Preface

The intelligentized welding manufacturing (IWM) is becoming an inevitable trend. The intelligentized robotic welding is the key technology in the IWM.

Welding handicraft is one of the most primordial and traditional technics, mainly by manpower and human experiences. Weld quality and efficiency are, therefore, straitly limited by the welder's skill.

Robotic welding can provide several benefits in welding applications. The most prominent advantages of robotic welding are precision and productivity. Another benefit is that labor costs can be reduced. Robotic welding also reduces risk by moving the human welder/operator away from hazardous fumes and molten metal close to the welding arc. The robotic welding system usually involves measuring and identifying the component to be welded, welding it in position, controlling the welding parameters and documenting the produced welds. To develop an intelligent robotic welding system that can accomplish useful tasks without human intervention and perform in the unmodified real-world situations that usually involve unstructured environments and large uncertainties, the robots should be capable of determining all the possible actions in an unpredictable dynamic environment using information from various sensors such as computer vision, tactile sensing, ultrasonic and sonar sensors, and other smart sensors. From the existing successful applications, it can be concluded that emerging intelligent techniques can enhance and extend traditional robotic welding.

In recent years, the intelligentized techniques for robotic welding have a great development. The current teaching play-back welding robot is not with real-time functions for sensing and adaptive control of weld dynamical process. Generally, the key technologies on Intelligentized welding robot and robotic welding process include computer visual and other information sensing, monitoring and real-time feedback control of Seam tracking, weld penetration, pool shape, seam forming and welding quality. Some applications on intelligentized robotic welding technology is also described in this book, it shows a great potential and promising prospect of artificial intelligent technologies in the IWM.

This volume is mainly based on the papers selected from the 2014 International Conference on Robotic Welding, Intelligence and Automation (RWIA'2014),

October 25–27, 2014, Shanghai, China. We have also invited some known authors as well as announced a formal Call for Papers to several research groups related to welding robotics and intelligent systems to contribute the latest progress and recent trends and research results in this field. The primary aim of this volume is to provide researchers and engineers from both academic and industry with up-to-date coverage of new results in the field of robotic welding, intelligent systems and automation.

The volume is divided into four logical parts containing 55 chapters. In Part I (17 chapters), the authors deal with some intelligent techniques for robotic welding. In Part II (18 chapters), the authors introduce the Sensing of Arc Welding Processing. Various applications such as vision sensing and control of welding process are discussed. In Part III (10 chapters), the authors describe their work on Modeling and Intelligent Control of Welding Processing. In Part IV (10 chapters), the authors exhibit their works on Intelligent Control and its Applications in Engineering.

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