

Preface

This book contains significant results from our research on industrial automation software conducted in previous years. Industrial automation software can be used in a wide variety of industrial fields such as condition monitoring and fault diagnosis for rotating machinery, public utilities monitoring, plant process supervision, intelligent building management, and many others. With the fast development of computer technology in recent years, a number of emerging software technologies can be adopted to build more powerful industrial automation software. These innovative technologies include modern software engineering, object-oriented methodology, visual/graphical programming platform, graphical user interface, virtual instrumentation, component-based system, systematic database management, dynamic data exchange, and so forth. All these technologies provide new opportunities to develop more comprehensive and reliable software artifacts than before. Thus the demand for new books in this field arises as the field continues to keep evolving, and both practicing engineers and academic people are simultaneously challenged by how to develop industrial automation software in a more effective and efficient manner.

This book is intended to address how the industrial automation software can be developed in a purposeful and disciplined fashion. Broadly speaking, the whole book is divided into two parts. The first part provides the reader with an overview of this field and a variety of fundamental design principles. Chapter 1 introduces the modern industrial automation systems, virtual instrumentation technology is discussed in Chapter 2, and the development of

component-based measurement systems is addressed in Chapter 3. Chapter 4 introduces the object-oriented software engineering. User interface design is discussed in Chapter 5. Database management is presented in Chapter 6. Software testing is fleshed out in Chapter 7. In the second part of this book, first an overview on the five typical applications in real-world industrial automation software design is given in Chapter 8. All of these case studies are highly representative so that they can serve as useful references when the reader wants to construct their own software systems. Chapter 9 represents an object-oriented reconfigurable software for industrial measurement and control. Because the reconfiguration concept is used throughout the software development process, the obtained software turns out to be highly flexible and able to accommodate different industrial application requirements. Chapter 10 focuses on the flexible measurement point management in the industrial measurement and control system. It provides the basis for building industrial automation systems with high configuration capability. A VxD-based automatic blending system is discussed in Chapter 11. To meet the communication speed in the presence of a large volume of data, multithreaded programming technique is used to avoid the data transmission bottleneck. Rotating turbine machinery is widely used in various industrial environments, and its design quality is of particular importance. Thus in Chapter 12, an automatic test system for turbine machinery is discussed, which is developed for ensuring the machine quality by automatic testing. Networked industrial systems are the development trend for different industry applications. In Chapter 13, an Internet-based online real-time condition monitoring system is discussed. It is developed based on the concept of modular design and functional decomposition. In the final chapter, the emerging technologies for building more powerful industrial automation software are introduced, which include middleware, Unified Modeling Language (UML), agent-based software development, and agile methodologies.

The authors welcome all the comments and suggestions regarding this book. All the correspondence may be addressed to the first author at l.f.wang@ieee.org. Thank you for reading the book, and I look forward to hearing from you.

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