Emergent properties in reactive systems

Aiguier et al., 2008

Reactive systems consist of interconnected sub-components part of structural links that define communication methods. These systems can exhibit emergent properties that are unpredictable even when complete knowledge of the systems are available. This implies complexity in the systems, such that they cannot be simplified to rules based on inferences from their properties, but knowledge of the rules of interaction between components is also necessary.

Emergent properties are often difficult to predict.

Shape-memory polymers

Behl et al., 2007

Shape-memory polymers are active polymers with the capability of dual shapes, changing from one shape to the other as a response to a particular stimulus.

An overview of novel soft actuators for soft robotics

Boyraz et al., 2018

The advantages of generative grammatical encodings for physical design

Hornby & Pollack, 2015

Genetic algorithms typically use direct encodings of solutions, but may struggle to cope with designing highly complex systems using these direct methods.

Generative encoding is a type of encoding that specifies the construction of the phenotype. It may be more scalable because of its self-similar and hierarchical structure.

The algorithmic beauty of plants

Prusinkiewicz, 1990

Evolving virtual creatures

Sims, 1994

A genotype is a programmed representation of potential individual or problem solution.

A phenotype is set of characteristics of an individual as they result from the composite of its genotypes.