The Effects of Centralized Vs. Distributed Data Fusion on Mission Outcome in a Cruise Missile Defense Scenario

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Abstract

This study shows the effect of improved quality of information on warfighting effectiveness in a simulated cruise missile defense scenario. This study examines the following two two possible improvements to the air tracking process: track fusion at the radar report level Vs. track association, and an increase in overall communication speed. We propose a hierarchy of information measures for this process, and simulate both the distributed and centralized data fusion architectures. The distributed architecture fuses radar reports on each surveillance platform to construct a track. Other platforms receive cross-told track data and associate it with local information, but they don't fuse the tracks at the sensor data level. We examine three communication rates in this distributed scenario. Each platform in the centralized architecture communicates radar measurement information to a central tracker, which distributes a single, integrated air picture on a fast, high-bandwidth !
communications system. The results show the centralized architecture is more efficient, generating fewer, more accurate tracks. It also generates fewer fighter assignments, but destroys more cruise missiles. The improvements in low-level tracking measures are statistically significant, but the improvements in the overall mission performance are not statistically significant. These results are specific to the scenario and systems depicted.