DYNAMICAL SYSTEMS AND THEIR APPLICATIONS

Results in Brief

Dynamical systems theory and applications

The beauty of mathematics even for non-mathematicians lies in its ability to explain the world around us, to make the seemingly abstract more concrete. Advances in an important field of mathematics are providing a window on physical and biological systems.

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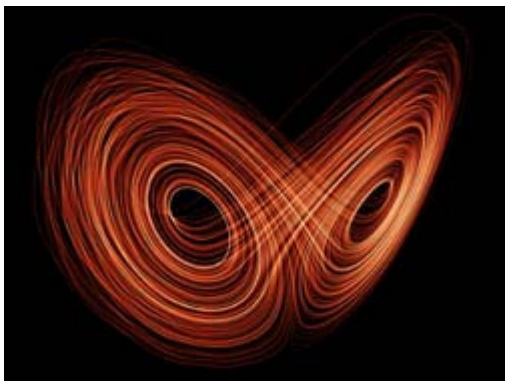

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Mathematical formulae explain phenomena like why we do not float off the surface of the Earth and how a neuron fires an action potential to send a signal to another cell. The world around us is a smorgasbord of physical, chemical and biological systems whose evolution in time can often be described using dynamical systems theory.

Given its relevance to so many real-world scenarios, scientists launched the EU-funded DYNSYSAPLL (Dynamical systems and their applications) project to significantly advance dynamical systems theory and use it to gain insight into important phenomena in physics, neuroscience and medicine.

With respect to fundamental mathematics, scientists have tackled topics ranging from bifurcations of limit cycles and almost periodic motions to some classes of continuous and non-continuous vector fields. Numerous new results and simplified or

more efficient approaches have been obtained, resulting in several publications in peer-reviewed scientific journals.

Researchers have also studied bifurcations of a model describing variation of plasma parameters in devices for controlled thermonuclear fusion. The model provides insight into the effects of changing parameters as they provide the basis for development of control strategies. Dynamical systems theory was also applied to harmonic oscillators, models of spiking behaviours in both single neurons and populations, and models of bone osteogenesis.

DYNSYSAPLL is creating fundamental knowledge and understanding in the field of dynamical systems theory and providing important insight into the workings of real-world systems. Along the way, it is providing fertile training ground for the researchers whom it supports.

Keywords

Dynamical systems, bifurcations, limit cycles, biological models, nuclear fusion, real-world systems

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Project Information

DYNSYSAPLL

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