

Closed-Loop Control of Total Intravenous Anesthesia

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Abstract: Engineering tools can be helpful for clinical anesthesiologists to maintain optimal safety and efficiency. Among these tools, closed-loop control of total intravenous anesthesia has attracted a lot of research interest in the last decades. In this talk, I will present an overview of some proposed methods and achieved results of the ACTIVA (Automatic Control of Total IntraVenous Anesthesia) project, which has been developed as a cooperation between the University of Brescia and the Brescia Hospital in Italy. The aim is to control the depth of hypnosis, measured through the BIS signal, obtained by co-administering propofol (hypnotic drug) and remifentanyl (analgesic drug). Practical issues in the design as well as in the implementation of the controller will be discussed, showing that the system may have practical application in daily practice contributing to a higher patient safety during surgical anesthesia.



Bio: He received the Laurea degree in Electronic Engineering from the University of Parma in 1995, discussing a Master Thesis about surfaces recognition through learning of ultrasonic echoes for mobile robot navigation. From September 1994 to February 1995 he was an ERASMUS student at the Electrical and Electronic Department of the Loughborough University of Technology (now Loughborough University), UK. From September 1995 to November 2012 he was with the Department of Information Engineering (formerly, Department of Electronics for Automation) of the Faculty of Engineering of the University of Brescia. In 1999 he received the Ph.D. degree in Applied Mechanics from the University of Brescia, discussing a Ph.D. thesis entitled "Control strategies for industrial robot manipulators".

Currently he holds a full professor position in Control Systems at the Department of Mechanical and Industrial Engineering of the University of Brescia. He is a senior member of IEEE, the chair of the IFAC Technical Committee on Education, a member of the Technical Committee on Education of the IEEE Control Systems Society, the secretary of the subcommittee on Industrial Automated Systems and Control of the IEEE Industrial Electronics Society Technical Committee on Factory Automation.

He served as general chair of the IFAC Conference on Advances in PID Control (Brescia, 2012) and of the IFAC Workshop on Internet Based Control Education (Brescia, 2015). He has served as IPC chair of the Second, Third and Fourth Edition of the International Conference on Event Based Control, Communication and Signal Processing (Krakow 2016, Funchal 2017 and Perpignan 2018). He has been also the IPC chair of the IFAC Conference on Advances in PID Control (Gent, 2018) and the IPC co-chair of the IFAC Symposium on Advances in Control Education (Philadelphia, 2019). He is the IPC chair of the IFAC Symposium on Advances in Control Education (Hamburg, 2022) and of the IEEE International Conference on Emerging Technologies and Factory Automation (Stuttgart, 2022). He has also served as IPC member of many international conferences.

He is Specialty Chief Editor of the Control and Automation Systems section of *Frontiers in Control Engineering*, Technical Editor for *IEEE/ASME Transactions on Mechatronics*, associate editor of *IET – Journal of Engineering*, associate editor of *Proceedings of the IMechE Part I: Journal of Systems & Control Engineering*, and associate editor of *IFAC-PapersOnLine*.

He has participated to many national and international research projects. In particular, he was the UNIBS coordinator in the I-MECH project "Intelligent Motion Control Platform for Smart Mechatronic Systems", funded by the ECSEL JU.

His research interests include industrial controllers, mechatronics, dynamic inversion based control, fractional control, anesthesia control.