Women in Control Webinar at the American Control Conference 2021

he Women in Control networking event at the 2021 American Control Conference (ACC) was held as a webinar on Tuesday, May 25, 2021. The theme of the webinar was diversity and inclusion (D&I), and it featured two inspiring speakers with a wealth of knowledge and experience in these areas: Susan K. (Kathy) Land, 2021 IEEE president and CEO, and Dr. Bonnie Ferri, vice provost at the Georgia Institute of Technology.

Land's presentation, "The IEEE, You, and Women's Empowerment," defined women's empowerment as "providing women the equal freedom and opportunity to make their own choices—without negative consequence." Her talk framed the global issues surrounding this topic. She then shared the IEEE Diversity Statement adopted by the IEEE Board of Directors in November 2019, which emphasizes the ongoing commitment of IEEE

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he presence of women in science, technology, engineering, and mathematics (STEM) is still very limited, from higher education to different levels of professional careers, worldwide. The IEEE Control Systems Society (CSS) is no exception, and, at present, there is an ever-growing endeavor to curb this problem. Women in Control (WiC) was founded in 1994 and has dedicated tireless efforts to promoting women memberships and facilitating the development of programs to promote the recruitment and growth of women CSS members. In this column, Afef Fekih, Dennice Gayme, and Bozenna Pasik-Duncan illustrate one of the very successful WiC events they organized at the 2021 American Control Conference.

Let me seize this opportunity to highlight the series of seminars organized by IEEE Women in Engineering, Extraordinary Women Extraordinary Science, as a seminal moment of inspiration for women and young researchers interested in STEM. Let's participate as CSS with our "extraordinary women"!

Maria Domenica Di Benedetto

Vice President, Membership Activities

toward facilitating this goal. The statement reads, "IEEE's mission to foster technological innovation and excellence to benefit humanity requires the talents and perspectives of people with different personal, cultural, and disciplinary backgrounds. IEEE is committed to advancing

diversity in the technical profession and promoting an inclusive and equitable culture that welcomes, engages, and rewards all who contribute to the field, without regard to race, religion, gender, disability, age, national origin, sexual orientation, gender identity, or gender expression."



Logo for the American Control Conference 2021.



Susan K. (Kathy) Land, 2021 IEEE president and CEO.



Dr. Bonnie Ferri, vice provost, Georgia Institute of Technology.

She stressed the importance of D&I for IEEE and shared IEEE's current initiatives to ensure leadership and engagement in promoting diversity expressed in this statement. These activities include the establishment of the IEEE Board Committee on Diversity, Inclusion, and Professional Ethics in 2019; the approval of a chair-elect committee position to the IEEE Women in Engineering Committee; and the upcoming IEEE D&I website, which will showcase best practices, provide education, and highlight D&I throughout IEEE and across our professions.

Ferri's presentation, "Hiring and Supporting a Diverse Faculty," explored some of the issues, challenges, and opportunities for hiring and supporting faculty from diverse groups in science, technology, and engineering disciplines. In particular, she highlighted the policies, practices, and programs that support a healthy and productive culture among a diverse population. She focused on the importance of defining the priorities of an organization and then ensuring that the evaluation criteria for advancement and success in it reflect those priorities. This led to a discussion of how changing promotion

and career advancement processes to reflect D&I as a core value might make academia more appealing to a more diverse group. She then elaborated on the contributions that professional societies can make to support success and what each of us can do individually to support diversity, equity, and inclusion in the faculty ranks.

The event was very well attended, with a maximum audience of 50 attendees. The talks were inspiring, motivational, and engaging. Both speakers pointed to concrete actions that each

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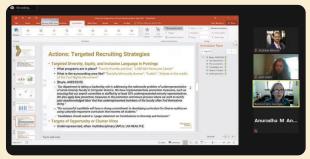












Snapshots from the webinar.

interests include identification, estimation, and control for aerospace applications. He is the author of Scalar, Vector, and Matrix Mathematics (Princeton University Press).

REFERENCES

- [1] J. B. Hoagg and D. S. Bernstein, "Nonminimum-phase zeros Much to do about nothing - Classical control - Revisited part II," IEEE Control Syst. Mag., vol. 27, no. 3, pp. 45-57, 2007, doi: 10.1109/MCS.2007.365003.
- [2] J. B. Hoagg, J. Chandrasekar, and D. S. Bernstein, "On the zeros, initial undershoot, and relative degree of collinear lumped-parameter structures," J. Dyn. Syst. Meas. Contr., vol. 129, no. 4, pp. 493–502, 2007, doi: 10.1115/1.2719764.
- [3] M. M. Seron, J. H. Braslavsky, and G. C. Goodwin, Fundamental Limitations in Filtering and Control. London, U.K.: Springer Nature Switzerland AG, 2012. [4] T. Mita and H. Yoshida, "Undershooting phenomenon and its control in linear multivariable servomechanisms," IEEE Trans. Autom. Control, vol. 26, no. 2, pp. 402-407, 1981, doi: 10.1109/TAC.1981.1102601.
- [5] T. Norimatsu, "On the zero non-regular control system," JIEE, vol. 81, no. 871, pp. 566-575, 1961.
- [6] H. H. Rosenbrock, State-Space and Multivariable Theory. Camden, NJ, USA: Nelson, 1970.
- [7] B. R. Holt and M. Morari, "Design of resilient processing plants-VI. The effect of right-half-plane zeros on dynamic resilience," Chem. Eng. Sci., vol. 40, no. 1, pp. 59-74, 1985, doi: 10.1016/0009-2509(85)85047-8.
- [8] M. Vidyasagar, "On undershoot and nonminimum phase zeros," IEEE Trans. Autom. Control, vol. 31, no. 5, pp. 440-440, 1986, doi: 10.1109/ TAC.1986.1104289.
- [9] S. B. A. Leon de la Barra, "On undershoot in SISO systems," IEEE Trans. Autom. Control, vol. 39, no. 3, pp. 578-581, 1994, doi: 10.1109/9.280763.
- [10] K. Lau, R. H. Middleton, and J. H. Braslavsky, "Undershoot and settling time tradeoffs for nonminimum phase systems," IEEE Trans. Autom. Control, vol. 48, no. 8, pp. 1389-1393, 2003, doi: 10.1109/TAC.2003.815025.
- [11] J. Stewart and D. E. Davison, "On overshoot and nonminimum phase zeros," IEEE Trans. Autom. Control, vol. 51, no. 8, pp. 1378-1382, 2006, doi: 10.1109/TAC.2006.878745.
- [12] K. Iinoya and R. J. Altpeter, "Inverse response in process control," Ind. Eng. Chem., vol. 54, no. 7, pp. 39-43, 1962, doi: 10.1021/ie50631a007.

- [13] K. V. Waller and C. Nygardas, "On inverse response in process control," Ind. Eng. Chem. Fundam., vol. 14, no. 3, pp. 221-223, 1975, doi: 10.1021/i160055a014.
- [14] L. H. McWilliams and M. K. Sain, "Qualitative features of discrete-time system responses," in Proc. Conf. Decis. Contr., 1994, pp. 18-23, doi: 10.1109/ CDC.1994.411053.
- [15] B. L. De La Barra, M. El-Khoury, and M. Fernández, "On undershoot in scalar discrete-time systems," Automatica, vol. 32, no. 2, pp. 255-259, 1996, doi: 10.1016/0005-1098(96)85556-7.
- [16] K. J. Astrom, P. Hagander, and J. Sternby, "Zeros of sampled systems," Automatica, vol. 20, no. 1, pp. 31-38, 1984, doi: 10.1016/0005-1098(84)90062-1.
- [17] K. J. Astrom and B. Wittenmark, Computer-Controlled Systems: Theory and Design. North Chelmsford, MA, USA: Courier Corporation, 2013.
- [18] S. R. Weller, W. Moran, B. Ninness, and A. Pollington, "Sampling zeros and the Euler-Frobenius polynomials," IEEE Trans. Autom. Control, vol. 46, no. 2, pp. 340-343, 2001, doi: 10.1109/9.905706.
- [19] M. J. Maciejowski, "Right-half plane zeros are not necessary for inverse response," in Proc. Eur. Contr. Conf., 2018, pp. 2488–2492, doi: 10.23919/ ECC.2018.8550187.
- [20] G. F. Franklin, M. Workman, and D. J. Powell, Digital Control of Dynamic Systems. London, U.K.: Pearson Education, 2005.
- [21] J. Chen, K. H. Lundberg, D. E. Davison, and D. S. Bernstein, "The final value theorem revisited-Infinite limits and irrational functions," IEEE Control Syst. Mag., vol. 27, no. 3, pp. 97-99, 2007, doi: 10.1109/MCS. 2007.365008.
- [22] G. F. Franklin, J. D. Powell, and A. Emami-Naeini, Feedback Control of Dynamic Systems. Englewood Cliffs, NJ, USA: Prentice-Hall, 2014.
- [23] A. V. Morozov, J. B. Hoagg, and D. S. Bernstein, "Retrospective cost adap $tive \, control \, of \, a \, planar \, multilink \, arm \, with \, nonminimum-phase \, zeros, "in {\it Proc.} \,$ IEEE Conf. Decis. Contr., 2010, pp. 3706–3711, doi: 10.1109/CDC.2010.5718121.
- [24] T. Damm and L. N. Muhirwa, "Zero crossings, overshoot and initial undershoot in the step and impulse responses of linear systems," IEEE Trans. Autom. Control, vol. 59, no. 7, pp. 1925-1929, 2013, doi: 10.1109/ TAC.2013.2294616.
- [25] C. H. Houpis and G. B. Lamont, Digital Control Systems. New York, NY, USA: McGraw-Hill, 1991.
- [26] S. Skogestad and I. Postlethwaite, Multivariable Feedback Control: Analysis and Design, 2nd ed. Hoboken, NJ, USA: Wiley, 2007.



MEMBER ACTIVITIES (continued from p. 16)

of us can take now to increase diversity and build a more inclusive environment. The discussions that followed were very interesting and simulating, and they were a good starting point for more conversations and actions about diversity, inclusion, women empowerment, and the crucial role of technical societies in shaping the future and increasing the visibility and impact of a diverse community.

The webinar was the result of great teamwork. It was widely advertised on the Women in Control webpage and social media accounts, IEEE Control Systems Society (CSS) Twitter account, and ACC conference website. It attracted 48 attendees, including Dr. Thomas Parisini, CSS president; Dr. Anuradha Annaswamy, CSS past president; Dr. Jay Farrell, president of the American Automatic Control Council (AACC); Dr. Maria Domenica Di Benedetto, IEEE CSS vice president of Member Activities; and Dr. George Chiu, ACC2021 general chair.

We are grateful for the speakers who volunteered their time and expertise to engage the attendees in a crucial topic and support this event. We are also grateful for the CSS and AACC support for Women in Control activities. To stay up to date and follow our upcoming events, you are cordially invited to join us on our webpage (http://ieeecss.org/member -activities/women-control), LinkedIn (https://www.linkedin.com/groups/ 5090839/), and Facebook (https:// www.facebook.com/groups/CSS .WiC/) accounts.

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