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UNICELLULAR LOGISTICIAN

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Physarum Polycephalum, which is also referred to as slime mold, is a species of myxomycetes of the Physara family. This unicellular organism is of interest to urban designers and scientists because of its abilities, such as finding a way out of a maze and building efficient transport networks [1].

Scientists say that the intellectual abilities of the slime mold bring it closer to the highest socially organized insects. Physarum Polycephalum, like any other system, is trying to achieve a certain goal. The organism's goal is survival which is achieved by organizing the consumption and distribution of nutritious substances through its entire body in the most effective way. It leads to the formation of complicated geometric patterns.

In experiments, small pieces of the Physarum Plasmodia were placed in a maze. As soon as the entire space of the maze had been filled by the plasmodia, two blocks with crushed oatmeal were placed at the entrance and exit.

After a relatively short period of time, the cytoplasmic strands in the dead-end and longer passages thinned and disappeared whereas the plasmodia then formed a single thick strand along the shortest path between food sources. Based on this, the scientists concluded that the Physarum has primitive intelligence [2].

Nevertheless, in some cases, plasmodia choose a longer path since the choice of the path occurs in one step without calculating all possible solutions. When there are more than two nutrition sources, the organism is capable of creating transport networks that are not inferior to those created by humans.

In 2010, Japanese scientists conducted an experiment in which they scattered oat flakes across the map of Japan including Tokyo and thirty-

six other large cities. In an attempt to find the oat, Physarum spread itself into a network that was «comparable in efficiency, reliability and economy» to Japan's railway system [3].

With the help of similar experiments, scientists also managed to imitate the transport systems of Great Britain, Portugal and some other countries.

The fact that the unicellular organism has no nervous system that could cause intelligent performance makes scientists interested in understanding the rules which can determine its behavior. Scientists are trying to model the slime mold using a number of simple rules. For example, Physarum Polycephalum has been modeled as a system of differential equations.

However, these models do not really explain the internal nature of the Physarum's intelligence. More research needs to be done, and more data about the slime mold's behavior needs to be collected to build more realistic models, therefore, nowadays, researchers are investigating the network structure of laboratory-grown Physarum.

Although Physara are organisms that have little to do with economics, their ability to build high-performance transportation networks can be adapted for economic purposes.

Studies have shown that the transport networks created by these logistically smart organisms can be more efficient and economical than human-developed transport networks. The abilities of the Physara can have practical application in the field of logistics where route optimization and cost minimization are the key factors of success.

References

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