Mathematical Modelling of Complex Systems and its Possible Applications

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Abstract: In this plenary talk, I review our recent studies on mathematical modelling of complex systems and its possible applications.

Keywords: mathematical modelling, complex systems

This plenary talk is to review our studies on mathematical modelling of complex systems and its possible applications, which have been carried out by the Aihara Complexity Modelling Project, ERATO, JST (Japan Science and Technology Agency). In this research project, we have been developing mathematical theory and analysis methodology for modelling complex systems in general, and simultaneously applying such modelling to individual real-world complex systems. The applications include (1) dynamical information processing of biological systems like neural networks ([1]-[6]) and genetic networks ([7]-[13]), (2) a new kind of computation by complex systems and its hardware and wetware implementations ([14]-[17]), and (3) modelling of diseases like new influenza and prostate cancer ([18]-[21]). These applications show that mathematical modelling is useful for understanding and controlling various complex systems in this real world.

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