

ДАНИЕ
о пленарных и полу-пленарных докладах на Всемирном Конгрессе ИФАК 2020
в г. Берлин, Германия

Ю.В. Митришкин

The screenshot shows a web browser window with the URL rayseven.com/r7/runtime/vdi/ifaac2020/vevent.php?l=en&x=74ddb44746793c0cdd58979b3f75791d0191d458&s=livehall.details&livehallsc=10.... The browser tabs include 'Входящие - Почта Mail.ru', 'Mail - Yuri Mitrishkin - Outlook', and 'IFAC-V 2020'. The page content features the IFAC logo and 'IFAC 2020 GERMANY' branding. The main slide is titled 'Tutorial – Live Discussion' and 'Modeling and Managing Multidisciplinary Cyber-Physical Production Systems as Innovations'. The organizers listed are Birgit Vogel-Heuser, Marion Merklein, Michael Lechner, Cesare Fantuzzi, Manuel Wimmer, and Minjie Zou. The event is scheduled for Tuesday, July 14th, from 11:00-13:00. The browser's taskbar at the bottom shows several PDF files open: 'Teaser Slide.pdf', '4178_PSS.pdf', and '4178.pdf'. The system tray indicates the time is 13:52 on 14.07.2020.

The screenshot shows a slide for a keynote presentation. The slide features the IFAC logo and 'IFAC 2020 GERMANY' branding. The title is 'Keynote' and 'Top-down and bottom-up: Formal representations of things and procedures in autonomous systems'. The speaker is Dr. Georg von Wichert, Siemens Corporate Technology. The date is Tuesday July 14. A small portrait of Dr. Georg von Wichert is shown in the bottom right corner of the slide. The background of the slide is a blue and white design with a cityscape and a globe.


Почта Mail.ru x Mail - Yuri Mitrishkin - Outlook x IFAC-V 2020

rayseven.com/r7/runtime/vdi/ifac2020/vevent.php?l=en&x=74ddb44746793c0cdd58979b3f75791d0191d458&s=livehall.details&livehallslc=10...

IFAC INTERNATIONAL FEDERATION OF AUTOMATIC CONTROL

IFAC 2020 GERMANY


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Keynote

From automated towards autonomous operations – a journey

Dr. Bernhard Eschermann
CTO, Industrial Automation, ABB



Tuesday July 14

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Teaser Slide.pdf 4178_PSS.pdf 4178.pdf Показать все

17:20 14.07.2020






Keynote

On the Road to Carbon Neutrality – A Holistic Perspective and an Exemplary Energy Efficiency Project

Dr. Dieter Förtsch and Marc Kalliski
Bayer AG – Engineering & Technology



Tuesday July 14

Keynote

Move, grow and play: impact of closed-loop control on families waiting for donor hearts

Dr. Matthias Kiesner and Dr. Robert Steingraber
Codialist/Berlin Heart

Tuesday July 14



Чтобы выйти из полноэкранного режима, нажмите Esc

Tutorial

Innovative Topics and Future Challenges in Traffic Control

Organisers

Cecilia Pasquale, Simona Sacone, Silvia Siri

Wednesday, July 15th, 11:00-13:00

Browser tabs: Входящие - Почта Mail.ru, Mail - Yuri Mitrishkin - Outlook, IFAC-V 2020

Address bar: rayseven.com/r7/runtime/vdi/ifac2020/vevent.php?l=en&x=cb24ddb3067a7ac38d88cbc31a6e7dfa9bc39b5a8s=livehall.details&livehallslc=100...

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PDE Backstepping and Extremum Seeking for Stabilization and Optimization of Congested Traffic

Miroslav Krstic
University of California, San Diego, USA

Tutorial Session on "Innovative topics and future challenges in traffic control" - IFAC WC 2020

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System tray: 12:21 15.07.2020

Browser tabs: (1) Входящие - Почта Mail.ru, Mail - Yuri Mitrishkin - Outlook, IFAC-V 2020

Address bar: rayseven.com/r7/runtime/vdi/ifac2020/vevent.php?l=en&x=cb24ddb3067a7ac38d88cbc31a6e7dfa9bc39b5a8s=livehall.details&livehallslc=100...


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Traffic control for the improvement of sustainability in freeway networks: a bibliometric analysis

S. Sacone, C. Pasquale, S. Siri, A. Ferrara

Department of Informatics, Bioengineering, Robotics and Systems Engineering - University of Genova, Italy
Department of Electrical, Computer and Biomedical Engineering, University of Pavia, Italy



Simona Sacone | IFAC WC2020, Berlin, July 15, 2020

System tray: LIVE, 12:39 15.07.2020

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Traffic control for the improvement of sustainability in freeway networks: a bibliometric analysis

Simona Sacone
University of Genova, Italy

Tutorial Session on "Innovative topics and future challenges in traffic control" - IFAC WC 2020

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12:39 15.07.2020

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Plenary

The Joy of Exploring the Emerging Dynamics of Integrated Systems

Jing Sun
University of Michigan, USA

Wednesday, July 15, 13:00 – 14:30

Session Chair:
Hajime Asama, University of Tokyo (JP)

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14:00 15.07.2020

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Pushing the Limits of Performance

Semi-Plenary

Maarten Steinbuch
Eindhoven University of Technology, Netherlands

Wednesday, July 15, 14:30 – 16:00

Session Chair:
Anuradha Annaswamy, MIT (US)

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15:31
15.07.2020

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120 Years of Moore's Law

Year	Technology	Calculations per second per constant dollar
1900	ANALYTICAL ENGINE	~1E-09
1905	HOLLERITH TABULATOR	~1E-08
1915	IBM TABULATOR	~1E-07
1925	COLLIER	~1E-06
1935	COLOSSUS	~1E-05
1940	ENIAC	~1E-04
1945	MARK II	~1E-03
1950	UNIVAC	~1E-02
1955	SAR	~1E-01
1960	IBM 7090	~1E+00
1965	IBM 360	~1E+01
1970	IBM 370	~1E+02
1975	IBM 3081	~1E+03
1980	IBM 3090	~1E+04
1985	IBM 3090X	~1E+05
1990	IBM 3096	~1E+06
1995	IBM 3096E	~1E+07
2000	IBM 3096E	~1E+08
2005	IBM 3096E	~1E+09
2010	IBM 3096E	~1E+10
2015	IBM 3096E	~1E+11
2020	IBM 3096E	~1E+12

Source: Ray Kurzweil, DTI

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15:32
15.07.2020

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Contents

- CST group @ TU/e
- Motion systems
- Robotics
- Cars
- University 4.0

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At the heart of the brainport region

Private R&D

City	Private R&D (Relative Index)
Eindhoven	~1.8
Amsterdam	~1.0
Utrecht	~0.6

PHILIPS ASML NXP TNO CITEA
 DSM IBC Silicon Labs Thermal Fiber DAI BOSCH
 PHILIPS Medical Systems CN ArScand JVC/SONY JVC/SONY Dräger BRAINPORT Excellence

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ME: Control Systems Technology – Faculty

50+ PhD Students, 70+ MSc graduating/year
4M€ project funding/year

Model-based Control, Learning Control, Identification and Design of Motion Systems
Steinbuch, Oomen, Heerfjes, Witvoet, Tiels, Vermeulen, Vrancken, Vacancy

Cyber-Physical Systems of Systems
Heemels, Antunes, Rovers, vd Mortel, Elman, v Beek, Chong, Fokkink, van Eekelen

Robotics for Care, Cure & Agro-food
vdMolengraft, Bruyminkx, Kappers, Effring, Torta, Vacancy

Automotive Powertrains & Smart Mobility
Hofman, Salazar, Silvas, Willems, van Keulen, Huisman, de Jager

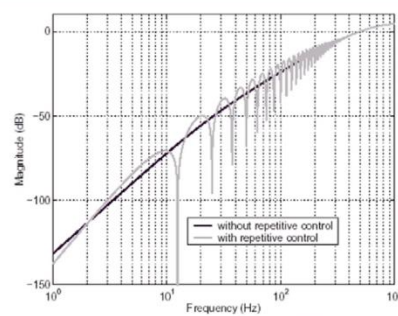
Control of fusion plasmas
De Baar, Vacancy



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Sensitivity function



Magnitude (dB)

Frequency (Hz)

— without repetitive control
- - - with repetitive control

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Gunter Stein's Bode Lecture, CDC 1989

IEEE Control Systems Magazine, 23 (2003), pp 12- 25

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Can we beat the Bode Sensitivity Integral?

Do there exist nonlinear controllers for linear motion systems which do a better job than linear ones?

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Idea 1: LPV specifications...(Lewis servo, 1953, PhD Wouter Aangenent 2008)

Step response for various values of damping coefficient ζ (1, 0.8, 0.6, 0.4).

Closed-loop:

$$\frac{2}{s^2 + (2\zeta\sqrt{2})s + 2}$$

Trade-off between overshoot / rise-time / settling-time.

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Let's make the damping (D-action) a function of the error

Linear Parameter Varying control

Now take $\zeta = 1 - \frac{(r-y)}{\sqrt{2}}$ to obtain the LPV controller:

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ u \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & -2\sqrt{2} + 2(r-y) & -2 & 2 \\ 1 & 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ y \\ r \end{bmatrix}$$

Closed-loop:

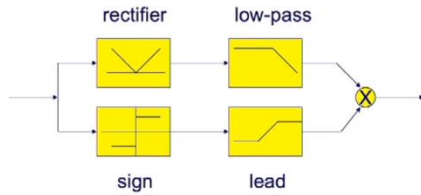
$$\frac{2}{s^2 + (2\sqrt{2} - 2(r-y))s + 2}$$

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Idea 2: SPAN- filter (1966)



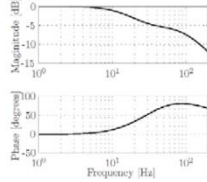
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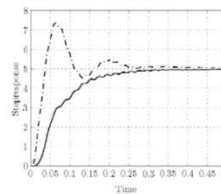


SPAN- filter implementation result

describing function



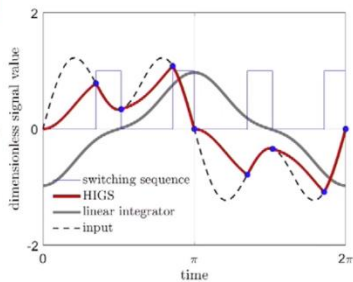
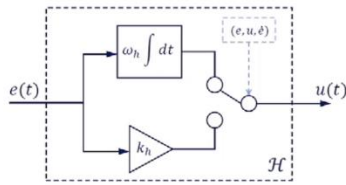
measured step response (solid line = SPAN filter)



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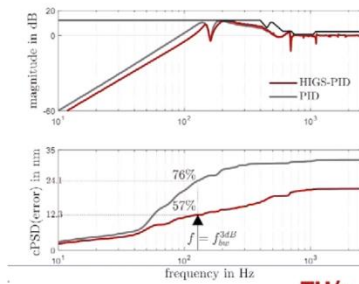
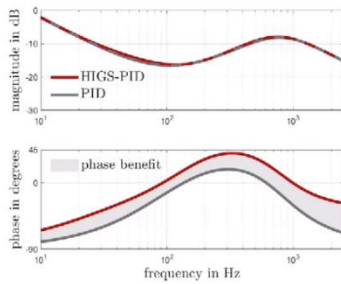
Idea 3: HIGS: Hybrid Integrator-Gain System definition and behavior as integrator (2020)



Hybrid systems
Marcel Heerjies, Maurice Heemels

TU/e

HIGS feedback control: stage PID-based control



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HIGS feedback control: measured time-series

MA(error) in mm

MSD(error) in mm

time in seconds

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Structural design of a superconducting planar motor

Motor application substantially different from medical or big science cryostats, 5x increase in magnetic field density compared to current planar motor – Hans Vermeulen, PhD Bart Koolmees (2016-now)

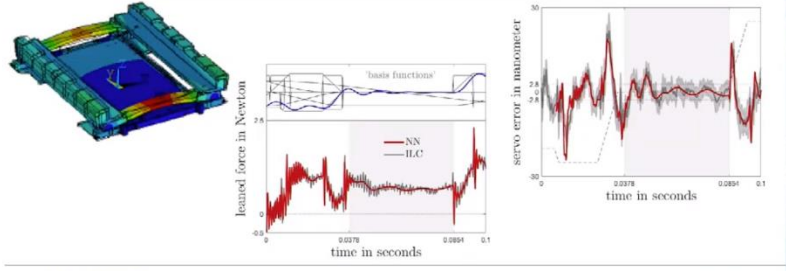
Planar motor configuration using HTS superconducting coils (DC)

Note: HTS = High temperature superconducting

Functional model of superconducting coil assembly, cross section (right), hardware realization (left)

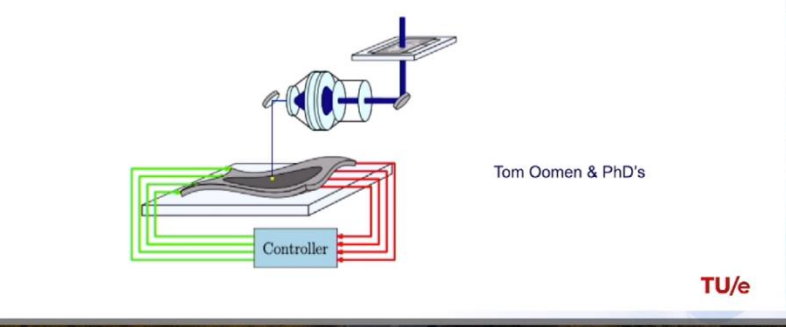
Ref: Koolmees, H.B., Vermeulen, J.P.M.B., Thermal insulation and high stiffness fixation in a superconducting planar motor, Proc. of the 18th european international conference, Venice, Italy, June 4-8, 2018

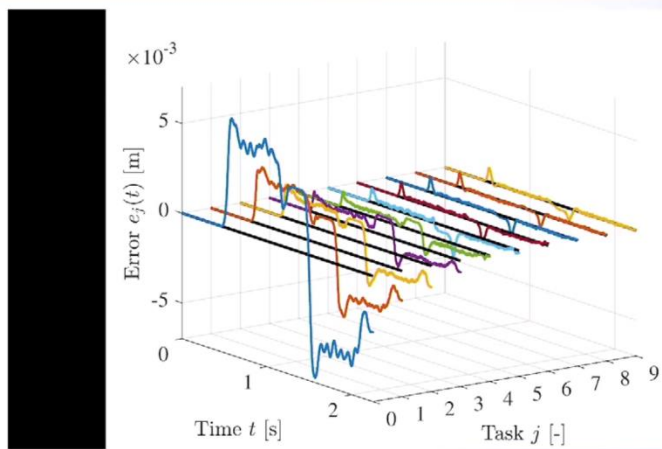
Machine learning: feedforward with basis functions



Motion systems Marcel Heertjes TU/e

Model based control, MIMO Control relevant identification (Iterative) Learning & Repetitive control

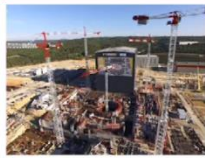




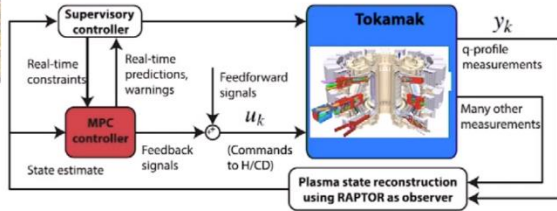
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Control of Nuclear Fusion Plasma's



Dutch Institute for Fundamental Energy Research
Marco de Baar & PhDs



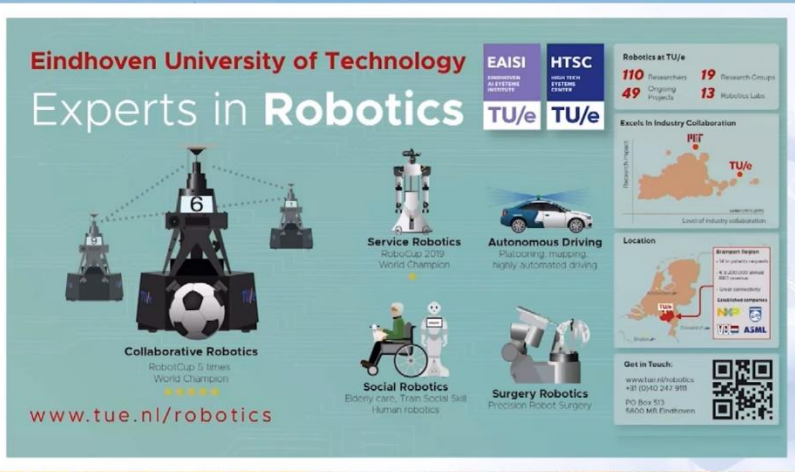
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Eindhoven University of Technology
Experts in Robotics

EAISI | **HTSC**
TU/e | TU/e

Robotics at TU/e
110 Research Teams | 49 Ongoing Projects | 19 Research Groups | 13 Robotics Labs

Excels In Industry Collaboration
PFIET | TU/e

Collaborative Robotics
RobotCap 5 times World Champion

Service Robotics
RobotCup 2017 World Champion

Autonomous Driving
Parking & Mapping, highly automated driving

Social Robotics
Elderly care, Team Social Skill, Human robotics


Surgery Robotics
Precision Robot Surgery

Get in Touch:
www.tue.nl/robotics
+31 (0)40 247 998
PO Box 513, 5600 MB Eindhoven

www.tue.nl/robotics

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Super human precision for surgeons – eye surgery

PREC EYES

Thijs Meenink PhD 2011


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Super human precision for surgeons – micro surgery



microsure
robot assisted microsurgery

PhD Raimondo Cau, 2014

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Super human precision for surgeons – bone robotics



Eindhoven Medical Robotics

Jordan Bos, PhD 2018
Marc Janssens, PhD 2018
Rolf Gaasbeek, PhD 2018

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The Car as an Ipad on Wheels



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16:07 15.07.2020


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First solar-powered passenger vehicle

Spin-off company: Lightyear (CEO: Lex Hoefsloot, Alumni TU/e)



<https://lightyear.one/>

LIVE

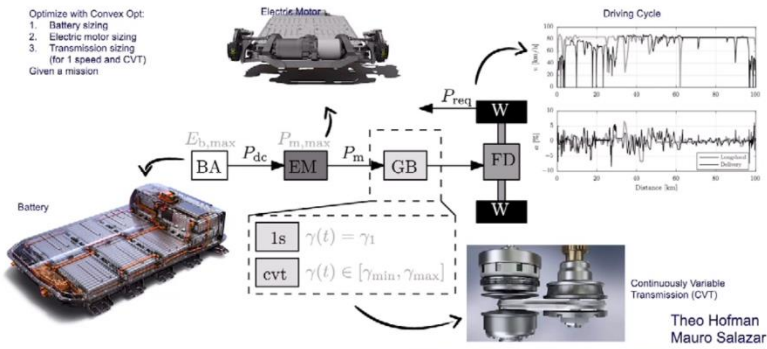
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16:10 15.07.2020

42

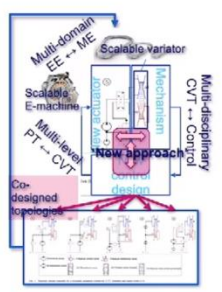
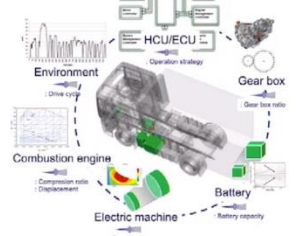
E-Powertrain Design Conditionally on the Achievable Performance

- Optimize with Convex Opt:
1. Battery sizing
 2. Electric motor sizing
 3. Transmission sizing (for 1 speed and CVT)
- Given a mission



Developing integrated design methods that produce system-wide optimal solutions for complex dynamic engineering systems.

- From system to component level:



Theo Hofman
 Mauro Salazar
 Emilia Silvas
 [Silvas (2015), Van Reeve (2018), Verbruggen (2021)]
 [Fahdzyana (2022), Prakash (2021)]
<https://www.tua.nl/en/research/researcher/theo-hofman/>

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In an exponential world,
should the research still be linear?
And education?

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Resources versus Performance

Performance

Innovate

Multi-disciplinary

Systems Engineering

Resources

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Towards a 4th generation University....

	3 rd Generation	4 th Generation
Objective	Education, research & know-how exploitation	Education, open innovation (research)
Role	Creating value	Enabling value creation
Method	Inter-disciplinary science	Multi-actor innovation
Human capital development	Professionals, scientists & entrepreneurs	Professionals, scientists entrepreneurs, artists, customers, ecosystem participants
Orientation	Global	Ecosystem
Language	English	English
Organization	Institutes & centers	Innovation spaces
Management	Professional management	Disruptors

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The mission of Eindhoven Engine

The Eindhoven Engine's mission has its origin in the conviction and ambition that it is possible to **accelerate innovation** in the Brainport region to provide new and timely technology-based solutions as an answer to the societal challenges our generation and environment is facing.

- Boost innovation in "unprecedented" ways
- Unique synergy between students, scientists, creatives and companies (the brightest minds, collective intelligence)
- Co-location

Philips Research success factors:

- Co-location
- Projects are limited (end)
- Open (no) doors
- Inspirational leadership
- Focus, speed, diversity, experience, mix of all techniques
- Immediately stop, what's not working

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16:17 15.07.2020

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ENGINE

HEALTH
ENERGY
MOBILITY

HTC BIC STRUP

AUTOMOTIVE CAMPUS

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16:19 15.07.2020

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Plenary

Reinforcement Learning for Process Control and Beyond

Jay H. Lee
KAIST, Republic of Korea

Thursday, July 16, 13:00 – 14:30

Session Chair:
Paul Van den Hof, TU Eindhoven (NL)

REINFORCEMENT LEARNING FOR PROCESS CONTROL AND BEYOND

Prof. Jay H. Lee
Head of Research and Innovation Engineering
Korea Advanced Institute of Science & Technology

IFAC 2020 GERMANY BERLIN

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14:00
16.07.2020

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Thursday, July 16, 14:30 – 16:00

Semi-Plenary

Safe Autonomy with Deep Learning in the Feedback Loop

George J. Pappas
University of Pennsylvania, USA

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15:29
16.07.2020






Tutorial



Dynamical Networks of Social Influence: Modern Trends and Perspectives

Organisers
Fabrizio Dabbene, Chiara Ravazzi, Anton V. Proskurnikov


Friday, July 17th, 11:30-13:30

ims-files-cdn.net переключен в полноэкранный режим? (Для выхода нажмите ESC.)


OK Завершить работу сейчас

Lobby Technical Program Sponsors Live Track Yuri Mitrishkin




Department of Electronics and Telecommunications



Opinion Formation and Information Diffusion under Social Influence

Anton V. Proskurnikov

¹Politecnico di Torino, Turin, Italy
²Institute for Problems in Mechanical Engineering, Russian Academy of Sciences, St. Petersburg, Russia



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Talk 2:



Chiara Ravazzi
Identification and Learning in Social Influence Networks

Institute of Electronics, Computer and Telecommunication Engineering, Torino
 National Research Council of Italy
 Systems Modeling & Control Group

- Ravazzi, C., Dabbene, F., Lagoa, C.M., Proskurnikov, A. (2020). Learning hidden influences in large-scale dynamical social networks: A data-driven sparsity-based approach. ArXiv

Tutorial on "Dynamical Networks of Social Influence: Modern Trends and Perspectives"

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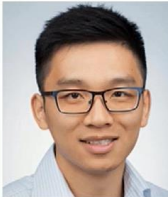

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Talk 3:

Mengbin Ye - Brian D.O. Anderson
Dynamics of Social Influence and Appraisals

Mengbin Ye
 Optus-Curtin Centre of Excellence in Artificial Intelligence, Curtin University, Perth, Australia

Brian D.O. Anderson
 Australian National University, Canberra, Australia
 Data61-CSIRO, Canberra, Australia
 Hangzhou Dianzi University, Hangzhou, China

Ye M. (2019), Opinion Dynamics and the Evolution of Social Power in Social Networks, Springer, Cham, Switzerland

Tutorial on "Dynamical Networks of Social Influence: Modern Trends and Perspectives"

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Plenary

Robots Interacting with Humans and Unknown Worlds: Pushing the Boundaries of Nonlinear Control

Alin Albu-Schäffer
German Aerospace Center DLR, Germany

Friday, July 17, 13:30 – 15:00

Session Chair:
Klaus Janschek, TU Dresden (DE)

Robots Interacting with Humans and Unknown Worlds: Pushing the Boundaries of Nonlinear Control
Alin Albu-Schäffer
DLR, Robotics and Manufacturing Center
TU Munich, Chair of Intelligent Assistive Robots and Systems
TUM

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