

Emergent Behaviour

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December 4, 2009

Outline

- 1 Definition
- 2 Occurrence
- 3 Importance
- 4 My Work
- 5 Summary

What It Is

- The development of patterns and more complex systems out of simple interactions
- The total of the system is greater than the sum of the components.
- Weak Emergence: patterns are non-linear, but still can be deduced from the components of the system
- Strong Emergence: properties cannot be deduced from the components of the system

Where Does It Occur

- Weak Emergence – Natural Systems
 - Physics
 - Biology
- Strong Emergence – Philosophical and Religious systems
- Complex Adaptive Systems
 - Cellular Automata
 - Actors
 - Genetic Algorithms

Why Does It Matter

- Modelling of natural and artificial systems
- Self organization
- Programming of Massively Multi-Agent Systems
- Source of anomalous behaviour

What I Am Doing With It

- Looking at hybrid Cellular Automata
- Pattern identification and classification
- Identification of generalized metrics and properties
- Better functional classification

Summary

- Emergent behaviour is **ubiquitous** in science and life
- **Non-linear**, so traditional analysis is not applicable
- **Self organization** is very powerful for specifying systems