

Software Library for Simulation of Collaborative Sensor Networks for Navigation and Sensing

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Abstract

Collaborative networks of small sensor platforms will form future observing systems. Maximizing the value of measurements from such systems will require autonomous decision making with regard to management of limited resources (i.e. power, communications, and sensor configuration). The complexity of this decision space warrants the creation of software tools to aid users in efficient modeling and simulation of collaborative sensing networks. Conventional simulations software supports platforms with fixed sensor parameters including observation geometry, spatial-temporal sampling, resolution, and observation metrics. However, intelligent and adaptive sensor platforms may vary all of these parameters in response to the scene observed or to queues from other sensor or model data. The complexity of collaborative, adaptive and resource constrained networks of remote sensor platforms poses a barrier to understanding the feasibility of such systems and navigating the cost/benefit design space. Therefore, new software tools are needed to simulate these systems to aid in their understanding. In this poster, we present a new open-source C++ library called Collaborate that is currently under development to support the simulation of collaborative networks of adaptive sensor platforms. Details of the software interface and functionality are introduced here, along with motivation for its inclusion in larger simulations. The library is designed to quantify the improvements of the usage of collaborative, autonomous decision-making networks of adaptive sensors through rapid simulation and modeling. Collaborate simplifies observing-system simulation through constellation design involving diverse sensor platforms and visual analysis of network behavior. The library's object-oriented class hierarchy provides a straight-forward approach to incorporating user-defined algorithms into simulations. Results from example simulations are presented to illustrate these properties.