) on the one hand, and logic rules and discrete-event systems (described by, e.g., automata, finite state machines, etc.) on the other. A hybrid system also arises in practice to model so called cyber-physical systems, e.g. when continuous physical processes are controlled via embedded software that intrinsically has a finite number of states only (e.g., on/off control).

contents

1. General introduction. Examples of hybrid systems & motivation.
2. Modelling frameworks (automata, hybrid automata, piecewise-affine systems, complementarity systems, mixed logic dynamical systems, ...)
3. Properties and analysis of hybrid systems (well-posedness, Zeno behaviour, stability, liveness, safety, etc.).
4. Control of hybrid systems (switching controllers, model predictive control, etc.)
5. Verification. Tools.

course materials

B. De Schutter and W.P.M.H. Heemels, "Modelling and Control of Hybrid Systems", Lecture Notes for the DISC Course. Revised edition. 2016.
These lecture notes will be made available electronically.
Course website:
https://mmazojr.3me.tudelft.nl/teaching/DISC_hs

prerequisites

Basic undergraduate courses in systems and control.
Basic programming skills (Matlab/Python).

homework assignments

Three homework assignments will be handed out. The assignments will be graded and the weighted average grade will be the final grade for this course.

stability, relative stability and synchronization of dynamical systems with time-delay

lecturers

Prof.dr.ir. W. Michiels, KU Leuven
dr.ir. E. Steur, Eindhoven University of Technology

objective

Time-delays are important components of many systems in engineering, economics and the life sciences, due to the fact that the transfer of material, energy and information is mostly not instantaneous. Time-delays appear for instance as computation and communication lags, they model transport phenomena and heredity and they arise as feedback delays in control loops. Since delays have a significant effect on the dynamic behavior of the system, and this effect is not always intuitive, it is important to take them explicitly into account in the mathematical model. Severe challenges in the research on time-delay systems are due to the emergence of new application fields, mainly in the area of large-scale interconnected systems and networks (e.g., analysis of neuronal networks, control of communication networks like the internet, networked control systems, distributed decision making and control).

The aim of the course is to present a detailed description of the main properties of dynamical systems subjected to time-delays, thereby highlighting differences and similarities with delay-free systems and providing insight, as well as to present an overview of techniques for the stability analysis of equilibria. Both frequency domain and time-domain methods are discussed. In the second part of the course, the emphasis is on the analysis of relative stability problems, such as consensus in multi-agent systems and synchronization. Several applications, ranging from traffic flow analysis to networks of interacting neurons, complete the presentation..

contents

1: Introduction to time-delay systems

• Examples and applications, fundamental properties of time-delay systems (representations, existence and uniqueness of solutions, stability notions), spectral properties of linear time-delay systems

• Qualitative effects of delays in dynamical systems (instability mechanisms, limitations in control, opportunities to use delays in controllers).

2: Methods for stability analysis

• Frequency domain techniques :

spectral analysis (characteristic roots and pseudospectral abscissa computation), stability regions in parameter spaces (from D-subdivision to numerical continuation, invariance properties and crossing direction of roots, algebraic and geometric techniques)

• Time-domain methods: generalization of Lyapunov's second method (Lyapunov-Krasovskii functionals, Lyapunov-Razumikhin functions) , methods based on the small gain theorem.

3: Relative stability problems

• Notions of relative stability; consensus and synchronization problems

• Synchronization of two coupled systems: synchronization manifold, stabilization mechanism, sufficient conditions, effect of coupling delays (invasive versus non-invasive coupling, synchronization conditions in terms of coupling gain and delay parameters, delay compensation)

4: Synchronization in complex networks

• Description of network, including the analysis of its graph Laplacian; relation between synchronization and the network topology, full and partial synchronization

• Examples: networks of coupled Hindmarsh-Rose neurons.

prerequisites

Basic courses on dynamical systems and control (Matlab/Python).

homework assignments

Two homework assignments will be given (at the end of Lectures 2 and 4), where the students are asked to solve exercises with pen and paper and MATLAB. Software, its documentation and supplementary course material will be made available online.

unit disc

Unit DISC is the council of research students of DISC. It represents the group of PhD students and interacts with the scientific director and board of DISC on all matters that relate to DISC activities and the position of PhD students. They also take care of the course evaluations. Unit DISC can be contacted through one of their representatives:

Shengling Shi (TU/e-EE),
s.shi@tue.nl

Henk van Waarde(RUG-ENTEG),
h.j.van.Waarde@rug.nl

Daniel Jarne Ornia (TUD-DCSC)
d.jarneornia@tudelft.nl

addresses disc departments

delft university of technology

Faculty of Mechanical, Maritime and Materials Engineering
Delft Center for Systems and Control (TUD-DCSC)
Mekelweg 2
2628 CD Delft

Faculty of Mechanical, Maritime and Materials Engineering
Cognitive Robotics (TUD-COR)
Mekelweg 2
2628 CD Delft

Faculty of Electrical Engineering, Mathematics and Computer Science
Department of Applied Mathematics
Section Mathematical Physics (TUD-DIAM)
P.O. Box 5031
2600 GA Delft

Faculty of Aerospace Engineering
Department of Aerospace Design, Integration & Operations
Section Control and Simulation (TUD-AE)
P.O. Box 5058
2600 GB Delft

eindhoven university of technology

Department of Mechanical Engineering (TUe-ME)
Section Dynamics and Control
Section Control Systems Technology
P.O. Box 513
5600 MB Eindhoven

Department of Electrical Engineering
Section Control Systems (TUe-EE)
P.O. Box 513
5600 MB Eindhoven

university of twente

Faculty of Electrical Engineering, Mathematics and Computer Science
Department of Robotics and Mechatronics (UT-RAM)
P.O. Box 217
7500 AE Enschede

Faculty of Electrical Engineering, Mathematics and Computer Science
Department of Applied Mathematics
Hybrid Systems Group (UT-AM)
P.O. Box 217
7500 AE Enschede

Faculty of Engineering Technology
Department of Mechanics of Solids, Surfaces & Systems
Structural Dynamics, Acoustics and Control (UT-MS3)
P.O. Box 217
7500 AE Enschede

Faculty of Engineering Technology
Department of Biomechanical Engineering (UT-BE)
P.O. Box 217
7500 AE Enschede

vu university amsterdam

Faculty of Sciences
Department of Mathematics
Section Mathematical Analysis (VU)
De Boelelaan 1081a,
1081 HV Amsterdam

university of groningen

Faculty of Science and Engineering
Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence (RUG-BI)
Group Systems, Control and Applied Analysis
Group Artifical Intelligence
P.O. Box 800
9700 AV Groningen

Faculty of Science and Engineering
Engineering and Technology Institute Groningen (**RUG-ENTEG**)
Division Discrete Technology and Production Automation
Division Smart Manufacturing Systems
Nijenborgh 4
9747 Groningen

maastricht university

Faculty of Science and Engineering
Department of Data Science and Knowledge Engineering (**MU**)
P.O. Box 616
6200 MD Maastricht

tilburg university

Tilburg School of Economics and Management (TiSEM)
CentER – Center for Economic Research
Department of Econometrics and Operations Research (**TiU**)
P.O. Box 90153
5000 LE Tilburg

wageningen university and research

Department of Plant Sciences
Biometris (**WU-BM**)
P.O. Box 17
6700 AA Wageningen

Department of Plant Sciences
Farm Technology **(WU-FT)**
P.O. Box 16
6700 AA Wageningen

scientific staff, researchers, phd students

name	e-mail address
CentER	
secretariat: Heidi Ket (phone 013-4662462)	
e-mail: secretariaat.econometrie@uvt.nl	
member DISC management team: dr. J.C. Engwerda	
Staff	
Dr. J.C. Engwerda	j.c.engwerda@uvt.nl
RUG – Engineering and Technology Institute Groningen	
secretariat division DPTA, SMS and ODS: Frederika Fokkens	
e-mail: secdtpa@rug.nl / secsms@rug.nl	
member DISC management team: division DTPA prof.dr.ir. J.M.A. Scherpen, division SMS prof.dr. C. De Persis	
Staff	
Dr. M.I. Acuautla Meneses	m.i.acuautla.meneses@rug.nl
Prof. D. Bauso	d.bauso@rug.nl
Prof. dr. M. Cao	m.cao@rug.nl
Dr. A.K. Cherukuri	a.k.cherukuri@rug.nl
Prof.dr. C. De Persis	c.de.persis@rug.nl
Prof.dr. B. Jayawardhana	b.jayawardhana@rug.nl
Dr. N. Monshizadeh	n.monshizadeh@rug.nl
Prof.dr.ir. J.M.A. Scherpen	j.m.a.scherpen@rug.nl
Dr. P. Tesi	p.tesi@rug.nl
PhD-students	
M.Z. Almuzakki	m.z.almuzakki@rug.nl
W.B. Baar	w.baar@rug.nl
L. Carvalho	l.carvalho@rug.nl
C. Cenedese	c.cenedese@rug.nl
N. Chan	n.p.k.chan@rug.nl
C. Chan Zheng	c.chan.zheng@rug.nl
L. Chen	l.m.chen@rug.nl

name	e-mail address
R. Cunha	r.f.cunha@rug.nl
T. Esteves Rosa	t.esteves.rosa@rug.nl
K. Frieswijk	k.frieswijk@rug.nl
L. Gong	l.gong@rug.nl
A. Govaert	a.govaert@rug.nl
M. Guo	m.guo@rug.nl
F. Huang	f.huang@rug.nl
M. Jeeninga	m.jeeninga@rug.nl
B. Jin	b.jin@rug.nl
H. Jin	h.jin@rug.nl
M.C. de Jong	matthijs.de.jong@rug.nl
C. de Jonge	chris.de.jonge@rug.nl
N. Li	ningbo.li@rug.nl
T. Li	t.li@rug.nl
A. Luppi	a.luppi@rug.nl
E. Martirosyan	e.n.martirosyan@rug.nl
M.A. Prawira Negara	m.a.prawira.negara@rug.nl
O. Portals Marin	o.portoles.marin@rug.nl
Y. Qin	yuzhen-qin@whu.edu.cn
M. Rotulo	m.rotulo@rug.nl
A.E.M. Schmerbauch	a.e.m.schmerbauch@rug.nl
M. Shakarami	m.shakarami@rug.nl
A. Silani	a.silani@rug.nl
S. Taleb	s.taleb@rug.nl
R. Tri Cahyono MSc	r.tri.cahyono@rug.nl
M.A. Vasquez Beltran	m.a.vasquez.beltran@rug.nl
H. van Waarde	h.j.van.waarde@rug.nl
W. Yao	w.yao@rug.nl
H. Zhang	hongyu.zhang@rug.nl
X. Zheng	
Researchers and postdocs	
M. Badillo	
A. Bisoffi	a. bisoffi@rug.nl
L.P. Borja	l.p.borja.rosales@rug.nl
M. Cucuzzella	m.cucuzella@rug.nl
M. Guo	m.guo@rug.nl
K.C. Kosaraju	k.c.kosaraju@rug.nl
V. Rostampour	v.rostampour@rug.nl
Z. Sun	zhonqi.sun@rug.nl

name	e-mail address
M. Ye	m.ye@rug.nl
L. Zino	lorenzo.zino@rug.nl

RUG –Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence

secretariat: Ineke Schelhaas (phone 050-3633379)
e-mail: Bernoulli.office@rug.nl
member DISC management team: prof.dr. H.L. Trentelman

Staff	
Dr. B. Besselink	b.besselink@rug.nl
Prof.dr. K. Çamlibel	m.k.camlibel@rug.nl
Prof. dr. R. Carloni	r.carloni@rug.nl
Prof.dr. A.J. van der Schaft	a.j.van.der.schaft@rug.nl
Dr. S. Trenn	s.trenn@rug.nl
Prof.dr. H.L. Trentelman	h.l.trentelman@rug.nl
Dr. A.S.M. Waters	a.m.s.waters@rug.nl
PhD-students	
A.B.M. Burohman	a.m.burohman@rug.nl
R. D'Anniballe	r.danniballe@rug.nl
J. Eising	j.eising@rug.nl
S. Hossain	s.hossain@rug.nl
J. Jia	j.jia@rug.nl
J. Jiao	j.jiao@rug.nl
V. Krishna	v.krishna@rug.nl
A. Mazumder	a.mazumder@rug.nl
V. Raveendranathan	v.raveendranathan@rug.nl
B. Shali	b.m.shali@rug.nl
K. Sholmalzadeh	k.shomalzadeh@rug.nl
G. Tagliabue	v. tagliabue@rug.nl
C. Wang	chase.wang@rug.nl
P. Wijnbergen	p.wijnbergen@rug.nl
T. Xu	t.xu@rug.nl
Researchers and postdocs	
Dr. Yahao Chen	yahao.chen@rug.nl

WU – Biometris

secretariat: Dinie Verbeek-Greeve
e-mail: dinie.verbeek@wur.nl
member DISC management team: prof. dr.ir. K.J. Keesman

Staff	
Prof. dr.ir. K.J. Keesman	karel.keesman@wur.nl

name	e-mail address
Dr. ir. J.D. Stigter	hans.stigter@wur.nl
Dr. ir. L.G. van Willigenburg	gerard.vanwilligenburg@wur.nl
PhD-students	
C.V.C. Geelen	caspar.geelen@wur.nl
D. Joubert	dominique.joubert@wur.nl
H. Kandemir	hakan.kandemir@wur.nl
E. Ross	edwin.ross@wur.nl
Z. Zhu	Ze.zhu@wur.nl
Researchers and postdocs	
S. Goddek	simon.goddek@wur.nl

WU – Farm Technology

secretariat: Miranda Tap – de Weme

e-mail: miranda.tap@wur.nl

member DISC management team: Prof. dr. ir. E. van Henten

Staff	
Dr. ir. S.M.E. Derakshani	sayed.derakshani@wur.nl
Dr. M. Derks	marjolein.derks@wur.nl
Prof. dr. ir. P. Groot Koerkamp	peter.grootkoerkamp@wur.nl
Prof. dr. ir. EJ van Henten	eldert.vanhenten@wur.nl
Dr. ir. J.W Hofstee	janwillem.hofstee@wur.nl
Drs. A.P.H.M. Janssen	arni.janssen@wur.nl
Dr. H.A. Khan	haris.khan@wur.nl
Dr. G.W Kootstra	gert.kootstra@wur.nl
Dr. A. Leylavi Shoustari	Ali.leylavishoushtari@wur.nl
Dr. ir. S. van Mourik	simon.vanmourik@wur.nl
Dr. ir. A. van 't Ooster	bert.vantooster@wur.nl
R.J.C. van Ooteghem	rachel.vanooteghem@wur.nl
Dr. P.J.J. van der Tol	rik.vandertol@wur.nl
PhD-students	
R. Barth	ruud.barth@wur.nl
F.P. Boogaard	frans.boogaard@wur.nl
P.M. Blok	pieter.blok@wur.nl
Drs. I.D.E. van Dixhoorn	ingrid.vandixhoorn@wur.nl
H.J.C. van Dooren	hendrikjan.vandooren@wur.nl
N. Dorji	nedup.dorji@wur.nl
D. Kaljaca	dejan.kaljaca@wur.nl
D. Katzin	david.katzin@wur.nl
I.M. Krijger	inge.krijger@wur.nl
A.Marquez Aguilar	angel.marquezaguilar@wur.nl
F.D. Mondaca Duarte	francisco.mondacaduarte@wur.nl
T.M.J. Ruigrok	thijs.ruigrok@wur.nl
X. Song	xiangyu.song@wur.nl
H. Suh	hyun.suh@wur.nl
H.J.E. van Weeghel	ellen.vanweeghel@wur.nl
B. Zhou	bo.zhou@wur.nl
M. Zhou	mengting.zhou@wur.nl

name	e-mail address

UM – Department of Knowledge Engineering

secretariat Esther Breuls phone
email: esther.breuls@maastrichtuniversity.nl
member DISC management team: prof.dr.ir. R.L.M. Peeters

Staff	
Dr. P.J. Collins	pieter.collins@maastrichtuniversity.nl
Dr. J.M.H. Karel	joel.karel@maastrichtuniversity.nl
Dr. Siamak Mehrkanoon	siamak.mehrkanoon@maastrichtuniversity.nl
Dr. R. Möckel	rico.mockel@maastrichtuniversity.nl
Prof.dr.ir. R.L.M. Peeters	ralf.peeters@maastrichtuniversity.nl
Dr. K. Stankova	k.stankova@maastrichtuniversity.nl
Dr. R. Westra	westra@maastrichtuniversity.nl
PhD-students	
A. Ahangi	amir.ahangi@ maastrichtuniversity.nl
L. Dahl	lucas.dahl@maastrichtuniversity.nl
Y. Gou	yiyong.gou@ maastrichtuniversity.nl
K. Schueller	k.schuller@maastrichtuniversity.nl

VU – Department of Mathematics

secretariat phone 020-5987700
member DISC management team: prof.dr. A.C.M. Ran

Staff	
Prof.dr. M.A. Kaashoek,	m.a.kaashoek@vu.nl
Prof.dr. A.C.M. Ran	a.c.m.ran@vu.nl

TUD - DCSC

secretariat: Marieke Versloot-Bus
e-mail: m.versloot-bus@tudelft.nl
member DISC management team: prof.dr.ir. M. Verhaegen, prof.dr.ir. B. De Schutter and prof. dr. J. Van Wingerden

Staff	
Dr. K. Batselier	k. batselier@tudelft.nl
Dr.ir. A.J.J. van den Boom	a.j.j.vandenboom@tudelft.nl
Prof.dr.ir. B. De Schutter	b.deschutter@tudelft.nl
Dr. R. Ferrari	r.ferrari@tudelft.nl
Dr. ing. G. Giordano	g.giordano@tudelft.nl
Dr. S. Grammatico	s.grammatico@tudelft.nl
Dr.ir. T. Keviczky	t.keviczky@tudelft.nl

name	e-mail address
Dr. M. Kok	m.kok-1@tudelft.nl
Dr. M. Mazo Jr.	m.mazo@tudelft.nl
Dr. P. Mohajerin Esfahani	p.mohajerinesfahani@tudelft.nl
Dr. ing. R. Van de Plas	raf.vandeplas@tudelft.nl
Dr. C. Smith	c.s.smith@tudelft.nl
Prof. dr. G. Vdovine	g.v.vdovine@tudelft.nl
Prof.dr.ir. M. Verhaegen	m.verhaegen@tudelft.nl
Dr. ir. S. Wahls	s.wahls@tudelft.nl
Prof. dr.ir. J. van Wingerden	j.w.vanwingerden@tudelft.nl
PhD-students	
Ir. T.E. Agbana	t.e.agbana@tudelft.nl
V. Bajaj	v.bajaj-1@tudelft.nl
M. Bianchi	m.bianchi@tudelft.nl
S. Chimmalgi	s.chimmalgi@tudelft.nl
J. Cnossen	j.p.cnossen@tudelft.nl
G. Delimpaltadakis	i.delimpaltadakis@tudelft.nl
C.A. Devia Pinzon	c.a.deviapinzon@tudelft.nl
B.M. Doekemeijer	b.m.doekemeijer@tudelft.nl
J. Dong	j.dong-6@tudelft.nl
J.E. Fransman MSc.	j.e.fransman@tudelft.nl
J.A. Frederik	j.a.frederik@tudelft.nl
J. Fu	j.fu-1@tudelft.nl
M. Gasparyan	m.gasparyan@tudelft.nl
E. de Gelder	e.degelder@tudelft.nl
G. Gleizer	g.gleizer@tudelft.nl
A. Gupta	a.gupta-3@tudelft.nl
U. Gutierrez Santiago	u.gutierrezsantiago@tudelft.nl
D. van der Hoek	d.c.vanderhoek@tudelft.nl
R.M. Hommes	r.m.hommes@tudelft.nl
D. Jarne Ornia	d.jarneornia@tudelft.nl
T. Keijzer	t.keijzer@tudelft.nl
P. de Koster	p.b.j.dekoster@tudelft.nl
S. Krilasevic	s.krilasevic-1@tudelft.nl
Kulmukhanova, A.	a.kulmukhanova@tudelft.nl
J.L.G. Lago Garcia	j.lagogarcia@tudelft.nl
M. Lv	m.lyu@tudelft.nl
Ir. S.P. Mulders MSc	s.p.mulders@tudelft.nl
M. Picallocruz	m.picallocruz.nl
T. Pippia	t.m.pippia@tudelft.nl

name	e-mail address
P.J. Piscaer	p.j.piscaer@tudelft.nl
P.J. Prins	p.j.prins@tudelft.nl
A. Raja	a.a.raja@tudelft.nl
M.A. Sharifi Kolarijani	m.a.sharifikolarijani@tudelft.nl
D. Sun	d.sun-1@tudelft.nl
T. Tao	t.tao-1@tudelft.nl
C.F. Verdier	c.f.verdier@tudelft.nl
X.Wang	x.wang-15@tudelft.nl
Researchers and postdocs	
L.A. de Araujo Passos	l.a.dearaujopassos@tudelft.nl
Dr. ing. M. Brühl	m.bruehl@tudelft.nl
Dr. F. Fabiani	f.fabiani@tudelft.nl
Dr. S. Fazel	s.fazel@tudelft.nl
B. Franci	b.franci-1@tudelft.nl
Dr. Y. Liu	y.liu-17@tudelft.nl
Dr. O.A. Soloviev	o.a.soloviev@tudelft.nl

TUD – Cognitive Robotics (CoR)

secretariat: Hanneke Hustinx and Karin van Tongeren
e-mail: secretariaat-cor-3mE@tudelft.nl
member DISC management team: prof. dr. ir. H. Hellendoorn and prof.dr. R. Babuska

Staff	
Prof. dr. ir. D.A. Abbink	d.a.abbink@tudelft.nl
Dr. J. Alonso Mora	j.alonsoMora@tudelft.nl
Prof. dr. R. Babuska	r.babuska@tudelft.nl
Dr. ir. E.R. Boer	e.r.boer@tudelft.nl
Prof. dr. D.M. Gavrila	d.gavrila@tudelft.nl
Dr. ir. R. Happee	r.happee@tudelft.nl
Prof. dr. ir. H. Hellendoorn	j.hellendoorn@tudelft.nl
Dr. ir. C. Hernández Corbato	c.h.corbato@tudelft.nl
Dr. ing. J. Kober	j.kober@tudelft.nl
Dr. J.F.P. Kooij	j.f.p.kooij@tudelft.nl
Dr. W. Pan	wei.pan@tudelft.nl
Dr. L. Peternel	l.peternel@tudelft.nl
Dr. B. Shyrokau	b.shyrokau@tudelft.nl
Dr. M. Wiertlewski	m.wiertlewski@tudelft.nl
Dr. ir. J.C.F. de Winter	j.c.f.dewinter@tudelft.nl
Prof. dr. ir. M. Wisse	m.wisse@tudelft.nl
PhD students	

name	e-mail address
A. Anil Meera	A.AnilMeera@tudelft.nl
S. Barendswaard	s.barendswaard@tudelft.nl
T. Bates	t.bates@tudelft.nl
T.D. de Bruin	t.d.debruin@tudelft.nl
Y.B. Eisma	y.b.eisma@tudelft.nl
B.F. Ferreira de Brito	bruno.debrito@tudelft.nl
G. Franzese	g.franzese@tudelft.nl
T.M. Hehn	t.m.hehn@tudelft.nl
M. Imre	m.imre@tudelft.nl
T. Irmak	t.irmak@tudelft.nl
S.B. Kolekar	s.b.kolekar@tudelft.nl
M. Kronmüller	m.kronmuller-1@tudelft.nl
P. Kulkarni	p.v.kulkarni@tudelft.nl
A. Palffy	a.palffy@tudelft.nl
R. Perez Dattari	r.j.perezdattari@tudelft.nl
C. Pezzato	c.pezzato@tudelft.nl
T. Melman	t.melman@tudelft.nl
E.A.I. Pool	e.a.i.pool@tudelft.nl
A. Serra	a.serragomez@tudelft.nl
L.F. van der Spaa	l.f.vanderspaa@tudelft.nl
J.C.J. Stapel	j.c.j.stapel@tudelft.nl
Y. Zheng	y.zheng-2@tudelft.nl
H. Zhou	h.zhou-3@tudelft.nl
H. Zhu	h.zhu@tudelft.nl
Researchers and postdocs	
X. Bai	x.bai@tudelft.nl
P. Bazilinskyy	p.bazilinskyy@tudelft.nl
N. Beckers	n.w.m.beckers@tudelft.nl
C.E. Celemin Paez	c.e.celeminPaez@tudelft.nl
L. Ferranti	l.ferranti@tudelft.nl
F.B. Flohr	f.b.flohr@tudelft.nl
C. Hernandez Corbato	c.h.corbato@tudelft.nl
N. Kluft	n.kluft@tudelft.nl
M. Mirakhorlo	m.mirakhorlo@tudelft.nl
A. Zgonnikov	a.zgonnikov@tudelft.nl

name	e-mail address
TUD – Department of Applied Mathematics	
secretariat: Dorothée Engering phone 015-2783883	
e-mail: d.w.m.engering@tudelft.nl	
member DISC management team: prof.dr.ir. A.W. Heemink	
Staff	
Prof.dr.ir. A.W. Heemink	a.w.heemink@tudelft.nl
Dr.ir. J.G. Maks	j.g.maks@tudelft.nl
Em. prof.dr.ir. G.J. Olsder	g.j.olsder@tudelft.nl
Em. prof.dr.ir. J.H. van Schuppen	j.h.vanschuppen@tudelft.nl
Dr. J.W. van der Woude	j.w.vanderwoude@tudelft.nl
PhD-students	
M. Adibi	m.adibi@tudelft.nl
J. Jin	j.jin-2@tudelft.nl
S. Lopez Restrepo	s.lopezrestrepo@tudelft.nl
A.R.P.J. Vijn	a.r.p.j.vijn@tudelft.nl
C. Xiao	c.xiao@tudelft.nl
A. Yarce Botero	a.yarcebotero@tudelft.nl
TUD – Faculty of Aerospace Engineering	
secretariat: Bertine Markus phone 015-2782094	
e-mail: b.m.markus@tudelft.nl	
member DISC management team: prof.dr.ir. M. Mulder	
Staff	
Dr.ir. C. Borst	c.borst@tudelft.nl
Dr. Q.P. Chu	q.p.chu@tudelft.nl
Dr.G.C.H.E. de Croon	g.c.h.e.decroon@tudelft.nl
Dr.ir. J. Ellerbroek	j.ellerbroek@tudelft.nl
Prof.dr.ir. J.M. Hoekstra	j.m.hoekstra@tudelft.nl
Dr. A. Jamshidnejad	a.jamshidnejad@tudelft.nl
Dr.ir. E. van Kampen	e.vankampen@tudelft.nl
Em. prof.dr.ir. J.A. Mulder,	j.a.mulder@tudelft.nl
Prof.dr.ir. M. Mulder	m.mulder@tudelft.nl
Ir. T.J. Mulder	t.j.mulder@tudelft.nl
Dr.ir. M.M. van Paassen	m.m.vanpaassen@tudelft.nl
Dr.ir. M.D. Pavel	m.d.pavel@tudelft.nl
Dr.ir. D.M. Pool	d.m.pool@tudelft.nl
Dr. J. Sun	j.sun-1@tudelft.nl
Dr. ir. A.C. in ‘t Veld	a.c.intveld@tudelft.nl
Dr.ir. C.C. de Visser	c.c.devisser@tudelft.nl
PhD-students	
Ir. P. Acquatella	p.j.acquatellabustillo@tudelft.nl
I. Arush	i.arush@tudelft.nl
Ir. D. Van Baelen	d.vanbaelen@tudelft.nl

name	e-mail address
Ir. K. Capiot	k.capiot-1@tudelft.nl
Ir. D. Cleij	d.cleij@tudelft.nl
M. Coppola	m.coppola@tudelft.nl
Ir. T. van Dijk	j.c.vandijk-1@tudelft.nl
Ir. M. Doole	m.m.doole@tudelft.nl
Y.B. Eisma	y.b.eisma@tudelft.nl
Ir. L. van Eykeren	l.vaneykeren@tudelft.nl
D. Friesen	d.friesen@tudelft.nl
Y. Huang	y.huang-2@tudelft.nl
C. Janke	c.janke@tudelft.nl
R.E. Klomp	r.e.klomp@tudelft.nl
S.Li, MSC	s.li-4@tudelft.nl
Ir. J.B. Maas	j.b.maas@tudelft.nl
Ir. K.N. McGuire	k.n.mcguire@tudelft.nl
Ir. G.A. Mercado Velasco	g.a.mercadovelasco@tudelft.nl
I.C. Metz, MSC.	i.c.metz@tudelft.nl
Ir. I. Miletovic	i.miletovic@tudelft.nl
Ir. N. Nabi	h.n.nabi@tudelft.nl
D.A. Olejnik	d.a.olejnik@tudelft.nl
S.U. Pfeiffer	N/A
Ir. J.L. de Prins	johan.l.deprins@boeing.com
I. Rudnyk	i.rudnyk@tudelft.nl
P.F. Scaramuzzino	p.f.scaramuzzino@tudelft.nl
B. Sun	b.sun-1@tudelft.nl
S. Sun	s.sun-4@tudelft.nl
Ir. M. Tielrooij	m.tielrooij@tudelft.nl
T. Visser`	t.visser-1@tudelft.nl
Ir. C. de Wagter	c.dewagter@tudelft.nl
Y. Xu	y.xu-6@tudelft.nl
Y. Yu	y.yu-2@tudelft.nl
Y. Zhang, MSc.	ye.zhang@tudelft.nl

TU/e – Department of Electrical Engineering

Secretariat: Diana Heijnerman and Hiltje Nawijn phone 040-2472300

e-mail: secretariaat.cs@tue.nl

member DISC management team: prof.dr.ir. P.M.J. Van den Hof

Staff

Prof.dr.ir. A.C.P.M. Backx	a.c.p.m.backx@tue.nl
Prof.dr.ir. H.J. Bergveld	h.j.bergveld@tue.nl
Em. prof.dr.ir. P.P.J. v.d. Bosch,	p.p.j.v.d.bosch@tue.nl
Prof.dr.ir. H. Butler	h.butler@tue.nl
Dr.ir. M.C.F. Donkers	m.c.f.donkers@tue.nl

name	e-mail address
Dr. S. Haesaert	s.haesaert@tue.nl
Dr. M. Lazar	m.lazar@tue.nl
Dr. L. Ozkan	l.ozkan@tue.nl
Prof. dr. ir. J.F.M. Schoukens	j.f.m.schoukens@tue.nl
Dr. M. Schoukens	m.schoukens@tue.nl
Dr. R. Toth	r.toth@tue.nl
Prof.dr.ir. P.M.J. Van den Hof	p.m.j.vandenhof@tue.nl
Prof.dr. S. Weiland	s.weiland@tue.nl
PhD-students	
G. Belgioioso MSC	g.belgioioso@tue.nl
T.A.H. Bloemers	t.a.h.bloemers@tue.nl
C.P. Bosman Barros	c.p.bosman.barros@tue.nl
A. Das	am.das@tue.nl
M. Dreef	h.j.dreef@tue.nl
F.S.J. Hoekstra	f.s.j.hoekstra@tue.nl
B. van Huijgevoort	b.c.v.huijgevoort@tue.nl
Ir. D.P.M. van den Hurk	d.p.m.v.d.hurk@tue.nl
P.W.J. Koelewijn	p.j.koelewijn@tue.nl
Z. Khalik	z.khalik@tue.nl
D. Khandelwal	d.khandelwal@tue.nl
L. Kivits	e.m.m.kivits@tue.nl
Ir. D. Lou	d.lou@tue.nl
C. Mendez-Blanco	c.s.mendez.blanco@tue.nl
G.P. Padilla Cazar	g.p.padilla.cazar@tue.nl
I. Proimadis MSc	i.proimadis@tue.nl
K. Ramaswamy	k.r.ramaswamy@tue.nl
S. Shi	s.shi@tue.nl
T.R.V. Steentjes	t.r.v.steentjes@tue.nl
Researchers and postdocs	
Dr. Y. Chen	y.chen2@tue.nl
Dr. X. Cheng	x.cheng@tue.nl
Dr. D.L. Danilov	d.l.danilov@tue.nl
Dr. ir. J.H.A. Ludlage	j.h.a.ludlage@tue.nl
Dr. C.E. Robles Rodriguez	c.e.robles.rodriguez@tue.nl
Dr. A. Sadeghzadeh	a. sedeghzadeh@tue.nl

TU/e – Dynamics and Control

secretariat D&C: Geertje Janssen-Dols

e-mail: secretariaat.DC@tue.nl

member DISC management team: prof.dr. H. Nijmeijer and prof. dr. ir. N. v.d. Wouw

Staff

Prof. dr. ir. I.J.B.F. Adan	i.adan@tue.nl
Dr.ir. I.J.M. Besselink	i.j.m.besselink@tue.nl
Dr.ir. R.H.B. Fey	r.h.b.fey@tue.nl
Dr.ir. M. Heertjes	m.f.heertjes@tue.nl
Prof. dr. A.M.L. Kappers	a.m.l.kappers@tue.nl
Dr. Ir. A.A.J. Lefeber	a.a.j.lefeber@tue.nl

name	e-mail address
Prof. dr.ir. I. Lopez	i.lopez@tue.nl
Prof.dr. H. Nijmeijer	h.nijmeijer@tue.nl
Dr. Ir. J. Ploeg	j.ploeg@tue.nl
Dr. A. Pogromsky	a.pogromski@tue.nl
Dr.ir. P.C.J.N. Rosielle	p.c.j.n.rosielle@tue.nl
Dr. A. Saccon	a.saccon@tue.nl
Dr. H. Sadeghian Marnani	h.sadeghian.marnani@tue.nl
Dr. Ir. T.P.J van der Sande	t.p.j.v.d.sande@tue.nl
Dr. ir. E. Steur	e.steur@tue.nl
Prof.dr.ir. N. v.d. Wouw	n.v.d.wouw@tue.nl
Prof. dr. Ir. P.W.A. Zegelaar	p.w.a.zegelaar@tue.nl
PhD-students	
A.G. Aribowo	a.g.aribowo@tue.nl
A. Bayuwindra	a.bayuwindra@tue.nl
C.J.J. Beckers	c.j.j. beckers@tue.nl
R. Beerens	r.beerens@tue.nl
B.J. Caasenbrood	b.j.caasenbrood@tue.nl
I.T. Castanedo Guerra	i.t.castanedo.guerra@tue.nl
S.J.A.M. van den Eijnden	s.j.a.m.v.d.eijnden@tue.nl
L. Hazeleger	l.hazeger@tue.nl
R.B.A. van Hoek	r.b.a.v.hoek@tue.nl
F. Hoogeboom	f.n.hoogeboom@tue.nl
K. Kural	k.kural@tue.nl
R. Lensvelt	r.lensvelt@tue.nl
Y. Ma	y.ma1@tue.nl
V. Mazulina	v.mazulina@tue.nl
A.I. Morales Medina MSc	a.i.morales.medina@tue.nl
S. Naderilordejani	s.naderilordejani@tue.nl
K. Peeters	k.peeters@tue.nl
J. Reinders	j.m.f.reinders@tue.nl
I. F. Rodrigues	i.f.rodrigues@tue.nl
K.O. Rogov	k.rogov@tue.nl
Ir. W.S. Schinkel	w.s.schinkel@tue.nl
W.J. Scholte	w.j.scholte@tue.nl
M.F. Shakib	m.f.shakib@tue.nl
J. Thomas	j.thomas@tue.nl
D. Veldman	d.w.m.veldman@tue.nl
Q.J.T. Voortman	q.j.t.voortman@tue.nl
C. Wang	c.wang1@tue.nl
H. Xing	h.xing@tue.nl
Researchers and postdocs	
Dr. R.W.H. Merks	r.w.h.merks@tue.nl
Dr. M. Plaisier	m.a.plaisier@tue.nl

name	e-mail address
TU/e – Control Systems Technology	
secretariat CST: Nancy Wagemakers	
e-mail: cst@tue.nl	
member DISC management team section CST prof.dr.ir. M. Steinbuch and prof dr. ir. M. Heemels.	
Staff	
Prof. dr. H.P.J. Bruyninckx	h.p.j.bruyninckx@tue.nl
Prof.dr.ir. W.P.M.H. Heemels	m.heemels@tue.nl
Dr.ir. T. Hofman	t.hofman@tue.nl
Dr.ir. A.G. de Jager	a.g.d.jager@tue.nl
Dr.ir. M.J.G. v.d. Molengraft	m.j.g.v.d.molengraft@tue.nl
Dr.ir. T.A.E. Oomen	t.a.e.oomen@tue.nl
Prof.dr.ir. M. Steinbuch	m.steinbuch@tue.nl
Prof. dr. ir. J.P.M.B. Vermeulen	j.p.m.b.vermeulen@tue.nl
Dr.ir. F.P.T. Willems	f.p.t.willems@tue.nl
Dr. ir. G. Witvoet	g.witvoet@tue.nl
PhD-students	
A.R.P. Andriën	a.r.p.andrien@tue.nl
M.H.B.I. Balaghiinaloo	m.balaghiinaloo@tue.nl
H.L. Chen	h.l.chen@tue.nl
R. Cobbenhagen	a.t.j.r.cobbenhagen@tue.nl
D. Deenen	d.a.deenen@tue.nl
M. Dolatabadi Farahani	m.dolatabadi.farahani@tue.nl
Y.G.M. Douven	y.g.m.douven@tue.nl
E. Evers	e.evers@tue.nl
C.A. Fahdzyana	c.a.fahdzyana@tue.nl
Ir. M.H.M. van Gastel	m.h.m.v. gastel@tue.nl
Ir.T.M. Hafkamp	t.m.hafkamp@tue.nl
S.J.H. Heijmans	s.h.j.heijmans@tue.nl
R.W.M. Hendrickx	r.w.m.hendrickx@tue.nl
W. Houtman	w.houtman@tue.nl
R.J.R. van Kampen	r.j.r.v.kampen@tue.nl
Ir. S.C.M. Knippeneberg	s.c.m.knippenberg@tue.nl
Ir. H.B. Koolmees	h.b.koolmees@tue.nl
W.J.P. Kuijpers	w.j.p.kuijpers@tue.nl
T. Meijer	t.meijer@tue.nl
R. Mohan	r.mohan@tue.nl
N.F.M. Mooren	n.f.m.mooren@tue.nl
L. Moormann	l.moormann@tue.nl
P. Mulders	p.j.a.m.mulders@tue.nl
S. Prakash	s.prakash@tue.nl
A. Rashidinejad	a.rashidinejad@tue.nl
T. Ravensbergen	t.ravensbergen@tue.nl
F.F.H. Reijnen	f.f.h.reijnen@tue.nl
Ir. R. de Rozario	r.d.rozario@tue.nl
Ir. B. Sharif	b.sharif@tue.nl
Ir. N.W.A. Strijbosch	n.w.a.strijbosch@tue.nl

name	e-mail address
S.B. Thuijsman	s.b.thuijsman@tue.nl
J.J. Verbakel	j.j.verbakel@tue.nl
Ir. F.J.R. Verbruggen	f.j.r.verbruggen@tue.nl
C. Wei	c.wei.1@tue.nl
Researchers and postdocs	
Dr. C.A. Lopez Martinez	c.a.lopez.martinez@tue.nl

UT – Department of Robotics and Mechatronics

secretariat: Jolanda Boelema-Kaufmann phone 053-4892626

e-mail: ram@utwente.nl

member DISC management team: prof.dr.ir. S. Stramigioli

Staff	
Dr.ir. M. Abayazid	m.abayazid@utwente.nl
Dr.ir. P.C. Breedveld	p.c.breedveld@utwente.nl
Dr.ir. J.F. Broenink	j.f.broenink@utwente.nl
Dr.ir. E.C. Dertien	e.c.dertien@utwente.nl
Dr. ir. D. Dresscher	d.dresscher@utwente.nl
Dr. ir. G.A. Folkertsma	g.a.folkertsma@utwente.nl
Dr. ir. A. Franchi	a.franchi@utwente.nl
Prof. dr. ir. G. Krijnen	gijs.krijnen@utwente.nl
Prof.dr.ir. S. Stramigioli	s.stramigioli@utwente.nl
Dr. ir. T.J.A. de Vries	t.j.a.devries@utwente.nl
PhD-students	
N. Botteghi MSC	n.botteghi@utwente.nl
T.G. Broenink MSC	t.g.broenink@utwente.nl
R. Cobos Mendez	r.cobosmendez@utwente.nl
A.P. Dijkshoorn	a.p.dijkshoorn@utwente.nl
R.F.M. van Doremalen	r.f.m.vandoremalen@utwente.nl
M. Eldiwiny	m.m.a.m.i.eldiwiny@utwente.nl
V. Groenhuis MSc	v.groenhuis@utwente.nl
L.H. Groot Koerkamp	l.h.grootkoerkamp@utwente.nl
R. Hashem MSc	r.a.m.rashadhashem@utwente.nl
Y.X. Mak	y.x.mak@utwente.nl
H. Noshahri MSC	h.noshahri@utwente.nl
K.J. Russcher MSc	k.j.russcher@utwente.nl
M. Schouten	m.schouten@utwente.nl
G. Wardhana	g.wardhana@utwente.nl
M.K. Welleweerd Msc	m.k.welleweerd@utwente.nl
G.J.W. Wolterink MSc	g.j.w.wolterink@utwente.nl
Researchers and postdocs	
Dr. F. Califano	f. califano@utwente.nl
Dr. ir. S.S. Groothuis	s.s.groothuis@utwente.nl
Dr. ir. H. Naghibi Beidokti	h.naghibibeidokhti@utwente.nl
Dr. ir. W. Roozing	w.roozing@utwente.nl
Dr. F. J. Siepel	f.j.siepel@utwente.nl
Dr. B. Sirmacek	b.sirmacek@utwente.nl

name	e-mail address
UT – Department of Applied Mathematics	
E-mail secretariat: info-sacs-ewi@utwente.nl	
member DISC management team: prof.dr. H.J. Zwart	
Staff	
Dr. P.K. Mandal	p.k.mandal@utwente.nl
Dr. G. Meinsma	g.meinsma@utwente.nl
Dr. J.W. Polderman	j.w.polderman@utwente.nl
Prof.dr. A.A. Stoorvogel	a.a.stoorvogel@utwente.nl
Dr. F. Schwenninger	f.l.schwenninger@utwente.nl
Prof.dr. H.J. Zwart	h.j.zwart@utwente.nl
PhD-students	
F. Acciani	f.acciani@utwente.nl
Researchers and postdocs	
Dr. M. Mamunuzzaman	m.mamunuzzaman@utwente.nl
Dr. S.F. Sharifi	s.f.sharifi@utwente.nl
UT – Department of Mechanics of Solids, Surfaces & Systems	
secretariat: Debbie Zimmerman van Woesik	
e-mail: d.b.zimmermanvanwoesik@utwente.nl	
member DISC management team: dr.ir. W.B.J. Hakvoort	
Staff	
Dr.ir. R.G.K.M. Aarts	r.g.k.m.aarts@utwente.nl
Dr. ir. W.B.J. Hakvoort	w.b.j.hakvoort@utwente.nl
Dr. H. Köroğlu	h.koroglu@utwente.nl

UT- Department of Biomechanical Engineering	
secretariat: Lianne Bode and Jeanine Lodeweges-de Vries	
email: secretariat-bw-ctw@utwente.nl	
member DISC management team: prof. dr. ir. H.F.J.M. Koopman	
Staff	
Dr. E.H.F. van Asseldonk	e.h.f.vanasseldonk@utwente.nl
Ir. A. Bergsma	a.bergsma@utwente.nl
Prof. dr. J.G. Grandjean	j.g.grandjean@utwente.nl
Ir. E.E.G. Hekman	e.e.g.hekman@utwente.nl
Dr. ir. A.Q.L. Keemink	a.q.l.keemink@utwente.nl
Prof.dr.ir. H. van der Kooij	h.vanderkooij@utwente.nl
Prof. dr. ir. H.F.M.J. Koopman	h.f.j.m.koopman@utwente.nl
M.A. Marra, MSc	m.a.marra@utwente.nl

name	e-mail address
Prof. dr. S. Misra	s.misra@utwente.nl
Dr. G.B. Prange	g.b.prange@utwente.nl
Dr. J. Reenalda	j.reenalda@utwente.nl
Prof. dr. J.S. Rietman	j.s.rietman@utwente.nl
Dr. ir. J. Rouwkema	j.rouwkema@utwente.nl
A. Sadeghi	a.sadeghi@utwente.nl
M. Sartori	m.sartori@utwente.nl
Dr. Ir. A.A. Schouten	a.c.schouten@utwente.nl
Prof. dr. ir. N.J.J. Verdonschot	n.verdonschot@utwente.nl
Prof. dr. ir. G.J. Verkerke	g.j.verkerke@utwente.nl
PhD-students	
G.V. Durandau	g.v.durandau@utwente.nl
S.S. Fricke MSc	s.s.fricke@utwente.nl
A.M. Geers MSc	a.m.geers@utwente.nl
Ir. M.E. Grootens	m.e.grootens@utwente.nl
C.J.W. Haarman	c.j.w.haarman@utwente.nl
F.R. Halfwerk	f.r.halfwerk@utwente.nl
C.M. Heunis	c.m.heunis@utwente.nl
M. Kaya MSc	m.kaya@utwente.nl
F. Khan	f.khan@utwente.nl
M. van Mierlo	m.vanmierlo@utwente.nl
S. Mohanty	s.mohanty@utente.nl
P. Padmanaban, MSc	p.padmanaban@utwente.nl
G. Philips Furtado	g.phillipsfurtado@utwente.nl
W.F. Rampeltshammer	w.f.rampeltshammer@utwente.nl
D. Rana	d.rana@utwente.nl
J. Sikorski MSc	j.sikorski@utwente.nl
F. Sojoodi Farimani MSc	f.s.farimani@utwente.nl
Ir. K. Staman	k.staman@utwente.nl
F. Stein	f.stein@utwente.nl
M.J.B. Tenniglo	m.j.b.tenniglo@utwente.nl
V. Trikalitis	v.trikalitis@utwente.nl
M. Tschiersky	m.tschiersky@utwente.nl
R.C. Van't Veld	r.c.vantveld@utwente.nl
S. Verros MSc	s.verros@utwente.nl
J. Zhang	j.zhang@utwente.nl
Researchers and postdocs	
C. Bayon Calderon	c.bayoncalderon@utwente.nl
Dr.ir. R. Fluit	r.fluit@utwente.nl
V. Kalpathy Venkiteswaran	v.kalpathyvenkiteswaran@utwente.nl

name	email address
A.I.R. Kottink	a.i.r.hutten@utwente.nl
N.Salehi Nik, MSc	n.salehinik@utwente.nl
A.J. Veale	a.j.veale@utwente.nl
Dr. Ir. M. Wessels	m.wessels@utwente.nl