A study on coevolutionary dynamics of knowledge diffusion and social network structure

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Deskriptoren
Diffusion; Austausch; Wissenstransfer; Verstellung; soziales Netzwerk; Knowledge-Management

Freie Begriffe
Wissensdiffusion; Netzstruktur; agentengestützte Modellbildung; komplexes Netz; zufälliges Netzwerk; ferner Standort; global level

Abstract

Knowledge diffusion in social networks has extensively been studied in the communities of knowledge and innovation management and of complex networks. However, less attention has been paid on the coevolution of knowledge and network. In this work an agent-based model is proposed to study such coevolutionary dynamics. A set of agents, which are initially interconnected to form a random network, either exchange knowledge with their neighbors or move toward a new location through an edge-rewiring procedure. The activity of knowledge exchange between agents is determined by a knowledge transfer rule that two connecting agents exchange knowledge only if their knowledge distance is less than a given threshold. What's more, within the threshold, knowledge exchange is more effective when the knowledge distance is greater. The activity of agent movement is determined by a neighborhood adjustment rule that one agent may move toward a remote location or reside in the local cluster. Through simulative analysis of this model, some interesting phenomena are observed. Essentially, the bi-directional influences between knowledge transfer and neighborhood adjustment give rise to the coevolution of the network structure and the diffusion of knowledge at the global level. In particular, the rise and fall of "small-world" structure of the network can be observed during the process of knowledge transfer.

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Quelle

Sprache
EN Englisch

Erscheinungsjahr
2015