

Preface

This book has been written to provide an avenue for discussion concerning the kinds of technologies, components, methodologies, architectures, etc., that will be necessary to create an actual fully autonomous artificial life form. An artificial life form is not just a collection of hardware and software/algorithms that magically becomes self-aware and begins to think, reason, learn, and make decisions like humans (as Hollywood would have you believe). It requires a cognitive ecosystem, similar to the human brain, central nervous system, etc., that all work and cooperate in unison to produce a complete “artificial brain.” It is our opinion that you cannot design a truly artificial life form from the bottom up. It must be designed as a high-level cognitive entity, with all the components in place in the architecture, the information/knowledge models, communication mechanisms and methodologies, everything that is required in place in the high-level systems design first. Only then can you begin to decompose the system design into separate subsystems and begin to look at what is required for each lower-level entity within the ecosystem.

Along with creating synthetic models, designs, and architectures that represent neuroscience concepts adapted for artificial life forms, we must also take into account psychological concepts that explain interactions within the human brain and adapt those to their artificial life form counterparts. These topics have been a major focus of Dr. Crowder and Mr. Friess’ research for the last 4 years. Dr. Carbone has spent many years deriving and architecting the information theoretics described in the book, in terms of knowledge formulation, retention, and retrieval within an artificial cognitive structure.

This book is a culmination of 18 years of research for all three authors. Each has concentrated on different aspects of Artificial Cognitive Architectures, bringing all the pieces together to form a complete picture and story of how an autonomous, thinking, learning, self-evolving life form could be designed and implemented. The authors have over 90 publications on various aspects of artificial intelligence, artificial psychology, information processing, and other concepts discussed here. These include journal publications, conference proceedings, books, and dissertations,

many of which can be found online. One of the most important things to understand about the book is that it is not the final answer on Artificial Cognitive Architectures but represents the beginnings of the discussion on complete, fully autonomous artificial life forms.

We have strived to create a book that appeals to researchers in all fields but also to anyone who is interested in understanding artificial intelligence (AI) from a complete systems view.

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