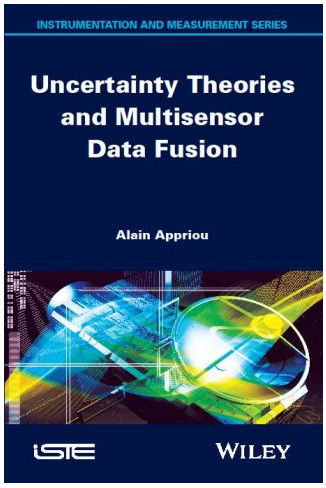

Uncertainty Theories and Multisensor Data Fusion

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Description

Combining multiple sensors in order to better grasp a tricky, or even critical, situation is an innate human reflex. Indeed, humans became aware, very early on, of the need to combine several of our senses so as to acquire a better understanding of our surroundings when major issues are at stake. On the basis of this need, we have naturally sought to equip ourselves with various kinds of artificial sensors to enhance our perceptive faculties. The association of multiple heterogeneous sensors provides a reliable and efficient situation assessment in difficult operational contexts, but imperfect local observations need to be managed in a suitable way (uncertainty, imprecision, incompleteness, unreliability, etc.). The theories of uncertainty make it possible to benefit from such information, but the implementation of these theories requires specific developments to meet the needs of multisensor data fusion.
This book first discusses basic questions such as: Why and when is multiple sensor fusion necessary? How can the available measurements be characterized in such a case? What is the purpose and the specificity of information fusion processing in multiple sensor systems? Considering the different uncertainty formalisms (probability, fuzzy set theory, possibility theory, belief function theory), a set of coherent operators corresponding to the different steps of a complete fusion process is then developed, in order to meet the requirements identified in the first part of the book. Furthermore, the implementation of these operators is illustrated and discussed within the framework of generic applications.

About the Author

Alain Appriou is Research Director at ONERA, the French Aerospace Lab. He is an Emeritus Member of the SEE (French Scientific Society for Electricity and Electronics), and received the Médaille Ampère. He is currently the Deputy Director of the General Scientific Directorate at ONERA, and the Vice-President of the SEE in charge of its Technical Panels. He has previously been responsible for research concerning signal, image, and information processing, complex system development, computing methods, radar techniques, navigation, and guidance. He now coordinates aerospace research. His main personal scientific contribution concerns on the one hand data fusion and signal processing for sensor systems, and on the other hand theoretical developments for uncertainty theories.