

Aggregation Procedures for Complex Systems

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A complex system is something with many interdependent components. An aggregation procedure consists in amalgamating selected groups of components into super-components with derived interactions between the super-components. No information is lost at the higher level and that at the lower level can be derived from the higher level by disaggregation.

Aggregation can often be iterated, producing hierarchical aggregation. Aggregation can be useful for computation, by breaking the problem down into pieces and combining them later. It can be useful for planning, since the effects of localised changes can be examined without recomputing the rest of the system. In systems with iterated aggregation, asymptotic trends to higher scales may emerge. Illustrations will be given from statistical physics, Markov processes, selfish traffic flow, synchronisation in oscillator networks, and multi-agent games.