Harold Chestnut Textbook Prize
Introducing the 2020 Winning Team

No.6
December 2020

The Harold Chestnut Control Engineering Textbook Prize is presented at each triennial IFAC World Congress for the best Control Engineering textbook for which the first edition(s) occurred not later than the Congress just prior to the one at which the award is presented. It recognizes the author(s) of the textbook(s) judged to have most contributed to the education of control engineers. The selection committtee was chaired by Henk Nijmeijer (NL) for the 2017-2020 triennium.

The candidates for the prize are nominated by a selection committee, while the books under consideration come before the committee through recommendation of the control engineering community. The prize consists of a monetary prize and a certificate. The funds for this prize were donated by the family of Harold Chestnut, IFAC's first president. This prize was created in 1986 and renamed in 2002. In this Newsletter readers have the opportunity to learn more about the team of authors Y. Shtessel, C. Edwards, L. Fridman, A. Levant (US, UK, MX, IL) that won the award in 2020 for Sliding Mode Control and Observation (Birkhäuser, 2013) wih the citation: *"This is an excellent and comprehensive textbook on sliding mode control and observation along with second order and higher order sliding mode techniques. the book is very well-written and features all essentials of a textbook as it contains, in addition to the basic mathematical oriented material, a breadth of real world worked examples and exercises. This book has proven its value, being used in numerous university courses worldwide as a core text."*

Yuri Shtessel

Yuri Shtessel received the M.S. and Ph.D. degrees in Electrical Engineering with concentration in Automatic Control from the South Ural State University, Chelyabinsk (RU) in 1971 and 1978, respectively. Since 1993 he has been with the Electrical and Computer Engineering Department, The University of Alabama in Huntsville, AL (US), where he has produced fourteen PhDs, and his present position is Distinguished Professor. His research interests include sliding mode control and observation with applications to aerospace vehicle and electric power system control.

Y. Shtessel has been a visiting professor in several universities, including Ecole Centrale de Nantes (FR) Polytechnic University of Cata-

lonia (ES); South East University of China, Nanjing (CN); Universities of Exeter, Sheffield and Leicester (all UK); Technion, Haifa, Israel; and UNAM, Mexico City (MX). He is the author of more than 110 journal papers, 30 book chapters, over 230 papers in refereed conference proceedings, and two patents. Y. Shtessel authored (with C. Edwards, L. Fridman, and A. Levant) a textbook *"Sliding Mode Control and Observation,"* (Birkhauser, 2014) This textbook won IFAC's Harold Chestnut Textbook Award for 2020.

He is a recipient of the Distinguished Visiting Fellowship of the Royal Academy of Engineering, UK (2008); the Lady Davis Fellowship (2003), and the IEEE Third Millennium Medal (2000). He also holds the ranks of Associate Fellow of AIAA and Senior Member of IEEE. He is a member of the IEEE Variable Structure Systems Technical Committee and the IEEE CSS Conference Editorial Board. Also, he serves as Subject Editor of the *Journal of the Franklin Institute,* Technical Editor of *IEEE Transactions on Mechatronics*, and Associate Editor of *IEEE Transactions on Aerospace and Electronic Systems*. He has also served as a session chair/co-chair on numerous IEEE and AIAA Conferences and IFAC World Congresses.

Y. Shtessel has served as guest editor of five journal special issues, including *"Adaptive Sliding Mode Control and Observation,"* *International Journal of Contro*l, Vol. 89, Issue 9, 2016 (with F. Plestan and L. Fridman); *"Advances in Guidance and Control of Aerospace Vehicles using Sliding Mode Control and Observation Techniques"* of *The Journal of the Franklin Institute,* Vol. 349, Issue 2, March 2012 (with C. Tournes and L. Fridman); *"Advances in Nonlinear Observation and Identification for Dynamic Systems"* of *The Journal of the Franklin Institute*, Vol. 347, Issue 6, August 2010 (with M. Basin); *"Advances in Higher Order Sliding Mode Control"* of *International Journal of Ro-*

The IFAC Journals

Automatica
http://www.journals.elsevier.com/automatica

Control Engineering Practice
http://www.journals.elsevier.com/control-engineering-practice

Engineering Applications of Artificial Intelligence
http://www.journals.elsevier.com/engineering-applications-of-artificial-intelligence

Journal of Process Control
http://www.journals.elsevier.com/journal-of-process-control

Annual Reviews in Control
http://www.journals.elsevier.com/annual-reviews-in-control

Journal on Mechatronics
http://www.journals.elsevier.com/mechatronics

Nonlinear Analysis: Hybrid Systems
http://www.journals.elsevier.com/nonlinear-analysis-hybrid-systems

IFAC Journal of Systems & Control
http://www.journals.elsevier.com/ifac-journal-of-systems-and-control

IFAC-PapersOnLine

http://www.journals.elsevier.com/ifac-papersonline

bust and Nonlinear Control, Vol. 18, Issue 4-5, 2008 (with L. Fridman and A. Zinober); and "Advances in Sliding Mode Observation and Estimation" of International Journal of Systems Science, Vol. 38, Issues 11 and 12, 2007 (with S. Spurgeon and L. Fridman).

Christopher Edwards

Christopher Edwards graduated from Warwick University, UK with first class honours in Mathematics. In 1991 he moved to Leicester University as a postgraduate student in the Engineering Department and was awarded a Ph.D. in 1995. He was appointed as a Lecturer in Control Engineering at Leicester University in 1996 and promoted to full professor in 2010. In 2012 he was appointed as Professor of Control Engineering in the College of Engineering, Mathematics and Physical Sciences at the University of Exeter, UK.

His current research interest is in the area sliding mode control and observation, and their applications. He is the author of 400 refereed papers in these areas, and three books: Sliding Mode Control: Theory and Applications (1998), Fault Detection and Fault Tolerant Control Using Sliding Modes (2011) and Sliding Mode Control and Observation (2014). In addition he co-edited the monograph Fault Tolerant Flight Control: a Benchmark Challenge (2010). His is currently Chair of the IEEE technical committee on Variable structure systems and an associated editor of the IEEE Transctions on Automatic Control and the IEEE Transactions on Control Systems Technology.

Leonid Fridman

Leonid M. Fridman received an M.S. degree in mathematics from Kuibyshev (Samara) State University, Samara, Russia, in 1976, a Ph.D. degree in applied mathematics from the Institute of Control Science, Moscow, Russia, in 1988, and a Dr. Sc. degree in control science from Moscow State University of Mathematics and Electronics, Moscow, Russia, in 1998.

From 1976 to 1999, L. Fridman was with the Department of Mathematics, Samara State Architecture & Civil Engineering University. From 2000 to 2002, he was with the Department of Postgraduate Study and Investigations at the Chihuahua Institute of Technology, Chihuahua, Mexico. In 2002, he joined the Department of Control Engineering and Robotics, Division of Electrical Engineering of Engineering Faculty at National Autonomous University of Mexico (UNAM), Mexico.

His research interest includes variable structure systems. He is a co-author and co-editor for 11 books and 18 special issues devoted to the sliding mode control.

In 2014-2018 he served as a Chair of TC on Variable Structure and Sliding Mode Control of IEEE Control Systems Society. He was a recipient of a Scopus prize for the best cited Mexican Scientists in Mathematics and Engineering 2010 and the best researcher of UNAM in exact science in 2019.

L. Fridman served and serves as an associated editor in different leading journals of control theory and applied mathematics. He was working as an invited professor in more than 20 universities and research laboratories of Argentina, Australia, Austria, China, France, Germany, Italy, Israel, and Spain. Currently, Professor Fridman is also an International Chair of INRIA, France, and a High-Level Foreign Expert of Ministry of Education of China.

Arie Levant

Arie Levant (formerly L. V. Levantovsky) received his M.S. degree from the Moscow State University (1980), and his Ph.D. degree in Control Theory from the Institute for System Studies of the USSR Academy of Sciences (Moscow, 1987). A. Levant has held a number of research and visiting-professor positions, has performed a number of practical research projects for industry. Since 2001 he is with the Applied Mathematics Dept. of the Tel-Aviv University (IL).

His scientific research is concentrated in nonlinear control theory, and his main results include introduction and development of high-order sliding modes, homogeneous sliding modes and the corresponding control methods. A. Levant has introduced homogeneous differential inclusions, proposed and developed arbitrary-order robust exact differentiators.

The IFAC Conference App is now available!

For users - conference participants:
How to download:
App Store: http://bit.ly/2ID8v0h
Google Play: http://bit.ly/2IRT8RZ
You can also search for 'IFAC' in the Apple App Store or in Google Play Store.

The app is paid for by IFAC and can be downloaded and used free of charge by IFAC event organizers and attendees.

From the IFAC President

Dear IFAC Friends and colleagues,

I am happy to announce that IFAC is offering an additional service to the control community: the IFAC App for technical Events. This new state of the art App will enhance the participation experience at IFAC events and is offered for free both for attendees and event organizers.

After studying several options, IFAC has selected Conference Compass, a company based in the Netherlands, as this service provider. See www.conference-compass.com for detailed information about the Conference Compass solutions. A contract has been signed that allows IFAC to support this service and cover the cost on behalf of Events organizers. Use of the IFAC App is not mandatory, but highly encouraged. It is our hope that many events will choose to utilize the IFAC App, adding new features facilitating and enhancing the interactions during IFAC Events. Not only does the IFAC App offer easily readable display of floorplans, exhibition and sponsor information, the program and abstracts, but it benefits from full IFAC-SMS (submission management system) integration for easy access to documents such as paper preprints, posters and others.

The IFAC App, which operates both on mobile devices and on any computer via web browsers, can replace paper versions of the events booklets and USB-disks. More than that, the IFAC App allows individuals to interact: push messages, private messages, appointments, networking, answering polls, rate sessions, enter chat rooms, all of which may be continued among IFAC App users after the event, and repeated at the next IFAC meeting. Extensions of the IFAC App (costs not covered by IFAC) allow hybrid on-site and online experiences. I look forward to receiving your feedback about your IFAC App experience in the forthcoming IFAC events, hoping it shall be positive.

Speaking of experiences: 2020 has been full of challenges and scenarios that none of us could have ever anticipated or wished for. Due to the pandemic the IFAC World Congress was held virtually for the first time ever in IFAC's storied history (instead of in-person in Berlin, Germany) as originally planned over many years, as well as many other events that were originally organized to be held in-person. I am grateful for our international community of NMOs and affiliates all over the globe who have pulled together during this time of the pandemic, even in a time when meeting together in-person has not been possible. Many thanks to the many volunteers who have made IFAC activities possible, despite the many challenges people are currently facing in their personal and professional lives. It is my hope that someday soon we will be able to gather again in person for IFAC technical events, meetings, seeing friends and colleagues old and new, and enjoying new adventures together!

Sending you and your loved ones my best wishes for health, peace, and joy during the upcoming festive season and the New Year 2021,

Hajime Asama,
IFAC President 2020-2023

IFAC Journal Award Winners 2020

The journal paper prizes are awarded to authors or teams of authors for journals within the portfolio of IFAC journals. The prize funds and certificates were both provided by Elsevier Ltd., the publisher of the IFAC journals.

Automatica Paper Prize

The Automatica Paper Prize is awarded for outstanding contributions to the theory and/or practice of control engineering or control science, documented in a paper published in the IFAC Journal Automatica. At each IFAC World Congress the prize is awarded to the authors of three selected papers published in *Automatica* in the three years preceding the Congress.

Winners (1. Survey, 2. Theory/Methodology, 3. Application)

1. John Maidens, Axel Barrau, Silvère Bonnabel and Murat Arcak: "*Symmetry reduction for dynamic programming*" (CA/FR/FR/US)
doi.org/10.1016/j.automatica.2018.08.024

2. K. S. Phogat, D. Chatterjee, and R. Banavar "*A discrete-time Pontryagin, maximum principle onmatrix Lie groups*" (IN)
doi.org/10.1016/j.automatica.2018.08.026

3. Xiaodong Cheng, Jacquelien M.A. Scherpen, and Bart Besselink: "*Balanced Truncation of Networked Linear Passive Systems*" (NL)
doi.org/10.1016/j.automatica.2019.02.045

Control Engineering Practice Paper Prize

The Control Engineering Practice Paper Prize is awarded for outstanding contributions to the practical application of control techniques and advanced control theory, documented in a paper published in *Control Engineering Practice*. At each IFAC World Congress the prize is awarded to the authors of three selected papers published in the journal in the three years preceding the Congress.

Winners (1. Survey, 2. Theory/Methodology, 3. Application)

1. T. Meurer, T. Böhm: "*Trajectory Planning and Tracking Control for the Temperature Distribution in a Deep Drawing Tool*" (DE)
doi.org/10.1016/j.conengprac.2017.04.004

2. K.V. Nielsen, M. Blanke, L. Eriksson and M. Vejlgaard-Laursen: "*Adaptive feedforward control of exhaust recirculation in large diesel engines*" (DK/DK/SE/DK)
doi.org/10.1016/j.conengprac.2017.05.003

3. L. Jadachowski, A. Steinböck and A. Kugi: "*State estimation and advanced control of the 2D temperature field in an experimental oscillating annealing device*" (AT)
doi.org/10.1016/j.conengprac.2018.06.011

Journal of Process Control Paper Prize

The Journal of Process Control Paper Prize is awarded for outstanding contributions to the theory, practice or survey of process control engineering, documented in a paper published in the *Journal of Process Control.* At each IFAC World Congress the prize is awarded to the authors of three selected papers published in the journal in the three years preceding the Congress.

Winners (1. Survey, 2. Theory/Methodology, 3. Application)

1. Peric N.D., R. Paulen, M.E. Villanueva and B. Chachuat: "*Set-membership nonlinear regression approach to parameter estimation*" (UK/SK/CN/UK)
doi.org/10.1016/j.jprocont.2018.04.002

2. Joy P., K. Rossow, F. Jung, H.-U. Moritz, W. Pauer, A. Mitsos and A. Mhamdi: "*Model-based control of continuous emulsion co-polymerization in a lab-scaletubular reactor*" (DE)
doi.org/10.1016/j.jprocont.2018.12.014

3. Saltik M.B., L. Özkan L., J.H.A. Ludlage, S. Weiland and P.M.J Van den Hof: "*An outlook on robust model predictive control algorithms: reflections on performance and computational aspects*" (NL)
doi.org/10.1016/j.jprocont.2017.10.006

Journal of Engineering Applications of Artificial Intelligence Paper Prize

The Journal of Engineering Applications of AI Paper Prize is awarded for outstanding papers on theory or practice of artificial intelligence published in the Journal of *Engineering Applications of AI.* At each IFAC World Congress the prize is awarded to the authors of two selected papers published in the journal in the three years preceding the Congress.

1. Lin J.C.-W., Yang L., Fournier-Viger P., Hong T.-P.: "*Mining of skyline patterns by considering both frequent and utility constraints*" (NO/CN/CN/TW(CN))
doi.org/10.1016/j.engappai.2018.10.010

2. Lu C., Gao L., Li X., Xiao S: "*A hybrid multi-objective grey wolf optimizer for dynamic scheduling in a real-world welding industry*" (CN)
doi.org/10.1016/j.engappai.2016.10.013

Mechatronics Paper Prize

The Mechatronics Paper Prize is awarded for outstanding contributions to the field of mechatronics documented in a paper published in the IFAC Journal *Mechatronics*. At each IFAC World Congress the prize is awarded to the authors of three selected papers published in the journal in the three years preceding the Congress.

1. Martin Saxinger, Lukas Marko, Andreas Steinboeck, Andreas Kugi: "*Active rejection control for unknown harmonic disturbances of the transverse deflection of steel strips with control input, system output, sensor output, and disturbance input at different positions*" (AT)
doi.org/10.1016/j.mechatronics.2018.10.008

2. Giovanni Cherubini, Angeliki Pantazi, Mark A. Lantz: "*Feedback control of transport systems in tape drives without tension transducers* "(CH)
doi.org/10.1016/j.mechatronics.2018.01.003

3. Stefan Flixeder, Tobias Glück, Andreas Kugi: "*Force-based cooperative handling and lay-up of deformable materials: Mechatronic design, modeling, and control of a demonstrator*" (AT)
doi.org/10.1016/j.mechatronics.2016.10.003

Nonlinear Analysis: Hybrid Systems Paper Prize

Being established in 2015, the Nonlinear Analysis: Hybrid Systems Paper Prize is awarded for outstanding contributions to the field of hybrid systems documented in a paper published in the IFAC Journal *Nonlinear Analysis: Hybrid Systems*. At each IFAC World Congress the prize is awarded to the authors of two selected papers published in the journal in the three years preceding the Congress.

Holicki T., Scherer C.W.: "*Stability analysis and output-feedback synthesis of hybrid systems affected by piecewise constant parameters via dynamic resetting scalings*" (DE)
doi.org/10.1016/j.nahs.2019.06.003

Annual Reviews in Control Paper Prize

Being established in 2019, the Prize is given for outstanding contributions to comprehensive and visionary views of the field of Systems and Control, documented in either a survey article (review papers on main methodologies or technical advances), or a vision article (cutting-edge and emerging topics with visionary perspective on the future of the field or how it will bridge multiple disciplines), or a tutorial article (fundamental guides for future studies) published in the IFAC Journal *Annual Reviews in Control*.

Anton V. Proskurnikov and Roberto Tempo: "*A tutorial on modeling and analysis of dynamic social networks, Part I*" (NL/IT)
doi.org/10.1016/j.arcontrol.2017.03.002

Season's Greetings from the IFAC NEWSLETTER!

Newly-Appointed IFAC Advisors

Kurt Schlacher (AT), Paul Van den Hof (NL), and Janan Zaytoon (FR) were appointed as IFAC Advisors by Immediate Past President Frank Allgöwer, and were honored as such during the online IFAC World Congress 2020. In this issue Newsletter readers have the opportunity to learn more about the people behind these lifetime appointments who were honored for their years of service to the IFAC community.

Kurt Schlacher

Kurt Schlacher (AT), born in 1955 in Graz, Austria, studied electrical engineering from 1973 – 1979 at the Technical University Graz. After completing his compulsory military service he finished his doctoral studies in 1984 at the Technical University Graz, where he received the Venia Docendi (habilitation) in 1990. Since 1992 he is professor for automatic control in the mechatronics group at the Johannes Kepler University (Linz, AT), where he is currently Head of the Institute of Automatic Control and Control Systems Technology and since autumn 2019 Dean of the Faculty of Engineering & Natural Sciences at his university. The faculty is divided into Chemistry and Polymer Engineering, Computer Science, Mathematics, Mechatronics and Physics, where the institutes focus on both base-knowledge and application-oriented research.

K. Schlacher's main theoretic interests are differential geometric methods for advanced modeling and control system design of lumped and distributed parameter systems, Hamiltonian and Lagrangian field theories and flatness. Together with his group he published more than 100 peer-reviewed papers about these topics. But he is also interested in the application of the methods to industrial relevant processes. From 1999 to 2006 he was head of the Christian Doppler Laboratory for Automatic Control of Mechatronic Systems in Steel Industries. The Christian Doppler Research Association promotes the cooperation between science and business.

Since 2008 K. Schlacher has taken part in several excellence programs, where his research was devoted to steel industries, in particular in rolling mills, and to plastic industry, in particular to polymere injection moulding. Currently he is involved in control of stochastic systems for time continuous and discrete systems for the center LCM (since 2018) and in dosage and gravimetric control for extrusion processes for the center Pro2Future (since 2017). Both centers belong to a group of excellence centers of the COMET program, where the Austrian government supports the cooperation between academia and industries in advanced research projects.

In IFAC K. Schlacher received the Outstanding Service Award in 2011 at the IFAC World Congress in Milan (IT). He served as a member of the IFAC Council from 2002-2005 and then from 2005-2020 as IFAC Secretary (and Editor-in-Chief of this Newsletter).

Paul Van den Hof

Paul M.J. Van den Hof was born in Maastricht (NL) in 1957. He received the M.Sc. and Ph.D. degrees in electrical engineering from Eindhoven University of Technology, Eindhoven (NL). In 1986 he moved to Delft University of Technology, where he was appointed as Full Professor in 1999. From 2003 to 2011, he was founding co-director of the Delft Center for Systems and Control (DCSC). From 2005-2015 he was scientific director of the Dutch Institute for Systems and Control (DISC).

As of 2011, he is a Full Professor and heading the Control Systems Group in the Electrical Engineering Department of Eindhoven University of Technology. His research interests include system identification, identification for control, and model-based control and optimization, with applications in industrial process control systems, and high-tech systems. He holds an ERC Advanced Research grant for a research project on identification in dynamic networks. He is also Member of the Scientific Board of the Eindhoven Artificial Intelligence Systems Institute (EAISI).

Paul Van den Hof is an IFAC Fellow and IEEE Fellow, and Honorary Member of the Hungarian Academy of Sciences. He has been a member of the IFAC Council (1999–2005, 2017-2020), the Board of Governors of IEEE Control Systems Society (2003–2005), and an Associate Editor and Editor of *Automatica* (1992–2005). In the triennium 2017-2020 he served as chair of the Executive Board and Vice-President of IFAC. He is married to Irma Van den Hof – Mater and they have two children.

Janan Zaytoon

Born in 1962, Janan Zaytoon (BSc Eng./1983, MSc Eng./1986, DEA/1988, PhD/1993, Habilitation/1997) is a Professor at the University of Reims Champagne-Ardenne (FR). He was President of the International Federation of Automatic Control (IFAC) from 2014 to 2017, and is currently an IFAC Advisor and the Chair of the IFAC Awards Committee. Janan Zaytoon is the Past Director of the French national research network/group "GDR MACS of CNRS" (with 2000 researchers and engineers involved), and the Founder and Past Director of the CReSTIC Research Center at the University of Reims Champagne-Ardenne (150 researchers and PhD students involved). He is currently the Vice-Chair of the IFAC Foundation.

His work is related to the areas of discrete-event systems, hybrid systems, and intelligent control systems. He published and edited 55 books, conference proceedings and special journals issues. He also published 62 journal papers, 128 conference papers, and six patents. He was the advisor of 18 PhD students and five "Habilitations".

J. Zaytoon is the co-founder of the *Nonlinear Analysis: Hybrid Systems* Journal. He moved this journal to the IFAC Publication portfolio after serving as its Editor-in-Chief . He is an Associate Editor of *Control Engineering Practice* and *Discrete Event Dynamic Systems*.

During his term as IFAC President, the 2017 IFAC World Congress was organized in Toulouse, FR and attracted a record of 3463 participants from 68 countries. J. Zaytoon initiated the series of IFAC ADHS Conferences on Analysis & Design of Hybrid Systems, and the series of IFAC CHAOS Conferences on Analysis and Control of Chaotic Systems. He chaired 17 international conferences and 12 national conferences. He chaired the IFAC Technical Committee on Discrete-Event and Hybrid Systems, and received the IFAC Outstanding Service Award and the 2014 Paper Prize of the Journal of Engineering Applications of Artificial Intelligence. He has been an invited plenary speaker for ten international conferences, and invited visitor to ten universities.

J. Zaytoon has also chaired the scientific excellence award committee of the French Ministry of Higher Education and Research. He has been an expert for many institutions, and national and international bodies.

Who's Who in IFAC

IFAC Council Member (Ex-officio) & Diversity & Inclusion Committee Chair: Mary Doyle-Kent

Mary Doyle-Kent (IE) is currently a lecturer and programme leader in Waterford Institute of Technology in Ireland. In the 1990s she graduated from the Technological University of Dublin (DIT) with a Bachelors Degree in Production Engineering, from Trinity College Dublin with a Masters Degree in Mathematics, and from Dublin City University with a Masters Degree in Engineering. Currently she is Candidate of the

Doctoral Programme in Engineering Science in Mechanical Engineering in TU Wien (Technical University of Vienna, Austria) and expects to complete this in early 2021.

M. Doyle-Kent's background is in the manufacturing industry, both in Ireland and in France, working as a new product Engineer and Manager in the automotive, medical device and toy industries for over a decade. As Chair of South East Region of Engineers Ireland, she has been a very active volunteer for over twenty years, promoting engineering as a profession, and in particular, encouraging minority groups such as young women.

Since 2014 M. Doyle-Kent has become an active member in IFAC's TC 9.5- *Technology, Culture and International Stability* (TECIS), and she became Chair of their Diversity and Inclusion working group in 2019. In July 2020 she became Chair of IFAC's Diversity and Inclusion Committee. On a personal note M. Doyle-Kent is married and has three sons, the youngest having special needs, hence her motivation for over two decades to champion inclusion.

IFAC Council Member: Brett Ninness

Brett Ninness (AU) was born in 1963 in Singleton, Australia and received his BE, ME and Ph.D degrees in Electrical Engineering from the University of Newcastle (AU) in 1986, 1991 and 1994 respectively. His research interests are in the areas of system identification and stochastic signal processing, in which he has authored approximately 100 papers in journals and conference proceedings. He has served on the editorial boards of Auomatica, IEEE Transactions on Automatic Control and has served as Editor in Chief for IET Control Theory and Applications.

B. Ninness has served as the joint general chair for the 14th IFAC Symposium on System Identification, held in Newcastle, AU and has also served as the Chair of the IFAC Technical Committee on Modelling, Identification and Signal Processing and the IEEE Technical Committee on System Identification and Adaptive Control. He is currently Pro-Vice Chancellor of the Faculty of Engineering and Built Environment at the University of Newcastle (AU) and Chair of the Go8+ group of Engineering Deans (Australia).

IFAC Journal of Process Control: New Editor-in-Chief

First established in January 1991, the *Journal of Process Control* enters its 30th year in January 2021. The journal became an IFAC affiliated journal in 1995, and it has been an IFAC journal since 2002. The *Journal of Process Control* covers the application of control theory, operations research, computer science and engineering principles to the solution of process control problems, as well as contributions on theory in these areas provided the theoretical contribution is aimed at process control.
Five Editors-in-Chief have marked the history of the Journal. The first Editor-in-Chief was John Perkins from Imperial College (London, UK). Tom McAvoy took over as EiC in 1997. He was replaced by Wolfgang Marquardt in 2009. Denis Dochain followed Wolfgang Marquardt in 2014.

The contribution of Denis Dochain has established the continued leadership of the *Journal of Process Control* in the area of process control and process systems engineering. The editorial board is currently composed of five Subject Editors: Denis Dochain, Chunhui Zhao, Michael Baldea, Gabriele Pannocchia, and Nicolas Petit, as well as the deputy editor-in-chief Juergen Hahn. Their contributions to the quality of the Journal have been stellar.

In the past, the *Journal of Process Control* has published special issues gathering papers from the two events sponsored by TC 6.1 (Chemical Process Control), ADCHEM and DYCOPS, as well as from the World Congresses. The editorial board is committed to continue this tradition. In the meantime, other special issues are in preparation, including a special issue of Production management. Detailed information and updates concerning the *Journal of Process Control* can always be found on the webpage of the journal.

The incoming Editor-in-Chief is Martin Guay. Guay received his PhD from Queen's University (CA) in 1996. He holds a MSc and BSc degree in Chemical Engineering from the University of Ottawa (CA).

M. Guay held a research scientist position at Dupont Canada from 1995 to 1997. M. Guay then joined the University of Alberta (CA) in 1997 as an Assistant Professor before returning to Queen's University in 1999. He is currently a Full Professor in the Department of Chemical Engineering at Queen's University. M. Guay is a Fellow of the Chemical Institute of

Canada. He was the recipient of the Syncrude Innovation award and the D.G. Fisher award from the Canadian Society of Chemical Engineers. He also received the Ontario Premier's Research Excellence Award. His research interests are in the area of nonlinear control systems including extremum-seeking control, model predictive control, adaptive control, and geometric control.

In addition to his new role as Editor-in-Chief of the *Journal of Process Control*, M. Guay is Senior Editor of the *IEEE Control Systems Letters*. He is also associate editor for *Automatica*, IEEE *Transactions on Automatic Control, Canadian Journal of Chemical Engineering* and *Nonlinear Analysis & Hybrid Systems*. He also served as IPC Co-Chair for the 2015 IFAC ADCHEM event.

Submitted by: Martin Guay (CA), *JPC* EiC

14th International Conference on Automatic Control & Soft-Computing (CONTROLO 2020)
1-3 July 2020
Bragança, PT

The 14th International Conference on Automatic Control and Soft-Computing (CONTROLO) took place online, and was organized from Bragança, Portugal from 1- 3 July 2020. Going to a conference is always an opportunity to establish contacts with other researchers and to grow culturally. Often synergies are generated from informal conversations fostered by the conferences social program, leading to new ideas and partnerships. Indeed, networking is a fundamental reason for being present at any conference. Moreover, every time we visit a new country, distinct realities are observed, and a kind of mild acculturation happens. Experiences gathered from travelling shape our vision of the world and promotes cultural enrichment.

CONTROLO 2020 was intended to be not only a scientific event, but also to give the opportunity for the control community to know Bragança, to know the Polytechnic Institute of Bragança and to network face-to-face in a friendly, safe, stimulating and international environment. The city was prepared to receive this scientific community, with a welcome reception at the Castle of Bragança and a gala dinner at the gardens of the Abade de Baçal Museum, providing all of the participants to get in touch with some of the most important landmarks of Bragança's cultural heritage. The ideal situation would be to gather and communicate face-to-face, but due to the current Coronavirus pandemic situation, we were forced to change the CONTROLO 2020 conference to be an online event for 2020.

From a health and security perspective, the benefit of holding the conference online was that it allowed the attendees to avoid crowd contact and effectively prevented virus propagation. Moreover, travel between many coun-

tries was, at the time we wrote this report, was difficult if not impossible. Despite the difficulties the decision to maintain the date of this event proves the resilience of APCA in adapting to extreme conditions. In addition, it was also important in this decision making to ensure that the dissemination of the research and development works, submitted and accepted for publication, would be made public in due time. As mentioned earlier, much was lost with this decision, as a conference is much more than only a meeting aimed at purely scientific matters. Nevertheless, we hope this was a memorable, valuable, and enjoyable experience for all its participants. Even with all the mentioned constraints, all the involved persons and entities gave an energetic response, providing all the necessary support for an event of this dimension, making it real, even during the current difficult times we are all experiencing.

CONTROLO aims to bring together scientists, researchers and engineers in order to promote knowledge sharing and research dissemination across all quadrants of control engineering. This conference was organized under the sponsorship of the Portuguese Association of Automatic Control (APCA), which is the Portuguese National Member Organization (NMO) of the International Federation of Automatic Control (IFAC), and aims to promote scientific information interchange and informal networking in the fields of Automatic Control and Soft-Computing applied to control problems. CONTROLO 2020 hosted a palette of five influential personalities in the automatic control systems design area:

- *"COLIBRI: A Twin Wing Flapping Robot of the Size of a Hummingbird Capable of Hovering"* André Preumont (BE)

- *"On the Control of Solar Thermal Plants"* Eduardo Camacho (ES)

- *"Cyber-Physical Control of Automated Transport Systems and Their Influence On Road Traffic"* Karl H. Johansson (SE)

- *"Can Feedback Control Attenuate Mental Illness?"* Kevin Passino (US)

- *"Fundamentals of Automatic Control: What to Teach? How to Teach it? How to Evaluate What Has Been Learned?"* Sebastián Dormido (ES)

CONTROLO 2020 had the involvement of researchers from 38 countries, five special sessions and a workshop promoted by Math-Works.

Submitted by: José Gonçalves, Manuel Braz-César and João Coelho

IFAC Blog Article
Advanced Control Approach for Early Fault Detection Helps Improve the Structural Design of the Airbus A350 Fleet

Aviation has always been a powerful engine of innovation, and advanced control technologies have been at the forefront of enabling the industry to aggressively pursue performance targets in reliability, safety, efficiency, and environmental impacts. Recently, a new control-enabled advance in onboard fault detection has been developed and is now deployed on the Airbus A350 fleet.

In flight control systems, one of the anomalies to detect is termed the oscillatory failure case (OFC). This failure is an abnormal (small amplitude) oscillation of a control surface due to component malfunction in control surface servo-loops. This signal, of unknown amplitude and frequency, can propagate downstream from the control loop to the control surface (e.g., an aileron, elevator, or rudder), thereby causing vibrations in the airplane structure and producing structural loads that can reach levels incompatible with structural design objectives. There is no impact on the aircraft trajectory and control, but for structural design objectives this fault case must be properly taken into account. In other words, the ability to detect or not the targeted amplitudes can lead to add or to remove structural reinforcement, impacting the aircraft weight. Improving the OFC detection performances can thus lead to optimize the aircraft weight which in turns help decrease the aircraft environmental footprint (e.g., reduced fuel consumption).

The innovation story started earlier than the A350, with the superjumbo A380. Because of the use of new-generation actuators and more stringent load requirements, it was not possible to equip the A380 with legacy OFC detection strategies, which mainly relied on basic signal processing techniques. A basic model-based fault detection and isolation (FDI) approach was developed to cover OFC detection on all control surfaces. This "analytical redundancy" technique produces a fault indicator defined as the difference between the measured control surface position and an estimated position. A nonlinear hydraulic actuator model is used to estimate the position. In the A380 implementation, in order to reduce the computational burden, some model parameters were fixed to their most probable values (e.g., hydraulic pressure, actuator damping coefficient, etc.).

In order to improve this elementary model-based approach and to be compliant with more stringent load requirements (as well as a dedicated flight control system architecture), a joint parameter and state estimation technique has been developed for the A350, in partnership with University of Bordeaux, France. The online physical parameter estimation of the actuator model allows for parameter variations during the aircraft flight and de facto improves the model accuracy. The estimation process is based on a nonlinear local filtering algorithm, based on robust control theory and shaped and adapted to the real-time constraints. The

decision-making step is similar to the one used in the A380, meaning the use of an "incremental approach" suitable for critical embedded systems. The whole strategy allows for smaller fault amplitudes to be detected at an earlier stage compared with conventional systems. As aforementioned, the ultimate benefits include weight saving because of structural design optimization (not being compliant with load objectives would have led to add structural reinforcements).

This new FDI algorithm went through extensive V&V (Validation & Verification) activities, before certification and entering commercial service. The inaugural commercial flight of an A350 aircraft took place on January 15, 2015, between Doha and Frankfurt. The main lessons learnt during this successful story we would like to emphasize here are the following:

In the civil aviation industry, new technologies are only adopted when there is a clear need in terms of cost, performance or operational reliability benefit that cannot be adequately addressed through conventional techniques. In all cases, the level of safety of the aircraft must not be compromised. Introducing structural modifications to the in-service solutions entails risk and may require up to several years of V&V activities and maturation. This is also especially why an incremental approach is often suitable.

- To be assessed as worthwhile and to operate with the aircraft's existing on-board systems, theoretical methods must be adequately shaped and adapted at an early design stage.
- Good average performance is of course necessary but it is by no means sufficient. The critical element is the achievable performance and robustness in extreme, unusual, non-standard and unexpected flight situations.
- A selected few, easy-to-tune, high-level parameters are decisive for the long-term use of an advanced solution during V&V activities.
- A major barrier is the certification of a new technique, particularly if it is structurally different to the in-service solutions. Here, the V&V activities play a crucial role, highlighting the importance of the above point 4.
- Control engineering can enable optimized solutions for critical and performance-sensitive industry sectors such as commercial aviation, provided that researchers expend the time and effort necessary to understand the application domain in depth. In particular, new theoretical paradigms must be adequately shaped and adapted early at the design stage.

This development is the result of a collaboration between the IMS lab, Bordeaux University, France, and the Airbus design office in Toulouse, France. It thus also serves as a case study for successful and impactful industry-academic collaboration.

Authors: Philippe Goupil, Airbus (FR) & Ali Zolghadri, Bordeaux Univ. – CNRS (FR)
http://blog.ifac-control.org/technology/fault-detection/advanced-control-approach-for-early-fault-detection-helps-improve-the-structural-design-of-the-airbus-a350-fleet

IFAC
INTERNATIONAL FEDERATION OF AUTOMATIC CONTROL

Calendar of IFAC Events

Title	2021	Place	Further Information
International Conference on Automation, XXV Congreso de la Asociación Chilena de Control Automático - ICA ACCA 2020	March 22 – 26	ONLINE Chile	https://controlautomatico.org/ica_acca2020/
Conference on American Control Conference (in cooperation with IFAC) ACC 2021	May 26 – 28	New Orleans, LA USA	http://acc2021.a2c2.org/
17th IFAC Symposium on Information Control Problems in Manufacturing INCOM 2021	June 07 – 09	Budapest Hungary	https://incom2021.org/ info@incom2021.org
16th IFAC Symposium on Control in Transportation Systems CTS 2021	June 08 – 10	Lille France	https://cts2021.univ-gustave-eiffel.fr/ cts2021@univ-eiffel.fr
11th IFAC Symposium on Advanced Control of Chemical Processes ADCHEM 2021	June 13 – 16	Venice Italy	https://www.adchem2021.org/ noc@adchem2021.org
Conference on European Control Conference (in cooperation with IFAC) ECC 2021	June/July 29 – 02	Rotterdam Netherlands	https://ecc21.euca-ecc.org/
4th IFAC Conference on Embedded Systems, Computational Intelligence and Telematics in Control CESCIT 2021	July 05 – 07	Valenciennes France	http://www.uphf.fr/cescit2021
7th IFAC Conference on Analysis and Design of Hybrid Systems ADHS 2021	July 07 – 09	Brussels Belgium	https://sites.uclouvain.be/adhs21/
7th IFAC Conference on Nonlinear Model Predictive Control NMPC 2021	July 11 – 14	Bratislava Slovakia	https://www.nmpc2021.org/ martin.klauco@stuba.sk
19th IFAC Symposium on System Identification SYSID 2021	July 14 – 16	Padova Italy	https://www.sysid2021.org/ organizingcommittee@sysid2021.org
4th IFAC Workshop on Linear Parameter Varying Systems LPVS 2021	July 19 – 20	Milan Italy	http://not yet available
6th IFAC Conference on Engine and Powertrain Control, Simulation and Modeling E-COSM 2021	August 23 – 25	Tokyo Japan	http://not yet available
24th International Symposium on Mathematical Theory of Networks and Systems (in cooperation with IFAC) MTNS 2020	August 23 – 27	Cambridge United Kingdom	https://mtns2020.eng.cam.ac.uk/ erd30@eng.cam.ac.uk
13th IFAC Symposium on Robot Control SYROCO 2021	August/Sept. 30 – 02	Matsumoto Japan	https://syroco2021.com/
6th IFAC Workshop on Mining, Mineral and Metal Processing MMM 2021	September 01 – 03	Nancy France	http://mmm2021.cran.univ-lorraine.fr/ mmm-2021@univ-lorraine.fr
20th IFAC Conference on Technology, Culture and International Stability TECIS 2021	September 14 – 17	Moscow Russian Federation	http://www.tecis2021.com/
3rd IFAC Conference on Modelling, Identification and Control of Nonlinear Systems MICNON 2021	September 15 – 17	Tokyo Japan	http://micnon2021.org/
11th IFAC Symposium on Biological and Medical Systems BMS 2021	September 19 – 22	Ghent Belgium	https://bms2021.ugent.be/ bms2021@ugent.be

Calendar of IFAC Events

Title	2021	Place	Further Information
6th IFAC Conference on Analysis and Control of Chaotic Systems CHAOS 2021	September 27 – 29	Catania Italy	http://not yet available
16th IFAC Workshop on Time Delay Systems TDS 2021	Sept./Oct. 29 – 01	Guangzhou China	http://not yet available
Conference on Control Conference Africa (in cooperation with IFAC) CCA 2021	December 07 – 08	Magalies South Africa	http://not yet available

Title	2022	Place	Further Information
Vienna International Conference on Mathematical Modelling MATHMOD 2022	February 16 – 18	Vienna Austria	http://not yet available
ACA, ICROS, SICE, IFAC et al. Conference on Asian Control Conference (in cooperation with IFAC) ASCC 2022	May 04 – 07	Jeju Island Republic of Korea	http://ascc2021.org/
17th IFAC Conference on Programmable Devices and Embedded Systems PDES 2022	May 17 – 19	Sarajevo Bosnia and Herzegovina	http://pdes-conference.eu/ dejan.jokic@ibu.edu.ba
11th IFAC Symposium on Fault Detection, Supervision and Safety for Technical Processes SAFEPROCESS 2022	June 07 – 10	Pafos Cyprus	https://safeprocess2021.eu/
13th IFAC Symposium on Dynamics and Control of Process Systems, including Biosystems DYCOPS 2022	June 14 – 17	Busan Republic of Korea	http://dycops2022.org/ secretariat@dycops2022.org
11th IFAC Symposium on Control of Power and Energy Systems CPES 2022	June 21 – 23	Moscow Russian Federation	https://cpes2021.com/ cpes2021@ipu.ru
10th IFAC Symposium on Robust Control Design ROCOND 2022	August/Sept. 30 – 02	Kyoto Japan	http://rocond21.ee.t.kyoto-u.ac.jp/index.html rocond2021-secretariat@googlegroups.com

> **The IFAC Calendar of Events is constantly updated as addditional technical events (Workshops, Symposia, and Conferences) are approved. Due to the Covid-19 pandemic some events have had date changes, cancellations, etc. since their initial approval. Please check back often for the current status. The complete version of the IFAC Calendar of Events is available online at:**
> https://www.ifac-control.org/events/

(To our readers: To comply with the Austrian 'Media Act', every publication must contain a declaration once a year concerning ownership and purpose, as below.)

Bundesministerium
Klimaschutz, Umwelt,
Energie, Mobilität,
Innovation und Technologie