# A study on a trade-off between efficiency and reliability in Byzantine gathering algorithm for mobile agents

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内 容 梗 概（１ページ目に収めること）

Recent years have seen a surge in the popularity of distributed systems, comprising many interconnected computers. These systems require fault tolerance and speed enhancement to maintain efficient operation, even when some computers fail. Mobile agent systems, which includes software programs (called agents) that autonomously move among nodes, become a key solution by facilitating cooperative behaviors among agents. A critical behavior in these systems is gathering to make the agents, which are initially dispersed and can only communicate with other agents at the same node, meet at a single node and declare the termination at the same time for effective communication and coordination. A major challenge is the potential fault of some agents, particularly those causing Byzantine faults (called Byzantine agents). This fault is known as the most severe among various agent faults because Byzantine agents behave maliciously.

This dissertation considers the gathering in the presence of Byzantine agents and focuses on reducing the time to achieve the gathering, which are significant in existing algorithms. We propose two efficient algorithms for scenarios with O(f^2) and O(f) non-Byzantine agents, where f is the number of Byzantine agents. These algorithms create groups comprising a sufficient number of non-Byzantine agents, utilizing these groups to reduce time to achieve gathering. Additionally, the second algorithm saves on the number of non-Byzantine agents by using a new technique to reach a consensus on the collected information. To reach consensus, the agents simulate a Byzantine consensus algorithm for synchronous message-passing systems on agent systems. From these results, we theoretically clarify that reliability and efficiency in the agent systems are trade-offs.