Special Issue on Sensor Fusion and Environment Perception for Autonomous Systems

Preface

Autonomous systems such as robots usually demonstrate humanlike intelligence to represent, reason about, and interpret data for various applications. Sensor fusion is an important method by which autonomous systems acquire reliable and comprehensive internal and external information for enhanced perception. In comparison with a single-source approach, sensor fusion can acquire more robust, sensitive, and accurate information from the surrounding environment. The function of perception grants autonomous systems awareness and perception of the environment, and also understanding of situations, so that they can make decisions responding to the complex environment around them. It is necessary to consider the irreplaceable roles of sensor fusion and environment perception for autonomous systems.

This special issue focuses on the state-of-the-art sensor fusion and environment perception for autonomous systems, which gather information and then learn about the structure of the information with different modalities, processing and analyzing the information to extract patterns and meaning, deriving new information, and transforming the obtained information into actionable intelligence to change their behaviors. All the papers were submitted by researchers working in related fields. This special issue contains 13 papers covering the topics of application of sensing technologies, sensor design, smart learning methods, and related technologies in sensor fusion and environment perception.

These papers are devoted to four research categories. The first six papers demonstrate sensor applications for a number of systems, such as unmanned aerial vehicles (UAVs), machine tools, and robots, and their interaction with human users. The seventh paper reports the design of a torque sensor and its application to a wide-blade drill rod. The next three papers explore various learning methods such as the convolutional neural network (CNN), recurrent neural network (RNN), and reinforcement learning (RL) for sensor applications. The last three papers study techniques relevant to sensory information fusion, such as signal processing, optimization, and factor identification.

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