**IFAC**

INTERNATIONAL FEDERATION
OF AUTOMATIC CONTROL

**TDS**
**2018**

# 14th IFAC WORKSHOP ON TIME DELAY SYSTEMS

June 28-30, 2018
Budapest, Hungary
Pesti Vigadó

## PROGRAMME BOOK

# CONTENT

# WELCOME

Dear Colleagues,

The growing interest of the scientific community in systems with time delay and their applications has been shown by a series of workshops held in Grenoble, France (1998), Ancona, Italy (2000), Santa-Fe, USA (2001), Rocquencourt, France (2003), Leuven, Belgium (2004), L'Aquila, Italy (2006), Nantes, France (2007), Sinaia, Romania (2009), Prague, Czech Republic (2010), Boston, USA (2012), Grenoble, France (2013), Ann Arbor, USA (2015) and Istanbul, Turkey (2016).

The 14th IFAC Workshop in Time Delay Systems (TDS 2018) is being held between 28-30th of June, 2018 in downtown Budapest, Hungary, where scientists, researchers and industrial partners are presenting their latest results on the theory and application of time delay systems.

The breathtaking venue, the Pesti Vigadó at the Danube bank, is a perfect place to continue the tradition of providing an international forum to exchange new ideas in the TDS community.

A new feature of the 14th workshop is that, in addition to the traditional 6-page paper submissions, contributions without paper (only abstract submissions) were also accepted in order to open the doors of the workshop and bring together researchers from different fields, such as mathematics, physics, biology, chemistry, economics and engineering.

Following the initiations of previous workshops, the scientific programme involves thematic sessions organized by the members of the International Program Committee.

It is our pleasure to welcome you in Budapest at this workshop to share and improve our knowledge in the diverse fields of time delay systems.

Gábor Stépán
General Chair
Department of Applied Mechanics
Budapest University of Technology and Economics

Tamás Insperger
Program Editor
Department of Applied Mechanics
Budapest University of Technology and Economics
and MTA-BME Lendület Human Balancing
Research Group

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# EXHIBITORS

Stability Islands:
Performance
Revolution in
Machining

erc

**MTA-BME Lendület**
**Human Balancing**
**Research Group**

# COMMITTEES

## LOCAL ORGANISING COMMITTEE
**General Chair**
Gábor Stépán
Department of Applied Mechanics, Budapest University of Technology and Economics

**Program Editor**
Tamás Insperger
Department of Applied Mechanics, Budapest University of Technology and Economics
and MTA-BME Lendület Human Balancing Research Group

## INTERNATIONAL PROGRAM COMMITTEE (IPC)
**Chair**
Eckehard Schöll
TU Berlin

**Co-chair**
Jianhong Wu
York University

**Vice-chair**
Zaihua Wang
Nanjing University of Aeronautics and Astronautics

## MEMBERS

| | |
|---|---|
| Nikolaos Bekiaris-Liberis (GR) | Nejat Olgac (US) |
| Islam Boussaada (FR) | Gabor Orosz (US) |
| Dimitri Breda (IT) | Andreas Otto (DE) |
| Sue Ann Campbell (CA) | Hitay Ozbay (TR) |
| Zoltán Dombóvári (HU) | Pierdomenico Pepe (IT) |
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| Ali Ergenc (TR) | Vladimir Rasvan (RO) |
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| Yuliya Kyrychko (UK) | Sjoerd Verduyn Lunel (NL) |
| Wim Michiels (BE) | Erik Verriest (US) |
| John Milton (US) | Tomáš Vyhlídal (CZ) |
| Sabine Mondié (MX) | Hans-Otto Walther (DE) |
| Silviu-Iulian Niculescu (FR) | Serhiy Yanchuk (DE) |

# GENERAL INFORMATION

**CONFERENCE DATE**
June 28-30, 2018

**CONFERENCE VENUE**
Pesti Vigadó
H-1051 Budapest, Vigadó tér 2.
Pesti Vigadó is located in the heart of the city next to the Danube river (Pest side), about 5 minutes walk from Deák Ferenc tér. Please note that the plenary room, session rooms are on the fourth floor of the building.

**ACCESS BY PUBLIC TRANSPORTATION**
The Pesti Vigadó can be reached directly by Tram No. 2.  It is also about 5 minutes walk from Deák Ferenc tér, which can be reached by metros (underground) line M1, M2, M3, trams 47,49, buses 9,16, 100E, 105 and trolley bus 72. The closest metro station (line M1) is at the Vörösmarty tér (3 minutes walk).

**OFFICIAL CONFERENCE LANGUAGE**
The official language of the Conference is English. No translation will be provided.

**INTERNET ACCESS**
Free WIFI is available during the conference opening hours.

**Registration and information desk opening hours**
28 June, Thursday          8.00 – 17.30
29 June, Friday              8.00 – 17.30
30 June, Saturday          8.30 – 15.30

**HOTLINE TO REGISTRATION DESK**
+36 70/608 6806

**TECHNICAL INFORMATION FOR SPEAKERS**
The organisers kindly ask you to bring your presentations with you on a USB memory stick. Your presentation must be uploaded to the computers in the posted room with the help of the assisting technicians responsible for the dedicated room. The presentation uploading deadline is the last coffee break prior to your scheduled presentation. Please note that double slide projection cannot be used.

**PROGRAMME CHANGES**
Due to unforeseen circumstances the organisers cannot assume liability for any changes in the scientific programme. Organisers will do their best to keep TDS 2018 participants up to date, possible changes in programme will be immediately communicated.

**CONFERENCE PAPERS PUBLICATION**
Full papers will be published on IFAC Papers-on-line:
https://www.journals.elsevier.com/ifac-papersonline/
All the papers and abstracts of the TDS 2018 Conference can be found on the USB pendrive.

**MEALS**
Included in the registration fee, organisers provide coffee breaks and hot lunches for the participants. The coffee breaks are served on the fourth floor, the lunches on the ground floor in the VígVarjú Restaurant. The serving times are detailed in the program overview.

**CONFERENCE BAGS**
Conference bags are provided for all registered participants. Please do not put personal belongings (money, ID Cards, mobile phones) in the Conference Bags, since hundreds of similar bags will be around the conference venue, and they could be easily confused.

**BADGES**
Identification badges are provided along with other conference materials upon registration. The organisers kindly ask you to wear them all the time during the conference. Please also note that your conference badge assures your entrance to conference premises and catering. Persons without badges may be refused. The identification badges are also helpful when contacting the secretariat and other participants.

# REGISTRATION

| Registration types | Early bird fees until April 20, 2018 | Regular fees after April 20, 2018 | Onsite fees |
|---|---|---|---|
| Participant/Author | EUR 450 | EUR 550 | EUR 600 |
| Student/Student Author | EUR 250 | EUR 300 | EUR 350 |
| Accompanying Person | EUR 250 | EUR 250 | EUR 300 |

All prices include 27% VAT.

**Participant / Author / Student fees include**
• Access to all conference sessions
• Conference bag
• Programme booklet
• Attendance at the Ice Breaker
• Attendance at the Farewell Dinner
• Coffee and tea during coffee breaks
• Lunches

**The accompanying person fee includes**
• Attendance at the Ice Breaker
• Attendance at the Farewell Dinner
• Attendance at a Sightseeing Tour
• Tour bag

| Official conference hotels | Single room | Double room |
|---|---|---|
| Mercure Budapest City Center H-1052 Budapest, Váci utca 20. | 129 Euro | 139 Euro |
| Roombach Hotel Budapest Center H-1075 Budapest, Rumbach Sebestyén utca 14. | 98 Euro | 110 Euro |
| Eurostars Hotel H-1053 Budapest, Kossuth Lajos utca 7-9. | 140 Euro | 150 Euro |
| Hotel Erzsébet City Center H-1053 Budapest, Károlyi Mihály utca 11-15. | 95 Euro | 106 Euro |

# SOCIAL PROGRAMMES & TOURS

**SOCIAL EVENTS**

**ICE BREAKER**
Wednesday, June 27, 2018, 18.00-20.00
Venue: Columbus Restaurant and Pub (H-1051 Budapest, Vigadó str. 4)
Included in registration fee / accompanying fee
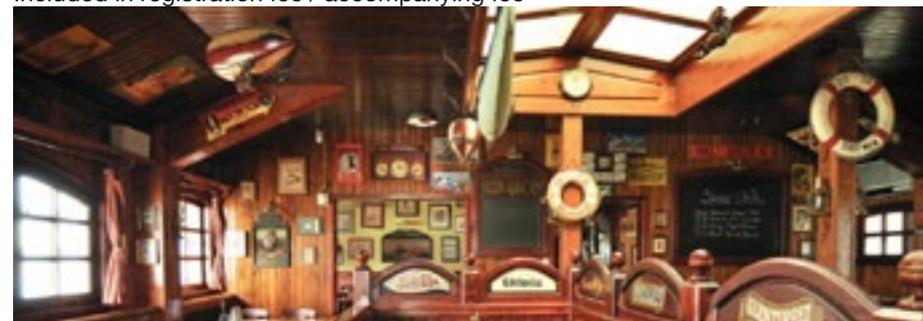


Refresh yourself after travelling with Hungarian wines and finger food. Come together with your colleagues on the Danube River.

**FAREWELL DINNER**
Friday, June 29, 2018, 18.30-22.00
Venue: Lázár Equestrian Park (Gödöllő)
Included in registration fee / accompanying fee
Departure: at 18.30 from Pesti Vigadó (Conference Venue)



This evening excursion will take us to the picturesque Domony Valley, which is a developing agricultural and entertainment site approximately 35 km from Budapest. This valley features the neighborhood of Gödöllő, an area of environmental protection. The welcoming atmosphere will feature horses, live music and the best of Hungarian hospitality, dishes and wine. A visit all around the Equestrian Park and a horse show are all included.

## TOURS

### PUB CRAWL
Thursday, June 28, 2018 20.00-24.00
Price: 35 EUR/person
Departure: at 20.00 from Pesti Vigadó (Conference Venue)



Join us for one of the most unique Budapest experiences, a visit to the famous 'ruin pubs' full of retro decor, strange furniture, and looping art house cinema. Regularly rated as some of the top bars in the world, these former tenements and disused public buildings have been turned into squatter's pubs and entertainment spaces of the new wave. It is a new dimension of night entertainment. English-speaking guide and limited number of drinks are included.

### SIGHTSEEING TOUR
Friday, June 29, 2018 10.00-14.00
Price: 35 EUR/person
This tour is included in accompanies' program!
Departure: at 10.00 from Pesti Vigadó (Conference Venue)



A half-day sightseeing tour highlights the most attractive features of the capital city. Discover the most important sights in Budapest. Let us show you the main attractions on both sides of the River Danube. Walk around the Castle District, enjoy the view and see the top attractions of Pest. The Central Market is a must see for anyone who enjoys the sights, sounds and smells of markets.
Transportation is by bus, English-speaking guide, entrance fees and lunch are included.

## CANCELLATION POLICY

All cancellations and changes must be sent to the Confernce office (CongressLine Ltd.) in written form. All refunds will be processed after the TDS 2018 Conference. Please send your exact bank account details in a written cancellation.

**Cancellation Policy of Registration**
• 100% refund (minus an administrative fee of 50 Euro)
   – in case of cancellation received before May 25, 2018
• No refund – in case of cancellation received after May 25, 2018

**Cancellation policy of Hotel reservation**
• 100% refund (minus 30 EUR administrative fee)
   in case of cancellation received before 18 May, 2018.
• No refund in case of cancellation received after 18 May, 2018.

**Cancellation policy of Tours**
• 100% refund (minus 15 EUR administrative fee)
   in case of cancellation received before 18 May, 2018.
• No refund in case of cancellation received after 18 May, 2018.

## USEFUL INFORMATION

**Recommended taxi company**
To reach the hotels or the conference venue and to avoid any inconvenience, please use the official TDS 2018 taxi company:
City Taxi
Phone: +36 1 211 1111
www.citytaxi.hu
Credit card payment is available in every car of City Taxi. Please note, that all licensed Budapest taxi companies have yellow cars and has the same rates, placed clearly visible on the screens. Airport – Pesti Vigadó route fares should be around 7000-9000 HUF.

**Currency**
The Forint (HUF), the official national currency, is convertible. The exchange rates applied in Budapest banks, official exchange offices and hotels may vary. All major credit cards are accepted in Hungary in places displaying the emblem at the entrance. Exchange rate: 1 Euro = 318 HUF in June 2018.

**Smoking**
Smoking is not permitted in the conference venue.

**Tipping**
Service charges are not added to accounts by hotels and restaurants. You may tip taxi drivers, hotel porters and restaurant waitstaff (up to about 10% of the bill) if you wish to acknowledge exceptional service. At any time, tipping is your choice.

**Emergency Details**
In an emergency call 112 for Ambulance, Fire Service or Police.

**Lost and Found**
Any found item may be turned into the Registration Desk. Enquiries about lost items can be directed to the Registration Desk also.

**Mobile phones**
Please respect the speakers and presenters by ensuring that your mobile phone is switched off during the scientific sessions.

## SMARTEVENTS© CONFERENCE APP

IFAC TDS 2018 Conference in your hands - conference app is available for smartphones at Google Play and iTunes.
Check the program, get together and chat with your fellow delegates, send your questions, get important (push) messages from the organisers by uploading the SmartEvent app.

**4 STEPS TO GET CONNECTED**

**Step 1**
Download the SmartEvents app from Apple, GooglePlay and Microsoft Stores

**Step 2**
Open the app on your device

**Step 3**
Read the following QR code within the app

**Step 4**
Set your profile by giving your name and e-mail address

# Floor Plan



Plenary Room

Room II.

Room I.

WC

REGISTRATION

EXHIBITION

WC
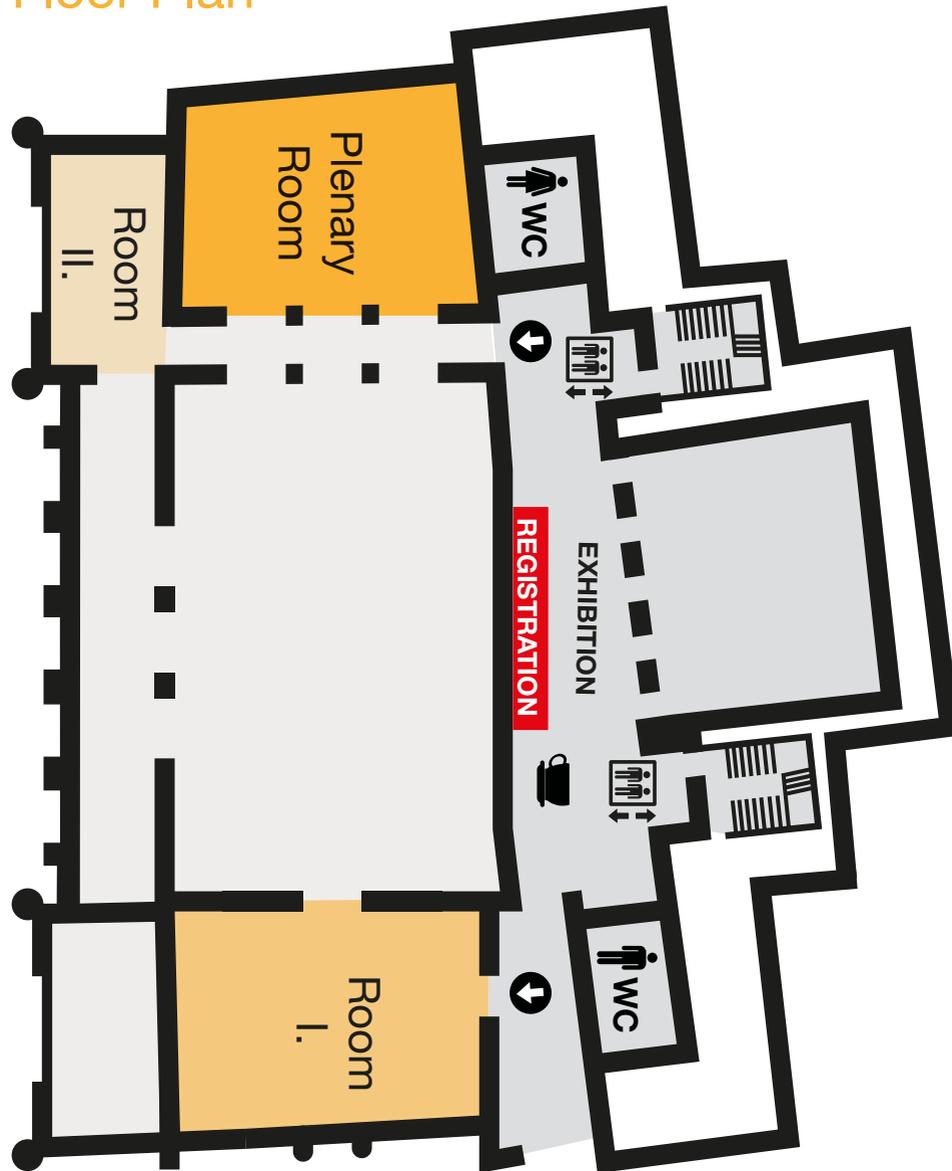
# Programme Overview

| JUNE 28 THURSDAY | | |
|---|---|---|
| **Plenary Room** | **Room I.** | **Room II.** |

| | Plenary Room | Room I. | Room II. |
|---|---|---|---|
| 9:00 - 9:30 | Opening Ceremony | | |
| 9:40 - 11:00 | **RS01** Nonsmooth Systems | **RS02** Machining Dynamics | **RS03** Networks and Multi-Agent Systems I. |
| 11:00 - 11:30 | Coffee break | | |
| 11:30 - 12:50 | **TS01** Time Delays in Biological Systems I. | **TS02** Regenerative Vibration in Machining | **TS03** Dynamic Economic Models with Delays |
| 12:50 - 14:00 | Lunch – VígVarjú Restaurant, Ground Floor | | |
| 14:00 - 15:20 | **TS04** Time Delays in Biological Systems II. | **TS05** Time Delays in Input Shaping Applications | **TS06** Controlling Delayed Complex Systems |
| 15:20 - 15:50 | Coffee break | | |
| 15:50 - 17:10 | **RS04** Biological Applications | **RS05** Stochastic Systems | **RS06** Networks and Multi-Agent Systems II. |
| 17:20 - 18:20 | IFAC TC Meeting | | |

**TS:** Thematic Session
**RS:** Regular Session

# Programme Overview

| JUNE 29 FRIDAY | | | |
|---|---|---|---|
| | **Plenary Room** | **Room I.** | **Room II.** |
| 9:00-11:00 | **RS07** Neutral Systems I. | **RS08** Nonlinear Systems | **RS09** Stability |
| 11:00-11:30 | Coffee break | | |
| 11:30 - 12:50 | **TS07** Dynamics of Networks with Delayed Connections I. | **TS08** Mathematical Biology | **TS09** Stochastic Time-Delayed Systems |
| 12:50-14:00 | Lunch – VígVarjú Restaurant, Ground Floor | | |
| 14:00 - 15:20 | **TS10** Dynamics of Networks with Delayed Connections II. | **TS11** Numerical Analysis for Delay Equations in Population Dynamics | **TS12** Time-Delayed Models of Neural Systems |
| 15:20-15:50 | Coffee break | | |
| 15:50 - 17:10 | **RS10** Neutral Systems II. | **RS11** Periodic Systems | **RS12** Applications |
| 17:20 - 18:00 | Knorr-Bremse Session | | |
| 18:30 | Farewell dinner | | |

**TS:** Thematic Session
**RS:** Regular Session

# Programme Overview

| JUNE 30 SATURDAY | | | |
|---|---|---|---|
| | **Plenary Room** | **Room I.** | **Room II.** |
| 9:00 - 11:00 | **RS13** Robust Stabilization and Predictor Feedback | **RS14** Vehicle Applications | **RS15** Theory of DDEs |
| 11:00-11:30 | Coffee break | | |
| 11:30 - 12:50 | **TS13** Time Delays in Connected and Automated Vehicles | **TS14** Spectral Methods for Rightmost Roots Characterization in LTI Time Delay Systems I. | **TS15** Positivity Based Approach in Stability of Delay Differential Systems |
| 12:50 - 14:00 | Lunch – VígVarjú Restaurant, Ground Floor | | |
| 14:00 - 15:20 | **TS16** Lyapunov Functionals and Matrices | **TS17** Spectral Methods for Rightmost Roots Characterization in LTI Time Delay Systems II. | **RS16** $H_\infty$ Control and Fractional Order Systems |
| 15:30 - 16:00 | Farewell Session | | |

**TS:** Thematic Session
**RS:** Regular Session

# Technical Program

THURSDAY, **JUNE 28, 2018**

**OPENING SESSION**
Session chair: Gábor Stépán
**9:00-9:30**                                                      Plenary Room

Bokor, József
Vice-President of MTA
Institute for Computer Science and Control, Hungarian Academy of Sciences, Budapest, Hungary
Budapest University of Technology and Economics, Hungary

Niculescu, Silviu-Iulian
IFAC TC2.2 Chair
L2S, CNRS-Supélec, University of Paris-Sud, Paris, France

Conte, Giuseppe
IFAC TC2.2 Former Chair
Polytechnic University of Marche, Ancona, Italy

Gáspár, Péter
IFAC NMO of Hungary Chair
Institute for Computer Science and Control, Hungarian Academy of Sciences, Budapest, Hungary
Budapest University of Technology and Economics, Hungary

**RS01**                                                           Plenary Room
**NONSMOOTH SYSTEMS (REGULAR SESSION)**
Session Chair: George Yin

**09:40-10:00**     **RS01.1**
**Switching diffusion with past dependent switching and countable state space**
Nguyen, Dang H. – Wayne State University, Detroit, USA
Yin, George – Wayne State University, Detroit, USA

**10:00-10:20**     **RS01.2**
**Finite-time control for switched linear systems with interval time-delay**
Göksu, Gökhan – Istanbul Technical University, Turkey
Ilgaz, Ulviye Başer – Istanbul Technical University, Turkey

**10:20-10:40**     **RS01.3**
**Design of PID controllers under saturation and time delay**
Zhang, Jingfan – The University of Manchester, UK
Mercader, Pedro – Israel Institute of Technology, Haifa, Israel
Carrasco, Joaquin – The University of Manchester, UK

**10:40-11:00**     **RS01.4**
**Global stabilization of a class of time-delay nonlinear systems with unknown control directions by nonsmooth feedback**
Rattanamongkhonkun, Kanya – Chiang Mai University, Thailand
Pongvuthithum, Radom – Chiang Mai University, Thailand
Lin, Wei – Case Western Reserve University, Cleveland, USA

**RS02**                                                           Room I.
**MACHINING DYNAMICS (REGULAR SESSION)**
Session Chair: Tamás Kalmár-Nagy

**09:40-10:00**     **RS02.1**
**An analytical study of wheel regeneration in surface grinding**
Tóth, Máté – The University of Sheffield, UK
Sims, Neil D. – The University of Sheffield, UK
Curtis, David – The University of Sheffield, UK

**10:00-10:20**     **RS02.2**
**Chatter classification in turning using machine learning and topological data analysis**
Khasawneh, Firas A. – Michigan State University, East Lansing, USA
Munch, Elizabeth – Michigan State University, East Lansing, USA
Perea, Jose A. – Michigan State University, East Lansing, USA

**10:20-10:40**     **RS02.3**
**A nonlinear delay-differential equation with harmonic excitation**
Lelkes, János – Budapest University of Technology and Economics, Hungary
Kalmár-Nagy, Tamás – Budapest University of Technology and Economics, Hungary

**10:40-11:00**  **RS02.4**
**On basic modeling of the dynamics of axles rolling process**
Farago, Denes – Budapest University of Technology and Economics, Hungary
Merino, Ruben – IK4-Ideko, Elgoibar, Spain
Dombovari, Zoltan – Budapest University of Technology and Economics, Hungary

**RS03**
**NETWORKS AND MULTI-AGENT SYSTEMS I.**
**(REGULAR SESSION)**
Session Chair: Pankaj Wahi

**09:40-10:00**  **RS03.1**
**Input delay effect on cluster consensus in continuous-time networks**
Develer, Ümit – Bogazici University, Istanbul, Turkey
Akar, Mehmet – Bogazici University, Istanbul, Turkey

**10:00-10:20**  **RS03.2**
**Necessary and suficient conditions for consensus tracking of multi-agent time-delay systems**
De, Souradip – Indian Institute of Technology Kanpur, India
Sahoo, Soumya Ranjan – Indian Institute of Technology Kanpur, India
Wahi, Pankaj – Indian Institute of Technology Kanpur, India

**10:20-10:40**  **RS03.3**
**Single-delay Proportional-Retarded (PR) protocols for fast consensus in a multi-agent system**
Koh, Min Hyong – Northeastern University, Boston, USA
Ramírez, Adrián – Northeastern University, Boston, USA
Sipahi, Rifat – Northeastern University, Boston, USA

**10:40-11:00**  **RS03.4**
**Multiple intentional delays can facilitate fast consensus and noise reduction in a multi-agent system**
Ramírez, Adrián – Northeastern University, Boston, USA
Sipahi, Rifat – Northeastern University, Boston, USA

**TS01**
**TIME DELAYS IN BIOLOGICAL SYSTEMS I.**
**(THEMATIC SESSION)**
Session Chair: Sue Ann Campbell

**11:30-11:50**  **TS01.1**
**Plankton models – interaction of time-delay and spatial effects**
Campbell, Sue Ann – University of Waterloo, Canada
Kloosterman, Matt – University of Waterloo, Canada
Poulin, Francis – University of Waterloo, Canada

**11:50-12:10**  **TS01.2**
**State dependent delays in the biological sciences: Where do they come from?**
Mackey, Michael C. – McGill University, Montréal, Canada

**12:10-12:30**  **TS01.3**
**Dynamics of epidemics with time-delayed response to awareness**
Blyuss, Konstantin – University of Sussex, UK

**12:30-12:50**  **TS01.4**
**An impulsive Goodwin-like model: The case of multiple delays**
Churilov, Alexander N. – Saint Petersburg State University, Russia, ITMO University, Saint Petersburg, Russia

**TS02**
**REGENERATIVE VIBRATION IN MACHINING**
**(THEMATIC SESSION)**
Session Chair: Zoltan Dombovari

**11:30-11:50**  **TS02.1**
**Milling with non-uniform pitch and variable helix tools**
Otto, Andreas – Technische Universität Chemnitz, Germany
Rauh, Stefan – Fraunhofer IWU, Chemnitz, Germany
Ihlenfeldt, Steffen – Fraunhofer IWU, Chemnitz, Germany, Technische Universität Dresden, Germany
Radons, Günter – Technische Universität Chemnitz, Germany

**11:50-12:10**     **TS02.2**
**Slowly varying parameters in time periodic delayed system**
Dombovari, Zoltan – Budapest University of Technology and Economics, Hungary,
IK4-Ideko, Elgoibar, Spain
Kuske, Rachel – Georgia Institute of Technology, USA
Stepan, Gabor – Budapest University of Technology and Economics, Hungary

**12:10-12:30**     **TS02.3**
**Optimal delay distribution selection for chatter avoidance in milling operations**
Munoa, Jokin – IK4-Ideko, Elgoibar, Spain
Dombovari, Zoltan – Budapest University of Technology and Economics, Hungary

**12:30-12:50**     **TS02.4**
**Stability of simultaneous turning processes**
Azvar, Milad – Sabanci University, Istanbul, Turkey
Budak, Erhan – Sabanci University, Istanbul, Turkey

## TS03
## DYNAMIC ECONOMIC MODELS WITH DELAYS
## (THEMATIC SESSION)

Room II.

Session Chair: Ferenc Szidarovszky

**11:30-11:50**     **TS03.1**
**Learning models in oligopoly with delays**
Szidarovszky, Ferenc – University of Pecs, Hungary

**11:50-12:10**     **TS03.2**
**Control of random walkers with time delayed feedback**
Kobayashi, Miki U. – Rissho University, Tokyo, Japan
Ando, Hiroyasu – University of Tsukuba, Japan

**12:10-12:30**     **TS03.3**
**Delay Cournot duopoly models revisited**
Guerrine, Luca – Polytechnic University of Marche, Ancona, Italy
Matsumoto, Akio – Chuo University, Tokyo, Japan
Szidarovszky, Ferenc – University of Pecs, Hungary

**12:30-12:50**     **TS03.4**
**On the convergence and the steady state in a delayed Solow model**
Varszegi, Balazs – Budapest University of Technology and Economics, Hungary,
MTA-BME Lendület Human Balancing Research Group, Budapest, Hungary

## TS04
## TIME DELAYS IN BIOLOGICAL SYSTEMS II.
## (THEMATIC SESSION)

Plenary

Session Chair: John Milton

**14:00-14:20**     **TS04.1**
**Sensory dead zones and sampled time delayed feedback in human balance control**
Milton, John – The Claremont Colleges, Claremont, CA, USA

**14:20-14:40**     **TS04.2**
**Delays in gambler's ruin and random relays**
Ohira, Toru – Nagoya University, Japan

**14:40-15:00**     **TS04.3**
**Human balancing on rolling balance board in the frontal plane**
Molnar, Csenge Andrea – Budapest University of Technology and Economics, Hungary,
MTA-BME Lendület Human Balancing Research Group, Budapest, Hungary
Zelei, Ambrus – Budapest University of Technology and Economics, Hungary,
MTA-BME Lendület Human Balancing Research Group, Budapest, Hungary
Insperger, Tamas – Budapest University of Technology and Economics, Hungary,
MTA-BME Lendület Human Balancing Research Group, Budapest, Hungary

**15:00-15:20**     **TS04.4**
**Aging transition in systems of oscillators with global distributed-delay coupling**
Kyrychko, Yuliya – University of Sussex, UK

**TS05**
**TIME DELAYS IN INPUT SHAPING APPLICATIONS**
**(THEMATIC SESSION)**
Session Chair: Tomáš Vyhlídal

<span>Room I.</span>

| | |
|---|---|
| 14:00-14:20 | **TS05.1** |
| | **Time delay algorithms for control of a quadcopter with suspended load** |
| | Bušek, Jaroslav – Czech Technical University in Prague, Czech Republic |
| | Kuře, Matěj – Czech Technical University in Prague, Czech Republic |
| | Vyhlídal, Tomáš – Czech Technical University in Prague, Czech Republic |
| | Hromčík, Martin – Czech Technical University in Prague, Czech Republic |
| 14:20-14:40 | **TS05.2** |
| | **Dynamics and command shaping control of quadcopters carrying suspended loads** |
| | Ichikawa, Sarah – Tokyo Metropolitan University, Japan |
| | Castro, Arnoldo – Georgia Institute of Technology, USA |
| | Johnson, Nicholas – Georgia Institute of Technology, USA |
| | Kojima, Hirohisa – Tokyo Metropolitan University, Japan |
| | Singhose, William – Georgia Institute of Technology, USA |
| 14:40-15:00 | **TS05.3** |
| | **Suppressing delay-induced vibrations via the tuned mass damper** |
| | Habib, Giuseppe – Budapest University of Technology and Economics, Hungary |
| | Stepan, Gabor – Budapest University of Technology and Economics, Hungary |
| 15:00-15:20 | **TS05.4** |
| | **Concurrent design of linear control with input shaping for a two-link flexible manipulator arm** |
| | Newman, Daniel – University of Louisiana at Lafayette, USA |
| | Vaughan, Joshua – University of Louisiana at Lafayette, USA |

**TS06**
**CONTROLLING DELAYED COMPLEX SYSTEMS**
**(THEMATIC SESSION)**
Session Chair: Andreas Otto

<span>Room II.</span>

| | |
|---|---|
| 14:00-14:20 | **TS06.1** |
| | **Controlling delayed complex systems** |
| | Otto, Andreas – Technische Universität Chemnitz, Germany |
| 14:20-14:40 | **TS06.2** |
| | **Delayed feedback control of self-mobile cavity solitons in a wide-aperture laser with a saturable absorber** |
| | Gurevich, Svetlana V. – University of Münster, Germany |
| | Schelte, Christian – University of Münster, Germany |
| | Panajotov, Krassimir – Vrije Univeristeit Brussel, Belgium |
| | Tlidi, Mustapha – Université Libre de Bruxelles, Belgium |
| 14:40-15:00 | **TS06.3** |
| | **Stability of a spatially uniform steady state in two Turing systems coupled by a delay connection** |
| | Konishi, Keiji – Osaka Prefecture University, Japan |
| | Hara, Naoyuki – Osaka Prefecture University, Japan |
| 15:00-15:20 | **TS06.4** |
| | **Adaptive control of cluster synchronization in delay-coupled oscillators** |
| | Hövel, Philipp – Technische Universität Berlin, Germany |

## RS04
## BIOLOGICAL APPLICATIONS
## (REGULAR SESSION)
Session Chair: Li Zhang

**15:50-16:10**  **RS04.1**
**A delayed epidemic model of bovine viral diarrhea**
Bassett, Jason – Technische Universität Berlin, Germany
Lentz, Hartmut H. K. – Friedrich Loeffler Institute, Greifswald, Germany
Gethmann, Jörn – Friedrich Loeffler Institute, Greifswald, Germany
Hövel, Philipp – Technische Universität Berlin, Germany,
Bernstein Center for Computational Neuroscience Berlin, Germany

**16:10-16:30**  **RS04.2**
**Distributed control in stabilization of a model
of infection diseases**
Bershadsky, Marina – Ariel University, Israel
Domoshnitsky, Alexander – Ariel University, Israel
Volinsky, Irina – Ariel University, Israel

**16:30-16:50**  **RS04.3**
**Stability analysis of a human balancing model
with different feedback delays**
Zhang, Li – Nanjing University of Aeronautics and Astronautics, China
Stepan, Gabor – Budapest University of Technology and Economics, Hungary

**16:50-17:10**  **RS04.4**
**Mathematical models for balancing tasks on a see-saw
with reaction time delay**
Buza, Gergely – Budapest University of Technology and Economics, Hungary,
MTA-BME Lendület Human Balancing Research Group, Budapest, Hungary
Insperger, Tamas – Budapest University of Technology and Economics, Hungary,
MTA-BME Lendület Human Balancing Research Group, Budapest, Hungary

## RS05
## STOCHASTIC SYSTEMS (REGULAR SESSION)
Session Chair: George Yin

**15:50-16:10**  **RS05.1**
**Stochastic averaging for functional diffusions**
Wu, Fuke – Huazhong University of Science and Technology, Wuhan, China
Yin, George – Wayne State University, Detroit, USA

**16:10-16:30**  **RS05.2**
**Stability of continuous-time systems with stochastic delay**
Sadeghpour, Mehdi – University of Michigan, Ann Arbor, USA,
Rice University, Houston, USA,
University of Houston, USA
Orosz, Gábor – University of Michigan, Ann Arbor, USA

**16:30-16:50**  **RS05.3**
**Noise-induced dynamics in a delayed triple-well potential
system driven by correlated noises**
Jin, Yanfei – Beijing Institute of Technology, China
Xu, Pengfei – Beijing Institute of Technology, China,
Changzhi University, Shanxi, China

**16:50-17:10**  **RS05.4**
**Parametric study of virtual stick balancing based on a delayed
PD model**
Kovacs, Balazs A. – Budapest University of Technology and Economics, Hungary,
MTA-BME Lendület Human Balancing Research Group, Budapest, Hungary
Insperger, Tamas – Budapest University of Technology and Economics, Hungary,
MTA-BME Lendület Human Balancing Research Group, Budapest, Hungary

## RS06
## NETWORKS AND MULTI-AGENT SYSTEMS II.
## (REGULAR SESSION)
Session Chair: Rifat Sipahi

**15:50-16:10**  **RS06.1**
**Approximation-based transient behavior analysis of multi-
agent systems with delay**
Fehér, Áron – Sapientia Hungarian University of Transylvania, Cluj-Napoca, Romania,
University of Pannonia, Veszprém, Hungary
Márton, Lőrinc – Sapientia Hungarian University of Transylvania, Cluj-Napoca, Romania

**16:10-16:30**  **RS06.2**
**Exploring the rendezvous of agents in cyclic pursuit
with possible negative controller gain
and homogeneous input delay**
De, Souradip – Indian Institute of Technology Kanpur, India
Sahoo, Soumya Ranjan – Indian Institute of Technology Kanpur, India
Wahi, Pankaj – Indian Institute of Technology Kanpur, India

**16:30-16:50**    **RS06.3**
**Synchronization in networks with heterogeneous
coupling delays**
Otto, Andreas – Technische Universität Chemnitz, Germany
Bachrathy, Daniel – Budapest University of Technology and Economics, Hungary
Orosz, Gabor – University of Michigan, Ann Arbor, USA
Radons, Günter – Technische Universität Chemnitz, Germany

**16:50-17:10**    **RS06.4**
**Further remarks on single-delay and multiple-delay PR
protocols for fast consensus in a large-scale network**
Ramírez, Adrián – Northeastern University, Boston, USA
Sipahi, Rifat – Northeastern University, Boston, USA

**IFAC TC MEETING**    `Plenary`
Session Chair: Silviu-Iulian Niculescu
17:20-18:20

**RS07**
**NEUTRAL SYSTEMS I.
(REGULAR SESSION)**    `Plenary`
Session Chair: Hitay Özbay

**09:00-09:20**    **RS07.1**
**On feedback stabilization of neutral time delay systems with
infinitely many unstable poles**
Gumussoy, Suat – MathWorks, Natick, USA
Özbay, Hitay - Bilkent University, Ankara, Turkey

**09:20-09:40**    **RS07.2**
**On the stabilization of a system of neutral type occurring in
co-generation**
Răsvan, Vladimir – University of Craiova, Romania
Danciu, Daniela – University of Craiova, Romania
Popescu, Dan – University of Craiova, Romania

**09:40-10:00**    **RS07.3**
**Neutral PID control loop investigated in terms
of similarity theory**
Fišer, Jaromír – Czech Technical University in Prague, Czech Republic
Zítek, Pavel – Czech Technical University in Prague, Czech Republic
Vyhlídal, Tomáš – Czech Technical University in Prague, Czech Republic

**10:00-10:20**    **RS07.4**
**A new stability criterion for neutral-type systems
with one delay**
Gomez, Marco A. – Cinvestav-IPN, Mexico City, Mexico
Egorov, Alexey V. – Saint Petersburg State University, Russia
Mondié, Sabine – Cinvestav-IPN, Mexico City, Mexico

**10:20-10:40**    **RS07.5**
**On control and anticipatory effects in applied mechanics**
Béda, Péter B. – Budapest University of Technology and Economics, Hungary

**10:40-11:00**    **RS07.6**
**On Hamilton-Jacobi equations for neutral-type differential games**
Gomoyunov, Mikhail – N.N. Krasovskii Institute of Mathematics and Mechanics of the Ural Branch of the Russian Academy of Sciences, Yekaterinburg, Russia, Ural Federal University, Yekaterinburg, Russia
Plaksin, Anton – N.N. Krasovskii Institute of Mathematics and Mechanics of the Ural Branch of the Russian Academy of Sciences, Yekaterinburg, Russia, Ural Federal University, Yekaterinburg, Russia

## RS08
## NONLINEAR SYSTEMS (REGULAR SESSION)

Room I

Session Chair: Vasil G. Angelov

**09:00-09:20**    **RS08.1**
**Dynamics of coupled Duffing oscillators with delayed feedback**
Weremczuk, Andrzej – Lublin University of Technology, Poland
Warminski, Jerzy– Lublin University of Technology, Poland
Rusinek, Rafal – Lublin University of Technology, Poland

**09:20-09:40**    **RS08.2**
**Nonuniform lossless transmission lines terminated by a nonlinear conductive element**
Angelov, Vasil G. – University of Mining and Geology, Sofia, Bulgaria

**09:40-10:00**    **RS08.3**
**Structural stability in scalar delay equations with monotone feedback**
López Nieto, Alejandro – Freie Universität Berlin, Germany

**10:00-10:20**    **RS08.4**
**Finite-element based observer design for nonlinear systems with delayed measurements**
Rehák, Branislav – Czech Academy of Sciences, Czech Republic

**10:20-10:40**    **RS08.5**
**Viable trajectories for nonconvex differential inclusions with constant delay**
Frankowska, Hélène – Sorbonne Université, Paris, France
Haidar, Ihab – ENSEA, Cergy, France

**10:40-11:00**    **RS08.6**
**On bounded control of a class of feedforward nonlinear time-delay systems**
Yang, Xuefei – Harbin Institute of Technology, China
Zhou, Bin – Harbin Institute of Technology, China
Lou, Weiwei – Harbin Institute of Technology, China
Lam, James – University of Hong Kong, China

## RS09
## STABILITY (REGULAR SESSION)

Room II.

Session Chair: Wim Michiels

**09:00-09:20**    **RS09.1**
**An algebraic approach for a stability analysis methodology for multiple time-delay systems**
Alikoc, Baran – Czech Technical University in Prague, Czech Republic
Ergenc, Ali Fuat – Istanbul Technical University, Turkey

**09:20-09:40**    **RS09.2**
**Some remarks on the asymptotic behavior for quasipolynomials with two delays**
Martínez-González, Alejandro – Universidad Autónoma De San Luis Potosí, Mexico, CNRS-Supélec, Paris, France
Méndez-Barrios, Cesar Fernando – Universidad Autónoma De San Luis Potosí, Mexico
Niculescu, Silviu-Iulian – CNRS-Supélec, Paris, France
Chen, Jie – City University of Hong Kong, China

**09:40-10:00**    **RS09.3**
**Stability analysis for systems with time-varying delay via orthogonal-polynomial-based integral inequality**
Park, JunMin – Pohang University of Science and Technology, Republic of Korea
Park, PooGyeon – Pohang University of Science and Technology, Republic of Korea

**10:00-10:20**    **RS09.4**
**Polynomial (chaos) approximation of the spectral abscissa: Efficiency and limitations**
Fenzi, Luca – KU Leuven, Belgium
Michiels, Wim – KU Leuven, Belgium

**10:20-10:40** | **RS09.5**
**Dynamics of a ring network with a linear tail**
Xu, Xu – Jilin University, Changchun, China
Yu, Dongyuan – Jilin University, Changchun, China

**10:40-11:00** | **RS09.6**
**New model transformations for the stability analysis
of time-delay systems**
Safi, Mohammed – Université de Toulouse, France,
CNRS, Paris, France
Baudouin, Lucie – Université de Toulouse, France,
CNRS, Paris, France
Seuret, Alexandre – Université de Toulouse, France,
CNRS, Paris, France

**TS07**
**DYNAMICS OF NETWORKS
WITH DELAYED CONNECTIONS I.
(THEMATIC SESSION)**
Session Chair: Serhiy Yanchuk

Plenary

**11:30-11:50** | **TS07.1**
**How interaction delays control spiking patterns
in pulse-coupled networks**
Yanchuk, Serhiy – Technische Universität Berlin, Germany

**11:50-12:10** | **TS07.2**
**Symmetry, Hopf bifurcation and the emergence of cluster
solutions in time delayed neural networks**
Campbell, Sue Ann – University of Waterloo, Canada
Wang, Zhen – University of Waterloo, Canada

**12:10-12:30** | **TS07.3**
**Properties of master stability islands for amplitude death
in networks of delay-coupled oscillators**
Huddy, Stanley R. – Fairleigh Dickinson University, Teaneck, USA

**12:30-12:50** | **TS07.4**
**Dynamics and synchronization of time-varying networks
with coupling delays**
D'Huys, Otti – Aston University, Birmingham, UK
Rodríguez-Laguna, Javier – UNED, Madrid, Spain
Jiménez-Martín, Manuel – UNED, Madrid, Spain
Korutcheva, Elka – UNED, Madrid, Spain,
Bulgarian Academy of Sciences, Sofia, Bulgaria
Kinzel, Wolfgang – Würzburg University, Germany

Room I.

**TS08**
**MATHEMATICAL BIOLOGY
(THEMATIC SESSION)**
Session Chair: John Milton

**11:30-11:50** | **TS08.1**
**Dynamics of some delay logistic equations**
Röst, Gergely – University of Oxford, UK

**11:50-12:10** | **TS08.2**
**Delay equations for disease and immunity dynamics**
Barbarossa, Maria Vittoria – Heidelberg University, Germany

**12:10-12:30** | **TS08.3**
**Controlling Mackey-Glass chaos**
Kiss, Gábor – University of Szeged, Hungary

**12:30-12:50** | **TS08.4**
**Differential equations with gamma-Ricker type
delayed feedback**
Liz, Eduardo – Universidad de Vigo, Spain

**TS09**
**STOCHASTIC TIME-DELAYED SYSTEMS
(THEMATIC SESSION)**
Session Chair: Yuliya Kyrychko

Room II.

**11:30-11:50** | **TS09.1**
**Noise-induced switching in systems with distributed delays**
Kyrychko, Yuliya – University of Sussex, UK

**11:50-12:10** | **TS09.2**
**Noise-induced chimeras in dynamical networks: Nonlocally coupled ring versus 2D modular fractal connectivity**
Zakharova, Anna – Technische Universität Berlin, Germany
Heym, Nikolas – Technische Universität Berlin, Germany
Schöll, Eckehard – Technische Universität Berlin, Germany

**12:10-12:30** | **TS09.3**
**Noise induced large fluctuations in delay-coupled mixed reality systems**
Schwartz, Ira B. – US Naval Research Laboratory, Washington DC, USA
Szwaykowska, Klimka – US Naval Research Laboratory, Washington DC, USA
Carr, Thomas W. – Southern Methodist University, Dallas, USA
Hindes, Jason – US Naval Research Laboratory, Washington DC, USA, National Research Council, USA

**12:30-12:50** | **TS09.4**
**Stochastic effects in a time-delayed model for autoimmunity**
Fatehi, Farzad – University of Sussex, UK
Kyrychko, Yuliya N. – University of Sussex, UK
Blyuss, Konstantin B. – University of Sussex, UK

**TS10**
**DYNAMICS OF NETWORKS**
**WITH DELAYED CONNECTIONS II.**
**(THEMATIC SESSION)**

Plenary

Session Chair: Serhiy Yanchuk

**14:00-14:20** | **TS10.1**
**Relation between the dynamics of a single-delay system and a feed-forward ring**
Klinshov, Vladimir – Institute of Applied Physics, Nizhny Novgorod, Russia
Shchapin, Dmitry – Institute of Applied Physics, Nizhny Novgorod, Russia
Nekorkin, Vladimir – Institute of Applied Physics, Nizhny Novgorod, Russia
Yanchuk, Serhiy – Technische Universität Berlin, Germany
Wolfrum, Matthias – Weierstrass Institute for Applied Analysis and Stochastics, Berlin, Germany
D'Huys, Otti – Aston University, Birmingham, UK

**14:20-14:40** | **TS10.2**
**Beyond Square Waves: Coherence-Incoherence patterns in a singularly perturbed Delay Differential Equation**
Ruschel, Stefan – Technische Universität Berlin, Germany

**14:40-15:00** | **TS10.3**
**Delayed feedback control of networks**
Schneider, Isabelle – Freie Universität Berlin, Germany

**15:00-15:20** | **TS10.4**
**Phase solitons in DDEs with large delay**
Wolfrum, Matthias – Weierstrass Institute for Applied Analysis and Stochastics, Berlin, Germany

**TS11**
**NUMERICAL ANALYSIS FOR DELAY EQUATIONS**
**IN POPULATION DYNAMICS**
**(THEMATIC SESSION)**

Room I.

Session Chair: Tony Humphries

**14:00-14:20** | **TS11.1**
**Pseudospectral methods for the stability of periodic solutions of delay equations**
Liessi, Davide – University of Udine, Italy
Breda, Dimitri – University of Udine, Italy

**14:20-14:40** | **TS11.2**
**Pseudospectral methods for the bifurcation analysis of nonlinear delay equations**
Scarabel, Francesca – University of Helsinki, Finland
Gyllenberg, Mats – University of Helsinki, Finland
Vermiglio, Rossana – University of Udine, Italy

**14:40-15:00** | **TS11.3**
**Improving numerical continuation for complex delay models of structured populations**
Andò, Alessia – University of Udine, Italy
Breda, Dimitri – University of Udine, Italy

**15:00-15:20** | **TS11.4**
**Worries with state-dependent delays**
Humphries, Tony – McGill University, Montréal, Canada

## TS12
## TIME-DELAYED MODELS OF NEURAL SYSTEMS (THEMATIC SESSION)

Room II.

Session Chair: Konstantin Blyuss

**14:00-14:20**     **TS12.1**
**Dynamics of interactions between discrete and distributed delays in neural networks**
Blyuss, Konstantin – University of Sussex, UK

**14:20-14:40**     **TS12.2**
**Chimera states in neural networks: interplay of fractal topology and delay**
Sawicki, Jakub – Technische Universität Berlin, Germany
Omelchenko, Iryna – Technische Universität Berlin, Germany
Zakharova, Anna – Technische Universität Berlin, Germany
Schöll, Eckehard – Technische Universität Berlin, Germany

**14:40-15:00**     **TS12.3**
**Delayed but not much: the role of inhibition in neuronal synchronization**
Matias, Fernanda S. – Universidade Federal de Alagoas, Maceió, Brazil, NeuroSpin Center, Gif-sur-Yvete, France
Carelli, Pedro V. – Universidade Federal de Pernambuco, Recife, Brazil
Copelli, Mauro – Universidade Federal de Pernambuco, Recife, Brazil
Mirasso, Claudio R. – Campus Universitat de les Illes Balears, Spain

**15:00-15:20**     **TS12.4**
**Delayed feedback for pulsatile electrical brain stimulation**
Popovych, Oleksandr V. – Research Centre Jülich, Germany
Lysyansky, Borys – Research Centre Jülich, Germany
Tass, Peter A. – Stanford University, USA

## RS10
## NEUTRAL SYSTEMS II. (REGULAR SESSION)

Plenary

Session Chair: Altug Iftar

**15:50-16:10**     **RS10.1**
**Stable and robust controller synthesis for unstable time delay systems via interpolation and approximation**
Yücesoy, Veysel – ASELSAN Research Center, Ankara, Turkey, Bilkent University, Ankara, Turkey
Özbay, Hitay – Bilkent University, Ankara, Turkey

**16:10-16:30**     **RS10.2**
**Adaptive robust stabilization of uncertain neutral delay-time systems via control schemes with simple structure**
Wu, Hansheng – Prefectural University of Hiroshima, Japan

**16:30-16:50**     **RS10.3**
**Overlapping decentralized controller design for neutral systems with distributed time-delay**
Iftar, Altug – Anadolu University, Eskişehir, Turkey

**16:50-17:10**     **RS10.4**
**Observer-based delayed resonator with acceleration feedback**
Kocak, Sena – Turkish Aerospace Industries, Ankara, Turkey
Ergenc, Ali Fuat – Istanbul Technical University, Turkey

## RS11
## PERIODIC SYSTEMS (REGULAR SESSION)

Room I.

Session Chair: Kestutis Pyragas

**15:50-16:10**     **RS11.1**
**Act-and-wait modification of time-delayed feedback control algorithm**
Pyragas, Kestutis – Center for Physical Sciences and Technology, Vilnius, Lithuania
Pyragas, Viktoras – Center for Physical Sciences and Technology, Vilnius, Lithuania

**16:10-16:30**     **RS11.2**
**Time-delay and sampled-data implementation of derivative-dependent control**
Selivanov, Anton – Tel Aviv University, Israel
Fridman, Emilia – Tel Aviv University, Israel

**16:30-16:50**     **RS11.3**
**Periodic and quasi-periodic oscillations of fixed and rotating self-excited structures with time delay**
Warminski, Jerzy – Lublin University of Technology, Poland

**16:50-17:10**     **RS11.4**
**A numerical approach for the stability of large-scale time-periodic time-delay systems**
Jarlebring, Elias – KTH Royal Institute of Technology, Stockholm, Sweden

## RS12
### APPLICATIONS (REGULAR SESSION)
Session Chair: Helmut Maurer

**15:50-16:10**    **RS12.1**
**Applications of optimal control problems with time delays**
Maurer, Helmut – University of Münster, Germany

**16:10-16:30**    **RS12.2**
**Delays in model reduction of chemical reaction networks**
Lipták, György – Institute for Computer Science and Control,
Hungarian Academy of Sciences, Budapest, Hungary
Hangos, Katalin M. – Institute for Computer Science and Control, Hungarian
Academy of Sciences, Budapest, Hungary,
University of Pannonia, Veszprém, Hungary

**16:30-16:50**    **RS12.3**
**Bound pulse trains in arrays of coupled spatially extended dynamical systems**
Puzyrev, Dmitry – Technische Universität Berlin, Germany
Vladimirov, Andrey G. – Weierstrass Institute for Applied Analysis and
Stochastics, Berlin, Germany,
Lobachevsky State University of Nizhni Novgorod, Russia
Pimenov, Alexander – Weierstrass Institute for Applied Analysis and
Stochastics, Berlin, Germany
Gurevich, Svetlana V. – University of Münster, Germany
Yanchuk, Serhiy – Technische Universität Berlin, Germany

**16:50-17:10**    **RS12.4**
**Complex dynamics of a typical electrostatic MEMS resonator and its control by delayed position feedback**
Shang, Huilin – Shanghai Institute of Technology, China

### KNORR-BREMSE SESSION
Session Chair: Gabor Stepan

**17:20-18:00**
**Automation of commercial vehicles**
Frank, Péter – Knorr-Bremse R&D Center, Budapest, Hungary

### FAREWELL DINNER
**18:30-**

## RS13
### ROBUST STABILIZATION AND PREDICTOR FEEDBACK (REGULAR SESSION)
Session Chair: László Keviczky

**09:00-09:20**    **RS13.1**
**Influence of time-delay mismatch for robustness and stability**
Bányász, Csilla – Institute for Computer Science and Control, Hungarian
Academy of Sciences, Budapest, Hungary
Keviczky, László – Institute for Computer Science and Control, Hungarian
Academy of Sciences, Budapest, Hungary
Bars, Ruth – Budapest University of Technology and Economics, Hungary

**09:20-09:40**    **RS13.2**
**Robust PID controller design for plants with delay using similarity theory**
Fišer, Jaromír – Czech Technical University in Prague, Czech Republic
Zítek, Pavel– Czech Technical University in Prague, Czech Republic
Vyhlídal, Tomáš – Czech Technical University in Prague, Czech Republic

**09:40-10:00**    **RS13.3**
**Extension of an anti-windup scheme for systems with time delay and integral action**
Öztürk, Dilan – Bilkent University, Ankara, Turkey
Özbay, Hitay – Bilkent University, Ankara, Turkey

**10:00-10:20**    **RS13.4**
**Necessary and sufficient conditions for the stability of uncertain input-delayed systems**
Bou Farraa, Berna – LS2N, Université Bretagne Loire, Nantes, France
Abbou, Rosa – LS2N, Université Bretagne Loire, Nantes, France
Loiseau, Jean Jacques – LS2N, Université Bretagne Loire, Nantes, France

**10:20-10:40**    **RS13.5**
**State predictive control by integral approximation for inverted pendulum with time delay**
Abe, Naoto – Meiji University, Tokyo, Japan
Fukunaga, Shinya – Meiji University, Tokyo, Japan

10:40-11:00  **RS13.6**
**Lower bounds on delay margin**
**of second-order unstable systems**
Ma, Dan – Northeastern University, Shenyang, China
Chen, Jianqi – City University of Hong Kong, China
Liu, Andong – City University of Hong Kong, China
Chen, Jie – City University of Hong Kong, China
Niculescu, Silviu-Iulian – CNRS-Supélec, Paris, France

**RS14**
**VEHICLE APPLICATIONS (REGULAR SESSION)**                    Room I.
Session Chair: Gabor Orosz

09:00-09:20  **RS14.1**
**Hierarchical steering control for a front wheel drive**
**automated car**
Beregi, Sándor – Budapest University of Technology and Economics, Hungary
Takács, Dénes – MTA-BME Research Group on Dynamics of Machines and
Vehicles, Budapest, Hungary
He, Chaozhe R. – University of Michigan, Ann Arbor, USA
Avedisov, Sergei S. – University of Michigan, Ann Arbor, USA
Orosz, Gábor – University of Michigan, Ann Arbor, USA

09:20-09:40  **RS14.2**
**Modeling highway traffic flow using distributed time-delay**
Iftar, Altug – Anadolu University, Eskişehir, Turkey

09:40-10:00  **RS14.3**
**Control of yaw dynamics in the presence of input time delay**
**with rear axle steering system**
Stréli, Tamás – Knorr Bremse Systems for Commercial Vehicles, Budapest, Hungary
Németh, Huba – Knorr Bremse Systems for Commercial Vehicles, Budapest, Hungary

10:00-10:20  **RS14.4**
**String and robust stability of connected vehicle systems with**
**delayed feedback**
Kamath, Gopal Krishna – Indian Institute of Technology Madras, India
Jagannathan, Krishna – Indian Institute of Technology Madras, India
Raina, Gaurav – Indian Institute of Technology Madras, India

10:20-10:40  **RS14.5**
**Lateral vehicle control using finite spectrum assignment**
Voros, Illes – Budapest University of Technology and Economics, Hungary
Varszegi, Balazs – Budapest University of Technology and Economics, Hungary,
MTA-BME Lendület Human Balancing Research Group, Budapest, Hungary

10:40-11:00  **RS14.6**
**Energy distribution of a vehicle shimmy system with the**
**delayed tyre model**
Mi, Tian – Southeast University, Nanjing, China
Chen, Nan – Southeast University, Nanjing, China
Stepan, Gabor – Budapest University of Technology and Economics, Hungary
Takacs, Denes – MTA-BME Research Group on Dynamics of Machines and
Vehicles, Budapest, Hungary

**RS15**
**THEORY OF DDES (REGULAR SESSION)**                    Room II.
Session Chair: Vladimir L. Kharitonov

09:00-09:20  **RS15.1**
**Approximate Lyapunov matrices for time-delay systems**
Kharitonov, Vladimir L. – Saint Petersburg State University, Russia

09:20-09:40  **RS15.2**
**The Sturm separation theorem for impulsive delay**
**differential equations**
Domoshnitsky, Alexander – Ariel University, Israel
Raichik, Vladimir – Ariel University, Israel

09:40-10:00  **RS15.3**
**On the quasilinearization method for a parameter estimation**
**problem in a class of functional differential equations with**
**state-dependent delays**
Hartung, Ferenc – University of Pannonia, Veszprém, Hungary

**10:00-10:20** **RS15.4**
**Symbolic computation for integro-differential-time-delay operators with matrix coeficients**
Cluzeau, Thomas – University of Limoges, France
Poor, Jamal Hossein – Austrian Academy of Sciences, Wien, Austria
Quadrat, Alban – INRIA Lille - Nord Europe, Villeneuve d'Ascq, France
Raab, Clemens G. – Johannes Kepler University Linz, Austria
Regensburger, Georg – Johannes Kepler University Linz, Austria

**10:20-10:40** **RS15.5**
**Sign-constancy of Green's functions for two-point boundary value problems with second order impulsive delayed differential equations**
Domoshnitsky, Alexander – Ariel University, Israel
Mizgireva, Yulia – Ariel University, Israel

**10:40-11:00** **RS15.6**
**Adaptive fuzzy backstepping control for flexible manipulator with time delay and uncertain parameters**
Li, Meichao – Shanghai Jiao Tong University, China
Cai, Guoping – Shanghai Jiao Tong University, China
Chen, Longxiang – Shanghai Jiao Tong University, China

**TS13**
**TIME DELAYS IN CONNECTED AND AUTOMATED VEHICLES (THEMATIC SESSION)**
Session Chair: Gabor Orosz

Plenary

**11:30-11:50** **TS13.1**
**Seeing beyond the line of sight – controlling connected automated vehicles**
Orosz, Gabor – University of Michigan, Ann Arbor, USA

**11:50-12:10** **TS13.2**
**Robust control design for connected automated vehicles**
Hajdu, Dávid – Budapest University of Technology and Economics, Hungary
Ge, Jin I. – California Institute of Technology, Pasadena, USA
Insperger, Tamás – Budapest University of Technology and Economics, Hungary, MTA-BME Lendület Human Balancing Research Group, Budapest, Hungary
Orosz, Gábor – University of Michigan, Ann Arbor, USA

**12:10-12:30** **TS13.3**
**Collaborative control strategy for connected autonomous vehicles in the presence of communication delays and cyber-attacks**
Petrillo, Alberto – University of Naples Federico II, Italy
Santini, Stefania – University of Naples Federico II, Italy, Italian National Research Council, Italy

**12:30-12:50** **TS13.4**
**Connected testbeds for connected automated vehicles**
Ersal, Tulga – University of Michigan, Ann Arbor, USA

**TS14**
**SPECTRAL METHODS FOR RIGHTMOST ROOTS CHARACTERIZATION IN LTI TIME DELAY SYSTEMS I. (THEMATIC SESSION)**
Session Chair: Rifat Sipahi

Room I.

**11:30-11:50** **TS14.1**
**Perspectives on the computation of rightmost roots: Recent results and future directions**
Sipahi, Rifat – Northeastern University, Boston, USA

**11:50-12:10** **TS14.2**
**Robust stabilisation of linear time-delay systems with uncertainties in the system matrices and in the delay terms**
Borgioli, Francesco – KU Leuven, Belgium
Michiels, Wim – KU Leuven, Belgium

**12:10-12:30** **TS14.3**
**A tuning procedure for the Cascade Proportional Integral Retarded Controller**
López, Kevin – Cinvestav-IPN, Mexico City, Mexico
Mondié, Sabine – Cinvestav-IPN, Mexico City, Mexico
Garrido, Rubén – Cinvestav-IPN, Mexico City, Mexico

**12:30-12:50** **TS14.4**
**Proper orthogonal decomposition and dynamic mode decomposition of delay-differential equations**
Heizer, Balazs – Budapest University of Technology and Economics, Hungary
Kalmar-Nagy, Tamas – Budapest University of Technology and Economics, Hungary

**TS15**

**POSITIVITY BASED APPROACH IN STABILITY OF DELAY DIFFERENTIAL SYSTEMS (THEMATIC SESSION)**

Session Chair: Alexander Domoshnitsky

11:30-11:50     **TS15.1**
**Positivity-based approach to stability of delay systems: new trends**
Domoshnitsky, Alexander – Ariel University, Israel

11:50-12:10     **TS15.2**
**Semistability of complex balanced kinetic systems with time delays**
Lipták, György – Institute for Computer Science and Control, Hungarian Academy of Sciences, Budapest, Hungary,
University of Pannonia, Veszprém, Hungary
Hangos, Katalin M. – Institute for Computer Science and Control,
Hungarian Academy of Sciences, Budapest, Hungary,
University of Pannonia, Veszprém, Hungary
Pituk, Mihály – University of Pannonia, Veszprém, Hungary
Szederkényi, Gábor – Institute for Computer Science and Control, Hungarian
Academy of Sciences, Budapest, Hungary,
Pázmány Péter Catholic University, Budapest, Hungary

12:10-12:30     **TS15.3**
**Stability of differential-difference systems**
Diblík, Josef – Brno University of Technology, Czech Republic

12:30-12:50     **TS15.4**
**Autopilot to maintain movement of a drone in a vertical plane at a constant height in the presence of vision-based navigation**
Domoshnitsky, Alexander – Ariel University, Israel
Kogan, Max – Ariel University, Israel
Kupervasser, Oleg – Ariel University, Israel,
TRANSIST VIDEO LLC, Moscow, Russia
Yavich, Roman – Ariel University, Israel

**TS16**

**LYAPUNOV FUNCTIONALS AND MATRICES (THEMATIC SESSION)**

Session Chair: Vladimir L. Kharitonov

14:00-14:20     **TS16.1**
**Lyapunov functionals and matrices: An overview**
Kharitonov, Vladimir L. – Saint Petersburg State University, Russia

14:20-14:40     **TS16.2**
**Stability conditions for time delay systems in terms of the Lyapunov matrix**
Mondié, Sabine – Cinvestav-IPN, Mexico City, Mexico
Egorov, Alexey V. – Saint Petersburg State University, Russia
Gomez, Marco A. – Cinvestav-IPN, Mexico City, Mexico

14:40-15:00     **TS16.3**
**At the junction of Lyapunov-Krasovskii and Razumikhin approaches**
Alexandrova, Irina V. – Saint Petersburg State University, Russia
Zhabko, Alexey P. – Saint Petersburg State University, Russia

15:00-15:20     **TS16.4**
**Computing the delay Lyapunov matrix and $H_2$ norm for high dimensional systems**
Michiels, Wim – KU Leuven, Belgium

**TS17**

**SPECTRAL METHODS FOR RIGHTMOST ROOTS CHARACTERIZATION IN LTI TIME DELAY SYSTEMS II. (THEMATIC SESSION)**

Session Chair: Islam Boussaada

14:00-14:20     **TS17.1**
**On the dominancy of multiple spectral values for time-delay systems with applications**
Boussaada, Islam – Université Paris Saclay, France,
CNRS-Supélec, Paris, France,
Institut Polytechnique des Sciences Avancées (IPSA), Ivry-sur-Seine, France
Niculescu, Silviu-Iulian – Université Paris Saclay, France,
CNRS-Supélec, Paris, France

**14:20-14:40**    **TS17.2**
**Pseudospectral approximation of characteristic roots and multipliers: how multiplicities affect convergence**
Breda, Dimitri – University of Udine, Italy
Liessi, Davide – University of Udine, Italy

**14:40-15:00**    **TS17.3**
**Spectral design of robust delayed resonator by double-root assignment**
Kuře, Matěj – Czech Technical University in Prague, Czech Republic
Vyhlídal, Tomáš – Czech Technical University in Prague, Czech Republic
Michiels, Wim – KU Leuven, Belgium
Boussaada, Islam – Université Paris Saclay, France, CNRS-Supélec, Paris, France

**15:00-15:20**    **TS17.4**
**On the dominant roots of a class of delay equations**
Atay, Fatihcan M. – Bilkent University, Ankara, Turkey

**RS16**
**H$_\infty$ CONTROL AND FRACTIONAL ORDER SYSTEMS (REGULAR SESSION)**
Session Chair: Matthew M. Peet

Room II.

**14:00-14:20**    **RS16.1**
**H$_\infty$ optimal observer design for time-delay systems using SOS**
Peet, Matthew M. – Arizona State University, Tempe, USA

**14:20-14:40**    **RS16.2**
**Structured H$_\infty$-control of infinite dimensional systems**
Apkarian, Pierre – ONERA, Palaiseau, France
Noll, Dominikus – Institut de Mathématiques de Toulouse, France

**14:40-15:00**    **RS16.3**
**Extending the limits of stabilizability of systems with feedback delay via fractional-order PD controllers**
Balogh, Tamas – Department of Applied Mechanics, Budapest University of Technology and Economics, Hungary
Insperger, Tamas – Department of Applied Mechanics, Budapest University of Technology and Economics and MTA-BME Lendület Human Balancing Research Group, Hungary

**15:00-15:20**    **RS16.4**
**α-stability of a class of linear fractional-delay systems**
Wang, Zaihua – Nanjing University of Aeronautics and Astronautics, China
Teng, Xinghu – Nanjing University of Aeronautics and Astronautics, China

**FAREWELL SESSION**
Plenary
Session Chair: Gabor Stepan
**15:30-16:00**

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