Genome Rearrangements: Fault-Tolerant Routing Analysis in Burnt Pancake Graph with one Faulty Node

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Abstract

Consider genome orientation, burnt pancake graph can be constructed. For node-to-node routing on n-burnt pancake graph, Cohen and Blum first proposed $O(n^2)$ algorithm with at most 2n length of the path. If there exist $(n - 1)$ faulty nodes, Iwasaki and Kaneko proposed $O(n^2)$ algorithm with at most $(2n + 4)$ length of the path; extending to $(n - 1)$ faulty clusters with diameter 3, Kaneko proposed $O(n^2)$ algorithm with at most $(2n + 10)$ length of the path.

Under well-designed steady system, the probability of faulty node is very low, and it can be repaired well soon. So the most case of node-to-node fault-tolerant routing is only one faulty node. In this paper, we propose one efficient fault-tolerant routing algorithm in n-burnt pancake graph with one faulty node, the length of the path is at most $(2n + 2)$, and time complexity is $O(n^2)$.

Keyword：Genome Rearrangements, Sorting by Prefix Reversals, Burnt Pancake Graph, Fault-tolerant Routing