

Preface

This book evolved over several years based on discussions and exchanges at various conferences. The motivation is compelling—commercial and residential building energy consumption constitutes a staggering percentage of the overall energy consumption in the United States and other countries. With the proliferation of sensors and embedded controllers, building control systems are becoming more “intelligent”, offering a ripe opportunity for the control community to contribute to creating solutions for energy efficiency, occupant comfort, and building management. Building control systems also pose challenges as complex interconnected subsystems, with interactions between human occupants and automation subsystems, and time-varying operating conditions depending on usage and weather conditions. Attempts to solve these issues in building control have resulted in a thriving research community. In automation and control conferences, special sessions on intelligent building, smart building, building control, etc., are regular fixtures in the conference programs. We feel the time is right for a collection of papers from leading academic and industrial researchers, in U.S., Europe, and Asia, to capture the current state of building control research and development, ranging from the overall building management, software architecture, to HVAC, lighting and human comfort, and other building-related issues including integration with the smart grid and the so-called Internet-of-Things. This book presents multiple facets of intelligent building control. Chapters 2–3 present the overall building control system architecture. Chapters 3–7 focus specifically on the HVAC system from vapor compression cycle to temperature control. In Chap. 8, the role of human mediation in buildings is illustrated. Chapters 9–11 go beyond building HVAC to examine other aspects of intelligent building control, including lighting, power distribution, and network connectedness. We hope that this book will benefit those interested in gaining a broader perspective and contemporary approaches on intelligent building control systems.

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