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*Seeing the Big Picture: A Target-Oriented Approach to Optimization for Data Association Models*

There are many applications for tracking algorithms, and they all share a common problem. The difficulty occurs in the task of associating sets of measurements from multiple targets to individual tracks. The problem is that the number of possible matches grows so rapidly, that an exhaustive search through all matches is too slow. This project will explore computer algorithms which match measurements to tracks.

My hypothesis states that my “big picture” auction algorithm will reduce the time to calculate data associations, while maintaining high accuracy.

I will test my hypothesis by programming and experimenting with alternative solution algorithms. For example, one possible solution is “track-oriented.” The track-oriented approach assigns measurements one-by-one to the “best” track. A shortcoming of this approach is that it is “greedy” for the best tracks. In contrast, my “target-oriented” algorithm will use the “big picture” to improve results. The big picture will allow my target-oriented assignment algorithm to auction the entire set of measurements to all the tracks at once.

Computer simulations will determine the best algorithm. I will compare my new “big picture” algorithm with my “greedy” algorithm and with my baseline “exhaustive” approach. Results are expected to show several situations where my auction approach improves the association speed, maintains high accuracy, and therefore supports improved tracking. This project will perform mathematical optimization for data association. The project will produce track results by executing my computer target model over multiple simulation executions.