Spatial-temporal Collaborative Sequential Monte Carlo for Mobile Robot Localization in Distributed Intelligent Environments

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Abstract- In this paper, a spatial-temporal collaborative sequential Monte Carlo architecture for mobile robot localization is designed to well suites intelligent environment for service robotic system. A proposed algorithm, namely Distributed Proportional Allocation-Augmented Particle Filter (DPA-APF), resolves the sensor collaboration problem by the processes of augmented sampling, inter-node resampling, inner-node resampling and particle exchange. These procedures exploit data parallelism and pipelining of resampling operations and improve the scalability of distributed particle filters (PFs). Moreover, modified visual and laser sensor perception models are also addressed to guarantee reliable and accurate robot localization in dynamic scenarios that robot coexists with people. The proposed method is applied to a home-care robotic intelligent room with distributed smart nodes, and the experimental results validate the effectiveness of the proposed

method, which is hopeful to reduce the gap that exists between PF theory and their implementation using networked hardware.

Index terms*:* spatial-temporal collaboration, mobile robot, particle filter, distributed sensor network, localization and navigation.