Chapter 3
Chaotic Systems and Their Recent Implementations on Improving Intelligent Systems

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ABSTRACT

Chaos Theory is a kind of a scientific approach/research effort which is based on examining behaviors of nonlinear dynamical systems which are highly sensitive to their initial conditions. Currently, there are many different scientific studies based on the Chaos Theory and the related solution approaches, methods, or techniques for problems of this theory. Additionally, the theory is used for improving the introduced studies of different fields in order to get more effective, efficient, and accurate results. At this point, this chapter aims to provide a review-based study introducing recent implementations of the Chaos Theory on improving intelligent systems, which can be examined in the context of the Artificial Intelligence field. In this sense, the main research way is directed into the works performed or introduced mostly in years between 2008 and 2013. By providing a review-based study, the readers are enabled to have ideas on Chaos Theory, Artificial Intelligence, and the related works that can be examined within intersection of both fields. At this point, the chapter aims to discuss not only recent works, but also express ideas regarding future directions within the related implementations of chaotic systems to improve intelligent systems. The chapter is generally organized as a reference guide for academics, researchers, and scientists tracking the literature of the related fields: Artificial Intelligence and the Chaos Theory.

INTRODUCTION

Today, Chaos Theory has a remarkable importance among scientists and researchers who work on designing and developing different kinds of approaches, methods, techniques or applications that are associated with using chaotic systems within the solutions that are wanted to be provided for the scientific literature. In this sense, it is a popular research field in Mathematics ensuring many problem-solution based applications in different disciplines. The related discipline scope of the theory includes the foremost scientific fields like Physics, Engineering, Economics, and Biology.

As general, the infrastructure of the Chaos Theory and its research coverage are based on scientific studies related to search on behavior of nonlinear dynamical systems, which are highly sensitive to their initial conditions. Within the literature this kind of systems are also defined as chaotic systems. Currently, there are many scientific studies based on the Chaos Theory and the related solution approaches, methods or techniques for problems of this theory. Additionally, the theory is also used for improving the introduced studies of different fields in order to get more effective, efficient and accurate results.

In the context of the mentioned information, the objective of this chapter is to provide a review-based study introducing recent implementations of the Chaos Theory on improving intelligent systems. At this point, it is important that the chapter is also some kind of a reference explaining the usage of the Chaos Theory within the Artificial Intelligence field. Furthermore, it is also a brief review for the latest improvements / scientific studies that take place within the current literature. In this sense, the chapter has also been organized as a reference guide for academicians, researchers and scientists who track the literature of Artificial Intelligence and the Chaos field.

Within the chapter, typical reviews of the related implementations are based on the following approaches also pointing some kind of objective evaluation – analyze on the literature:

- Introducing the related implementation.
- Pointing out basic features of the implementation.
- If exists, expressing the main problem of the work.
- Explaining the evaluation – test processes and obtained results briefly.

Regarding to the chapter content, it is aimed to discuss about not only recent works but also express ideas regarding to future directions within the related implementations of chaotic systems to improve intelligent systems.

According to the related explanations, the rest of the chapter is organized as follows: The next section provides brief explanations related to foundations of this chapter. In this sense, the readers are enabled to have ideas about the Chaos Theory, chaotic systems, Artificial Intelligence and also intelligent systems that can be examined within the subject scope of the chapter. Next, the Section 3 provides a review-based study regarding to implementations of chaotic systems on improving intelligent systems. In the context of the section, some explanations regarding to remarkable points on the current literature have been provided firstly. In this way, main problems and the related applications within the intersection of the Chaos Theory and the Artificial Intelligence fields are provided in order to improve readers' knowledge and awareness levels. After providing the related information, the recent implementations in years between 2008 and 2013 are explained briefly in order to provide a review-based study to obtain information about the current status of the literature and have ideas about problems and applications in this context. Following that, the

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