Atsushi Tero
Kyusyu University
e-mail: `tero.atsushi@gmail.com`
Toshiyuki Nakagaki
Future University Hakodate
Ryo Kobayashi
Hiroshima University

Modeling of the Adaptive Network of True Slime Mold

We describe here a mathematical model of the adaptive dynamics of a transport network of the true slime mold Physarum polycephalum, an amoeboid organism that exhibits path-finding behavior in a maze. This organism possesses a network of tubular elements, by means of which nutrients and signals circulate through the Physarum. When the organism is put in a maze, the network changes its shape to connect two exits by the shortest path. By reproducing this phenomenon we introduce new method to solve shortest path problem. In addition, Physarum makes various optimal network for their environmental condition. It is similar to human transportation network. We will talk about the mathematical model of Physarum which can apply to various adaptive network.

References

[1] A. Tero, S. Takagi, T. Saigusa, K. Ito, D. P. Bebber, M. D. Fricker, K. Yumiki, R. Kobayashi, T. Nakagaki, Rules for Biologically Inspired Adaptive Network Design. Science 2010/1/22 Vol. 327, No.5964 P.439-442

[2] A. Tero, R. Kobayashi, T. Nakagaki, A mathematical model for adaptive transport network in path finding by the true slime mold. J. Theor. Biol, ELSEVIER 244(2007)553-564