50 Years of Dissipativity Theory, Part I

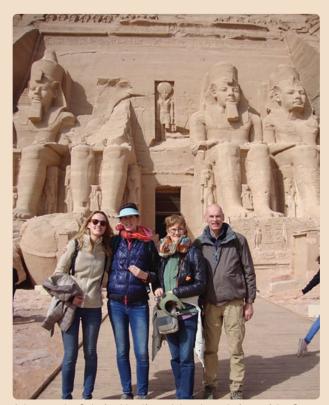
his IEEE Control Systems issue celebrates the 50th anniversary of the publication of Jan Willems' two publications laying the foundations of dissipativity theory. "From the Editor" elaborates on reasons to celebrate this event. Guest Editor Arjan van der Schaft has assembled six articles for the first special issue

Digital Object Identifier 10.1109/MCS.2021.3139547 Date of current version: 24 March 2022 devoted to the first part of the dissipativity article: "Compositional Design and Verification of Large-Scale Systems Using Dissipativity Theory," by Murat Arcak; "Passivity-Based Control of Robots," by Nikhil Chopra, Masayuki Fujita, Romeo Ortega, and Mark Spong; "Dissipativity and Optimal Control," by Lars Grüne; "Dissipativity, Stability, and Connections: Progress in Complexity," by David Hill and Tao Liu; "Interconnection

and Approximation in Networks of Dissipative Systems," by Siep Weiland and Xiaodong Cheng; and "Passivity Measures in Cyberphysical Systems Design," by Hasan Zakeri and Panos Antsaklis. The six articles are described in the introductory article by Guest Editor Arjan van der Schaft.

"Applications of Control" features "Swinging a Playground Swing," by Sergiy Koshkin and Vojin Jovanovic. Models of a playground swing have

Contributors



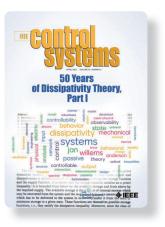
Arjan van der Schaft with wife and daughters in front of the Great Temple of Abu Simbel, Egypt.



Masayuki and Mitsuko Fujita. Mitsuko is adorned in traditional Japanese clothing.

been studied since the 1960s. However, in most of them, the position of the swinger is controlled directly. This simplifies the problem but hides the mechanics of torques applied to keep the swing swinging in a regular pattern. The two models considered in the present article are identical to popular models

of modern robotics: the Acrobot and the reaction wheel pendulum. However, the control task of sustaining the swing's regular oscillations by a static feedback control is new and challenging, especially when damping in the joint connecting the swing to the frame is considered. The authors develop two



accomplish this task. One works for small damping and is based on linearizing the undamped system by a suitable preliminary feedback control. The other works for large damping. In the steady state, the resulting closed-loop system describes a harmonically driven damped

types of controls to

pendulum, a simple system known for its complex behavior, including chaotic motion for some parameter values. Control parameters are adjusted based on simulations to achieve the regular oscillations seen on playgrounds. In his "Presidential Message," Thomas Parisini invites Dr. Robert Shorten

(professor of cyber-physical systems design at Imperial College London) to share his views on the field in an article titled "Why We Do What We Do." In "Membership Activities," Marika Di Benedetto invites the winners of the 2019 and 2020 Outstanding Chapter Awards (David Banjerdpongchai, chair of the Thailand Chapter and Levent Kovacs, chair of the Hungary Chapter) to report on the activities of their respective chapters. "People in Control" includes interviews with Travis E. Gibson (instructor of pathology at Brigham and Women's Hospital and Harvard Medical School), Andrew Lamperski (assistant professor of electrical and computer engineering at the University of Minnesota), Rifat Sipahi (professor at Northeastern University in Boston), and Tansel Yucelen (associate professor of the mechanical engineering



Murat Arcak enjoying the asparagus season with his host, Frank Allgower, in Stuttgart, Germany.



Lars Grüne



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Nikhil Chopra on the beach in Ocean City, Maryland.

at the University of South Florida). "Technical Activities" provides an update from Yoshio Ebihara on the IEEE Technical Committee on Robust and Complex Systems. "Conference Reports" includes a preview of the

2022 Control and Decision Conference (CDC2022) and a report on the 2021 Society for Industrial and Applied Mathematics (SIAM) Conference on Control and Its Applications (CT21), which was held online from July

19–21, 2021 under the umbrella of the SIAM Annual Meeting. The "Awards" column presents the 2021 recipients of the Control Systems Awards presented at the Annual Awards Ceremony of the IEEE Control Systems Society



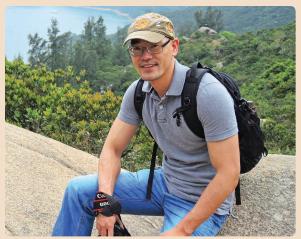
Romeo Ortega and family visiting the pyramids of Giza, Egypt.



David Hill in early morning with dogs at famous Three Sisters in the Blue Mountains.



Mark Spong at the top of Waynapicchu Mountain with Machu Picchu far below.



Tao Liu hacking at Dragon's Back Trail in Hong Kong.

(CSS) during the 60th IEEE Conference on Decision and Control. The "25 Years Ago" article revisits "Control Education: A World ShowCase," by J. Jim Zhu, guest editor of a special issue on control education. "Conference

Calendar" lists upcoming conferences sponsored or cosponsored by the IEEE CSS. "Book Announcements" provides summaries of books recently published in the control field. "Book Reviews" provides a discussion by K. G. Vamvoudakis of the book *A Dynamical Systems Theory of Thermodynamics*, authored by Wassim M. Haddad.

Rodolphe Sepulchre

