Integrated Stability Analysis of Industrial Symbiosis Networks

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Abstract

The concept of industrial symbiosis network (ISN) has progressed in recent years and has become a hot issue in the field of industrial ecology. There are lots of stability problems in the eco-industrial practices. A major challenge in stability analysis is to effectively deal with different kinds of exogenous and endogenous attributes, especially their quantification problems and their effect on the design and operation of the industrial ecosystem. To promote and manage stability of ISN, this work focuses on the methodology of integrated stability analysis based on information fusion technology.

This work provides an introduction of classification and characterization for stability attributes. We focus on knowledge, organization, and production process dimensions. Then, we classified into a total of 18 kinds of attributes according to the exogenous and endogenous contribution. An integrated analysis method based on information fusion is proposed to deal with the acquisition, transmission and processing of stability information. This method attempts to use the data from multi-sources under various spatial-temporal conditions. Two-level information fusion model is proposed to obtain the holistic result. In the first level (data level), the data filter and estimation based on modular neural network model is developed to obtain the characteristic value. The in the second one (decision level), the characteristic value processing and fusion is implemented based on the approximate reasoning algorithm.

This proposed methodology will facilitate the representation, the inner relation and working mechanism of multi-sources information among the member entities in the ISN. To demonstrate the applicability of the proposed methodology, a real-world eco-industrial park as a case study is presented.