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The name “intelligent control” was coined by K.S. Fu in 1971 when he was asked to define an area that goes beyond adaptive and learning control. Saridis has defined intelligent control as the process of autonomous decision-making in structured or unstructured environments based on the interaction of the disciplines of artificial intelligence, operations research, and automatic controls. Key notions in these ideas are those of “going beyond” and “interaction.” Intelligent control implies, at least in the systems and controls community, a rising above or beyond current accepted practice.

This book is a compendium of 16 essays by different authors. It is remarkable in several aspects, not the least of which is the bringing together, under one book cover, work by some of the best-known researchers in several different fields. The breadth of coverage alone makes this volume unique.

The book is divided into three Parts. Part I, Theory and Architectures, describes foundations for intelligent control structures and design. Several different paradigms are covered, but the chapters are more remarkable in their similarities than their differences. A basic multi-level (often three-level) hierarchy based on the principle of Increasing Precision with Decreasing Intelligence appears in many of the approaches. The decomposition of each level into sensors, processor/world model, and actuators is another ubiquitous theme.

Part II presents Design Approaches and Techniques and includes work by well-known control engineers, computer scientists, and industrial engineers. The multi-faceted perspective that emerges provides the reader with a panoramic intuitive feel for intelligent control. Discussed are expert systems, fuzzy logic and neural nets, learning control, and AI planning systems.

Part II deals with Applications of intelligent control in robotics, failure diagnosis, flight control, and diagnosis in process operations.

The chapters are self-contained essays by different authors, so that the work of developing a coherent point of view of intelligent control is placed squarely on the shoulders of the reader. In this endeavor, fortunately, he is considerably aided by the preliminary overview, which helps bring the ideas in the chapters together.

The similarities in the ideas of these authors from disparate disciplines, areas of research, and industrial vs. academic backgrounds make for an overall point of view that is in some measure reassuringly unified. This can only indicate one thing—at long last there is emerging a paradigm for intelligent control in the sense of Thomas Kuhn. There has been a long period of years of disagreement, argument over definitions, and individualistic investigation by independent researchers using their own theories. That long fruitful period of innovative pioneering research is beginning to coalesce into a unified point of view of intelligent control that is now producing rigorous stability proofs and repeatable design algorithms at the level of neural network control and fuzzy logic control in the real-time loops, as well as at the hybrid system level and the rule-based sequencing/routing control level.

It is due to books such as this one that the development of a unifying paradigm in an enigmatic and contested field of human endeavor is finally possible.


This clear and concise overview of learning automata contains a wealth of useful references and several interesting examples within 225 pages organized into six chapters. The last chapter, Applications of Learning Automata, is almost a third of the length of the entire book. It covers seven examples, three of learning control: of a drying furnace, an absorption column, and an evaporator. The first case illustrates multilevel learning control leading to an explicit and effective control algorithm. The second, hierarchical learning control, is too complex for the explicit control method, yet a probabilistic result also improves operations. The other three examples range over communication system cyclic code choice, multimodal function optimization, constrained optimization, and neural network synthesis. Occasionally the authors err on the side of too-concise an exposition, as in the introduction to the application chapter, where the second sentence includes "...implementation of the classical PID control algorithm..." with no explanation of the acronym. Since PID is cited in the index, but nowhere explained, the authors have chosen to write for an audience of specialists on automatic control, while only slight expansion of their book could have made it accessible to a wider group.

This review begins with the applications because the authors state that the book can be read in a nonlinear mode, and the examples convey a great deal more of the flavor of this field than do the initial theoretical chapters. Stating the theory re-