Flexible Electronic Systems (FES) Technical Committee

The rapid advancement in Flexible Electronic Systems (FES) and other related technologies have led to the emergence of flexible and intelligent sensing systems as a highly promising multidisciplinary field. Flexible electronics are electronic systems that are soft, flexible, foldable, warping, bending, thin, etc. This field brings together researchers from various areas, including computer science, electrical engineering, and materials science, and has a wide range of applications in fields such as environmental monitoring, healthcare, agriculture, transportation, and security. As the significance of these systems continues to increase, it is crucial to establish a dedicated technical committee to focus on the development and advancement of these systems in order to further the understanding and capabilities of flexible electronics in various fields of study.

This committee will bring together experts in flexible electronics, materials science, and related fields to collaborate and advance the understanding and capabilities of flexible and intelligent sensing systems. One of the key advantages of these systems is their ability to integrate data from multiple sources, such as flexible sensors, cameras, and other flexible electronics, to extract valuable insights. This ability has led to the development of numerous applications in fields such as medicine and biology, where flexible and intelligent sensing systems have the potential to revolutionize the way we understand and interact with the world around us.

The technical committee aims to bring together experts from academia, industry, and researchers to discuss and advance the state-of-the-art in flexible and intelligent sensing systems. The committee will cover a range of topics, including advanced materials, machine learning and artificial intelligence, sensor technologies, data processing and analysis, and applications of these systems in various fields. By holding regular meetings and discussions, the committee will provide a platform for exchanging ideas and knowledge, fostering collaboration and networking, and promoting the development of new technologies and applications in the field of FES.

The approach to flexible and intelligent sensing systems is particularly interesting because it aims at three main goals: 1) Leveraging advanced materials, flexible electronics, and intelligent perception technologies to create flexible and intelligent sensing systems with a wide range of applications, in order to advance the state of the art; 2) Strengthening the collaboration between researchers in various fields, including computer science, electrical engineering, and materials science, in order to advance the understanding and capabilities of these systems; and 3) Enabling the development of advanced perception and action behaviors in a wide range of fields, including environmental monitoring, healthcare, agriculture, transportation, and security. Additionally, it also focuses on the manufacturing of flexible sensors and the research of smart materials, as well as the corresponding signal processing technology based on smart materials and flexible sensors.

The increasing interest in this kind of research is evident in the strong growth of activity in:

- Flexible electronic systems for advanced sensor technology
- Novel materials for sensing systems
- Multi-sensor data fusion and intelligent sensor fusion
- Soft, skin-like electronic and bionic sensors
- Intelligent monitoring with advanced materials
- Flexible electronics for intelligent recognition

- Computational intelligence in sensing
- Advanced material study in flexible and stretchable sensors
- Intelligent materials and systems for novel devices
- Intelligent sensing for the Internet of Things (IoT) and Industry 4.0
- Advanced materials for flexible sensor fabrication
- Novel fabrication techniques for advanced material-based sensors
- Flexible and biocompatible sensors for medical diagnostics and vital sign monitoring
- Computational intelligence for sensing in fields such as healthcare, environment, agriculture, transportation

Despite the significant progress that has been made in the field of FES over the past few decades, there are still many challenges that need to be addressed in order to fully realize the potential of these systems. These challenges include issues related to data processing, machine learning, and the integration of FES with other technologies. In order to continue advancing the state of the art in FES, it is necessary to bring together experts from academia, industry, and researchers to share ideas and knowledge, and to collaborate on the development of new technologies and applications.

Mission and Vision

The mission of the FES TC is to provide an entity within the IEEE for flexible electronics researchers, engineers, and practitioners interested in promoting flexible electronics as a research domain. The FES TC will support the organization of conferences, special sessions, special journal issues learning materials, best practices, tutorials, sessions, webinars, and other educational resources related to FES systems. The TC will be involved in international standardization efforts and be a source of professional knowledge on state-of-the-art best practices and trends in FES, with the objective of becoming a center of excellence in FES and related concerns. Furthermore, our goal is to stimulate the growth of this specific TC within the SMCS in order to get more members interested in the activities and to benefit from IEEE membership.

The IEEE Systems, Man, and Cybernetics (SMC) Technical Committee (TC) on flexible electronics is formed with the goal of providing a forum and dissemination mechanism for the interplay between flexible electronics and presenting sensing intelligence as a learning tool for novel engineering paradigms. The Flexible Electronics Committee (FES-TC) strives to maintain SMC's leadership position in the research of sensing systems and design, providing strategic support to SMC members active in intelligent sensing system research, and serving as a link between members of the FES-TC and other technical committees within the IEEE SMC Society.

Proposed Scope

The scope of the research covers broad technical fields related to the latest technologies, new research results, and developments in the area of FES on all levels, from developments in core enabling technologies to advanced materials, intelligent sensing, development and cognition in developed artificial systems and applications. It provides a platform for like-minded researchers to present their findings and the latest developments of intelligent flexible sensing, covering relevant advances in engineering, computing, arts, and artificial intelligence. Interests include, but are not limited to:

- Flexible electronics and sensor technology
- Novel materials for sensing systems
- Multi-sensor data fusion and intelligent sensor fusion
- Soft, skin-like electronics and bionic sensors

- Intelligent monitoring with advanced materials
- Flexible electronics for intelligent recognition
- Advanced material study in flexible and stretchable sensors
- Intelligent materials and systems for novel devices
- Intelligent sensing for the Internet of Things (IoT) and Industry 4.0
- Advanced materials for flexible sensor fabrication
- New sensor technologies and their applications in FES
- Machine learning and data analysis techniques for FES
- Decision-making algorithms and methods for FES
- Communication and networking technologies for FES
- Cybersecurity for FES
- Real-world applications of FES, including case studies and demonstrations
- Advancements and challenges in the field of FES
- The future of FES and emerging trends in the field.
- Fault detection, identification, and optimization of sensing systems

The TC on FES will endeavor to foster research, development, training, and dissemination of the art and science of flexible electronics.

TC Chair and Co-Chairs

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Haisheng Xia (Member, IEEE) received his B.E. in Mechatronics Engineering from Northwest A&F University in 2014 and Ph.D. degree in Mechanical Engineering from Shanghai Jiao Tong University in 2020. From Mar. 2019 to Jun. 2019, he was a visiting scholar at the University of British Columbia, and from Aug. 2019 to Mar. 2020, he was a visiting scholar at Seoul National University. From Jul. 2020 to Apr. 2022, he was a postdoc research fellow in the Department of Automation, University of Science and Technology of China. He is currently an associate professor at the Institute of Artificial Intelligence, Hefei Comprehensive National Science Center. He is a member of the IEEE-RAS Technical Committee on Neuro-Robotics Systems. He has served as a guest editor of IEEE SMC Magazine, and Robotica. He served as an associate editor of the IEEE International Conference on Advanced Robotics and Mechatronics (ICARM 2021/2022/2023), the Registration Chair of ICARM 2021, the Session Chair of ICARM 2022, the Registration Chair of IEEE International Conference on Development and Learning (ICDL 2023). He has authored more than 30 papers in international journals and conferences, 8 invention patents, and directed 7 national/provincial research projects. He was a recipient of the Silver Medal at the International Exhibition of Inventions Geneva (2023), Best Conference Paper Finalist at the ICARM 2021, and the OARSI Collaborative Scholarship Award (2018). His research interests mainly include wearable robotics and wearable systems.

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Jonathan M. Garibaldi (Fellow, IEEE) received the B.Sc (Hons) degree in Physics from Bristol University, UK in 1984, and the M.Sc. degree in Intelligent Systems and the Ph.D. degree in Uncertainty Handling in Immediate Neonatal Assessment from the University of Plymouth, UK in 1990 and 1997, respectively. He is Head of the School of Computer Science at the University of Nottingham, UK, and leads the Intelligent Modelling and Analysis (IMA) Research Group. The IMA research group undertakes research

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Guanglin Li (Senior Member, IEEE) received the Ph.D. degree in biomedical engineering from Zhejiang University, China, in 1997. From 1999 to 2002, he was a Post-Doctoral Research Associate with the Department of Bioengineering at the University of Illinois at Chicago. From 2002 to 2006, he was a Senior Engineer with the BioTechPlex Corporation, where he was involved in the research and development of the biomedical and biological products. From 2006 to 2009, he served as a Senior Research Scientist in the Neural Engineering Center for Artificial Limbs at the Rehabilitation Institute of Chicago, and jointly served as an Assistant Professor of Physical Medicine and Rehabilitation, at the Northwestern University. Since 2009, he has been with the Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences (CAS), and is currently the Professor and Director of the Research Center for Neural Engineering. And he also has served as the Director of the CAS Key Laboratory of Human-Machine Intelligence-Synergy Systems since 2014. He has authored over 230 peer-reviewed papers and filed over 110 patents in the field of the biomedical engineering and rehabilitation engineering. His current research interests include flexible sensing technologies, neuro-rehabilitation engineering, human-machine interaction, rehabilitation robotics, and neural functional reconstructions.

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Zhijun Li (Fellow, IEEE) is currently a Chair Professor of University of Science and Technology, China, where he has been the Vice Dean of the School of Information Science and Technology since 2019. He received the Ph.D. degree in mechatronics from Shanghai Jiao Tong University, Shanghai, China, in 2002. From 2003 to 2006, he was a Postdoctoral Fellow at the University of Electro-Communications, Tokyo, Japan, and the National University of Singapore, Singapore. He has published over 400 papers, where the prestigious contributions were wearable robotics and bio-mechatronics systems. He has received the Distinguished Lecturer (RAS), the Web of Science Highly Cited Researcher (2019-2022), the 2018 National Ten-thousand Talents Program in China, and the 2016 National Distinguished Young Scholar (NSFC). He is an IEEE Fellow and AAIA Fellow. He is a Member of Board of Governors, IEEE Systems, Man and Cybernetics Society (2023-2025). Since 2016, he has been the Co-Chairs of IEEE SMC Technical Committee on Bio-mechatronics and Bio-robotics Systems (B^2S), and IEEE-RAS Technical Committee on Neuro-Robotics Systems. He has served as Senior Editors of IEEE Transactions on Automation Science and Engineering and Journal of Intelligent & Robotic Systems, and Associate Editors of several IEEE Transactions including TRO, TFS, TNNLS, TASE, TMech, TCyber, TCDS, TSMCS, etc..