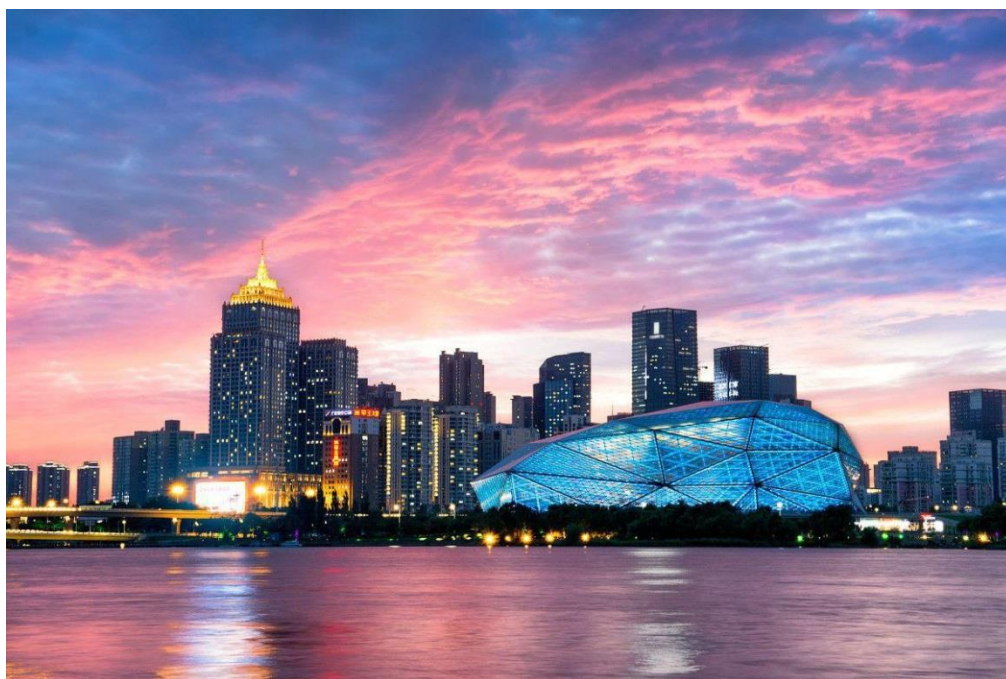




The 6th International Conference on Industrial Artificial Intelligence (IAI 2024)

23-24 August, 2024, Shenyang, China



Conference Program



Plenary Talk 3. PID Control with Intelligent Compensation

08:30-09:30 August 24, 2024

Building 1, Ying Bin Hall

Zoom Meeting ID: 865 0514 6506

Password: 817780

Speaker: Prof. Wen Yu

Chair: Prof. Chun-Yi Su

Abstract: Proportional-Integral-Derivative (PID) control has been widely used for regulating industrial processes. But its integral term can slow down the system's response (reduced bandwidth) and even lead to instability. This talk explores how to enhance PID control with intelligent compensation techniques. "PID Control with intelligent compensation" means a PID controller with an extra layer of intelligence. This 'intelligent' part utilizes machine learning techniques like neural networks or fuzzy logic. These data-driven compensators learn the system's non-linearities and disturbances without requiring a complex mathematical model. This is a significant advantage compared to traditional model-based compensation, which can be time-consuming and challenging to implement. The talk will delve into specific examples of designing neural and fuzzy logic compensators for PD control. These intelligent techniques can significantly reduce reliance on the integrator term in PID control. This not only improves the system's responsiveness but also allows for more flexibility in choosing the PID gains. We'll explore how Lyapunov stability analysis, a powerful mathematical tool, ensures the system remains stable even with reduced integrator action. Combining the strengths of traditional PID control with intelligent compensation can lead to faster response times, improved tracking accuracy, and greater robustness to disturbances in industrial processes.

Biography:



Prof. Wen Yu received the B.S. degree in automation from Tsinghua University, Beijing, China in 1990 and the M.S. and Ph.D. degrees, both in automatic control, from Northeastern University, Shenyang, China, in 1992 and 1995, respectively. From 1995 to 1996, he served as a lecturer in the Department of Automatic Control at Northeastern University, Shenyang, China. Since 1996, he has been with CINVESTAV-IPN (National Polytechnic Institute), Mexico City, Mexico, where he is currently a professor with the Departamento de Control Automático.

From 2002 to 2003, he held research positions with the Instituto Mexicano del Petróleo. He was a Senior Visiting Research Fellow with Queen's University Belfast, Belfast, U.K., from 2006 to 2007, and a Visiting Professor with the University of California, Santa Cruz, from 2009 to 2010. He also holds a visiting professorship at Northeastern University in China from 2006.

He holds the distinguished position of Full Professor (Investigador Cinvestav 3F) at CINVESTAV-IPN in Mexico City, Mexico. He is a member of the Mexican Academy of Sciences. He currently has more than 500 publications, including more than 200 journal papers and 8 monographic books. He has supervised 38 PhD theses and 40 Master theses. His publications currently report more than 11,200 citations and his h-index is 52 according to Google Scholar. He is among the top 2% of the most-cited scientists in the world (Stanford/Elsevier, 2023). On Research.com's list of World's Best Scientists, in Electronics and Electrical Engineering as well as Computer Science, he holds the 6th position and 5th position in Mexico. He was the General Chair of the IEEE flagship annual meeting SSCI 2023. He serves as associate editors of IEEE Transactions on Cybernetics, IEEE Transactions on Neural Networks and Learning Systems, Neurocomputing and Journal of Intelligent and Fuzzy Systems.