



Piero Mella

# The Combinatory Systems Theory

Understanding, Modeling and Simulating Collective Phenomena

Series: Contemporary Systems Thinking

- Establishes a simple but complete theory called the Theory of Combinatory Systems, which is able to describe, interpret, explain, simulate and control collective phenomena and their observable effects
- Presents the theory of Combinatory Automata and build models for simulating the operative logic of combinatory systems
- Describes the heuristic models of several relevant Combinatory Systems in the context of five typical classes (which differ in regards to their macro behavior and/or their macro effect)

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This study adopts the logic of Systems Thinking and Control Systems, presenting a simple but complete theory called the Theory of Combinatory Systems. This new theory is able to describe, interpret, explain, simulate and control collective phenomena and their observable effects. Despite specific differences among these phenomena – many of which are “one way”, non-repeatable or reproducible – they can all be described or explained, and thus understood, using the model, as simple as it is general, of combinatory systems; that is, systems formed by collectivities, or populations of non-connected and unorganized individuals of some species, which appear to be directed by an invisible hand that guides the analogous actions of similar individuals in order to produce an emerging collective phenomenon. Combinatory Systems function due to the presence of micro control systems which, operating at the individual level, lead to uniform micro behavior by individuals in order to eliminate the (gap) with respect to the objective that is represented – or revealed – by the global information (macro behavior or effect). The book also examines Combinatory Automata, which represent a powerful tool for simulating the most relevant combinatory systems. In stochastic combinatory automata, when both probabilities and periods of transition of state are agent/time/state sensitive, the probabilistic micro behaviors are conditioned by the macro behavior of the entire system, which makes the micro-macro feedback more evident.

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