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Deviation degree between ideal and real of domain transition probability in resource circulation considering production synchronization ratio

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Abstract

The authors propose "the domain transition probability model for resource circulation" that is developed from "the conceptual model for resource circulation". The former model (conceptual model) is a qualitative model that describes resource circulation between the natural space and social space on Earth by domain transition of four areas, namely the resource domain → production domain → consumption domain → waste domain → resource domain → ..., macroscopically. The latter model (domain transition probability model) is a scheme that enables the quantitative analysis of the Earth's environment in the future by introducing the domain transition probability matrix and state vector in the conceptual model. Given the current (t = 0) state vector and domain transition probability matrix, we can predict the state vectors at time t and t → ∞.

However, when considering resource circulation on Earth, the authors designate the state wherein the intake, expulsion, and natural purification rates are equal as an ideal state for achieving smooth resource circulation. Further, the authors have conducted research on the "three element deviation degree" for quantitatively describing the deviation degrees of these three ideal and real elements. In this research, in consideration of the deviation degree of synchronization between production and sales in corporate activities, the authors propose the "four element deviation degree," which synthesizes the "three element deviation degree" and "synchronization deviation degree". By doing this, a quantitative discussion of the gap between the ideal and the real in the four domain transitions, including corporate activities, can be conducted. In this research, simple numerical examples on the current (t = 0) state vector (initial state vector) and domain transition probability matrix are established. Further, the crisis situation of Earth's environment in the future is implicated by analyzing the relation between these deviation degrees and the resource, inventory, in-use, and waste proportions.

Keywords

resource circulation, Earth environment, domain transition probability, deviation degree, production synchronization ratio

Biographies

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