An zone-based architecture for improving the scalability and consistency of collaborative virtual environment systems.

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Abstract
Collaborative virtual environments (CVEs) are becoming very popular in recent years, due to the rapid growing of network virtual collaborative applications such as virtual military training applications, virtual manufacturing process application, virtual education, massive multiplayer online games (MMOGs). The existing architectures with a multi-server have both capacity and resource constraints due to huge inter-server communication emerging from continues portioning of virtual environments. As the number of concurrent user’s increases, the scalability and consistency becomes one of the major challenges in designing interactive CVE system. A zone-based multi-server architecture base on centralized server infrastructures for improving the scalability and consistency of CVE systems is proposed. In the proposed architecture, the main server, the zone servers and the users’ workstations maintain the state of the CVE together. In order to improve the scalability and consistency, there should be effective management of inter-server communication problem from architectural point of view and partitioning process with message filtering that can allow message dissemination to all users concern. An imperialist competitive algorithm is proposed to be use with the proposed architecture for partitioning the virtual environment and allocation of computing resources together with modified time-bounding-box-based filtering scheme for effective management of traffic and communication resources. The proposed architecture with the algorithms are expected to improved consistency and scalability of collaborative virtual environment systems even with high inter-server communication arises due to huge number of concurrent collaborators.