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COMPLEX SYSTEMS – OVER VIEW (THEORY OF COMPLEX SYSTEMS REGARDING TO BIOPHYSICS, MEDICAL PHYSICS REVIEW)

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Abstract: Study of Complex Systems Physical and Chemical behaviours are every time challenging to the scholars because they are not the predicted by the cooperative interaction of individual components or expressed as a sum of the behaviours of its parts (or of their multiples). Nowadays complex systems and study of complex theory extends to a separate new branch in Physics. Both theoretical and practical research studies regarding complex systems related to bio physics and medical physics are more in demand. Some of recent outcomes – A little change in one of the individual component in a complex system can have far reaching consequences for the system as a whole. Complex system needs energy to sustain their dynamic structural behaviour. The authors aim is to develop this case study as The Concepts of Complex Theory in Physics as a Scholarly research topic whichever useful & may be extendable for Academic studies as a Special Branch of Physics.
Keywords: complex system; chaotic systems; CAS; Nonlinear systems; complex theory

I. INTRODUCTION

Overview

A complex system is a network of heterogeneous components that interact nonlinearly, to give rise to emergent behaviour.

History

Although one can argue that humans have been studying complex systems for thousands of years, the modern scientific study of complex systems is relatively young when compared to conventional science areas with simple system assumption such as physics and chemistry. The history of scientific study of these systems follows several different research trends.

II. TYPES OF COMPLEX SYSTEMS

A. CHAOTIC SYSTEMS

A dynamical system is to be classified as Chaotic, if it has the following properties, viz.,

- It should be Sensitive to initial conditions
- It must be Topologically Mixing and
- Its periodic orbits must be dense

B. COMPLEX ADAPTIVE SYSTEMS (CAS)

CAS – are the special cases of complex systems. They are complex in that they are diverse and made up of multiple interconnected elements and adaptive in that they are have the capacity to change and learn from experience. Examples of complex adaptive systemsinclude the biosphere. This includes some large scale online systems, such as collaborative tagging systems.

C. NONLINEAR SYSTEMS

The behaviour of nonlinear system is not subject to the principle of super position while that of linear system is subject to superposition. Thus, a nonlinear system is one whose behaviour can't be expressed as a sum of the behaviours of its parts (or of their multiples).

III. FEATURES OF COMPLEX SYSTEMS

Complex systems may have the following features:

DIFFICULT TO DETERMINE BOUNDARIES

It can be difficult to determine the boundaries of a complex system

COMPLEX SYSTEM MAY BE OPEN

Complex systems are usually open systems – that is, they exist in thermodynamic gradient and dissipate energy. In other words, complex systems are frequently far from energetic equilibrium but despite this flux, they may be pattern stability

COMPLEX SYSTEMS MAY HAVE MEMORY

The history of a complex system may be important. Because complex systems are dynamical systems they change over time and prior states may have an influence on present state. More formally, complex systems often exhibit hysteresis.

COMPLEX SYSTEMS MAYBE NESTED

The components of a complex system may themselves be complex systems

DYNAMIC NETWORK OF MULTIPLICITY

As well as coupling rules, the dynamic network of a complex system is important. Small networks which have many local interactions and a smaller number of inter – area connections are often employed.

RELATIONSHIPS ARE NON – LINEAR

In practical terms, this means a small perturbation may cause a large effect, a proportional effect or even no effect at all. In linear systems, effect is always directly proportional to cause.

RELATIONSHIPS CONTAIN FEEDBACK LOOPS

Both negative (damping) and positive (amplifying) feedback are always found in complex systems. The effects of an element's behaviour are fed back to in such a way that the element itself is altered.

IV. CONCLUSION

At present Concepts of Complex Theory is in more Demand in the field of Bio Physics and Medical Physics (as well to develop sensors related to biomedical Instrument technology

– carried out in thin film and Nano technology in the industrial fields too). So more research works need to work out in these fields.

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