

Morphological Analysis

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A major contributor to this article appears to have a close connection with its subject. It may require cleanup to comply with Wikipedia's content policies, particularly neutral point of view. Please discuss further on the talk page. (August 2010). Morphological analysis or General Morphological Analysis is a method developed by Fritz Zwicky (1967, 1969) for exploring all the possible solutions to a multi-dimensional, non-quantified problem complex.

As a problem-structuring and problem-solving technique, morphological analysis was designed for multi-dimensional, non-quantifiable problems where causal modeling and simulation do not function well or at all. Zwicky developed this approach to address seemingly non-reducible complexity. Using the technique of cross consistency assessment (CCA) (Ritchey, 1998), the system however does allow for reduction, not by reducing the number of variables involved, but by reducing the number of possible solutions through the elimination of the illogical solution combinations in a grid box. A detailed introduction to morphological modeling is given in Ritchey (2002, 2006).

Overview

General morphology was developed by Fritz Zwicky, the Swiss astrophysicist based at the California Institute of Technology. Zwicky applied MA inter alia to astronomical studies and the development of jet and rocket propulsion systems.

Illustration of the need for Morphological Analysis

Consider a complex real world problem, like those of marketing or making policies for a nation, where there are many governing factors, and most of them cannot be expressed as numerical time series data, as one would like to have for building mathematical models. The conventional approach here would be to break the system down into parts, isolate the vital parts (dropping the trivial components) for their contributions to the output and solve the simplified system for creating desired models or scenarios. The disadvantage of this approach is that real world scenarios do not behave rationally and more often than not a simplified model will break down when the contribution of trivial components becomes significant. Also significantly, the behaviour of many components will be governed by states of, and relations with other components, perhaps minor.

Morphological Analysis on the other hand, does not drop any of the components of the system itself, but works backwards from the output towards the system internals. Again, the interactions and relations get to play their parts in MP and their effects are accounted for in the analysis.