148. Multi-Robot Systems and Edge Computing for Dynamic Collaborative Geo-Mapping

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Fleets of robots can map areas that are hard to reach, but their shared map changes constantly as the robots explore and the environment changes. Keeping only the current map loses the earlier maps on which decisions were taken, together with the robot data behind them. This paper proposes a three-layer framework that keeps this history. Robots run Simultaneous Localization and Mapping onboard and send their maps to edge servers. Each edge server fuses the maps of its robots, and a mission service fuses the edge maps into a global map. Edge servers and the mission service publish versions of their maps that never change, and each version records the versions it was built from. Any global version can therefore be retrieved by time and traced back to the robot maps behind it. Publication policies decide when a new version is published, either at regular intervals or after a given amount of change. The framework was tested in 20 simulated scenarios with three robots. Every checked global version could be rebuilt from its sources and no edge version was lost during network outages.