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Foraging behavior of ants and its application in optimization field

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Ants and other social animals have captured the attention of many scientists because of their self-organizing behavior and the high level of structuration their colonies can achieve, especially when compared to the relative simplicity of the individuals. The study of the foraging behavior of group animals (especially ants) is of practical ecological importance, but it also contributes to the development of widely applicable optimization problem-solving techniques. In recent years, algorithms inspired by models of animal group behaviors have achieved increasing success among researchers in computer science, communication networks and operations research. This talk introduces basic mechanisms of effective foraging for social insects or group animals that have a home. The whole foraging process of ants is controlled by three successive strategies: Hunting, homing, and path building. These learning strategies have advantages on the internet optimization process. This speech also introduces some dynamical models of ant foraging. We introduce the influences of the special region around the nest, the size of the food source, the search range, the limitation of ants' physical ability and ants' learning process with respect to foraging behavior. Our analysis suggests that group animals that have a home do not perform random walks, but rather deterministic walks in a random environment. They use their knowledge to guide them and their behavior is also influenced by their physical abilities, their age, and the existence of homes. In this talk, we will also introduce the application fields of ant foraging behavior, such as network optimization, signal processing, network security, distributed control et al.

Recent Publications

1. Li L, Peng H, Kurths J *et al.* (2014) Chaos-order transition in foraging behavior of ants. Proceedings of the National Academy of Sciences of the United States of America 111:8392-8397.
2. Li L, Yang Y, Peng H, *et al.* (2006) An optimization method inspired by chaotic ant behavior. International Journal of Bifurcation and Chaos 16(8):2351-2364.
3. Chen Y, Li L, Peng H *et al.* (2017) Particle swarm optimizer with two differential mutation. Applied Soft Computing 61:314-330.
4. Peng H, Li L, Yang Y *et al.* (2010) Parameter estimation of dynamical systems via a chaotic ant swarm. Physical Review E 81:016207.
5. Wan M, Wang C, Li L *et al.* (2012) Chaotic ant swarm approach for data clustering. Applied Soft Computing 12:2387-2393.

Biography

Lixiang Li is currently a professor at the school of cyber space security, Beijing University of Posts and Telecommunications, China. She received the PhD degree in signal and information processing from Beijing University of Posts and Telecommunications, China, in 2006. Her interests include compressive sensing, swarm intelligence, neural networks and complex networks. She is co-author for more than 150 papers. Her SCI citations of other scholars are over 2000 times, and her Google citations are over 3400 times. In 2014, her result of swarm intelligence published in PNAS has been widely reported by more than 200 domestic and foreign media (such as Time Magazine, Science Daily, the Christian Science Monitor, the Daily Mail, Science and Technology Daily and etc.). In 2015, her result of memory resistance neural network published in *EPJB* was assessed as highlight paper and was reported by at least 28 international media.

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