Message Ferry Routing Method Using Embedded Levy Search Structure in Fractal-like Network

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Message Ferrying scheme is a strategy for DTN (delay/disruption tolerant networking) that used special mobile node (or walker) called message ferries. The role of message ferries is moving around in order to deliver the data. Therefore, it is important that how to design a route for message ferries. Recently, many Message Ferrying scheme has been proposed. To take an example, it has been proposed that the strategy using Levy flight pattern. Levy flight is a random walk whose step lengths chosen from a probability distribution with a power-law tails. Levy flight patterns observed in animals such as birds, bumble bees and monkeys. Another example of Message Ferrying scheme is using multiple ferries to transport data. There are three types of ferry interaction. No interaction strategy: Ferries do not relaying data between themselves. Ferry relaying strategy: Ferries exchange data between each other directly. Node relaying strategy: Ferries exchange data via to stationary nodes. In general, ferry relaying and node relaying strategy are effective more than no interaction strategy. This is because message ferries work in cooperation with each other. Ferry relaying strategy need to synchronize ferries movement. With Node relaying strategy, there is no need to synchronize ferries movement. This is because stationary nodes are relaying data.

Most studies of Message Ferrying scheme assumed that each spatial distributions of communication requests are homogeneous. But in reality, this assumption is not fulfilled.

For example, it has been reported that there are correlations between population and router density. Furthermore, a spatial distribution of population is inhomogeneous.

Recently, it has been proposed that a scalably self-organized geographical network is suitable for searching inhomogeneously distributed targets more efficiently than levy flight.

In this study, we propose a new message ferry strategy that using a scalably self-organized geographical network, and multiple ferries. Message ferries exchange data via to stationary nodes in this strategy (i.e., Node relaying). This strategy is more effective than other strategies. This is because this strategy is no need to synchronize message ferries movement. We investigated the effectiveness of this strategy by simulation. In particular, we focus on pathfinding. A message ferry is a random walker. Furthermore, message ferries move around on a network to search for source and destination nodes and a path between a source and destination node. As the number of messages ferries increases, data delivery performance and path length were improved. In addition, message ferries can find a path between a source and destination node only using the partial information of network.