

Session: Decision Support Technologies

Title: Dynamic Diagrams for Time-Sensitive Targeting

Abstract

We present an engineering approach and a prototype system for “Enabling Speed of Command” in time-sensitive targeting. The basic approach is based on normative and cognitive analyses of weapon-target pairing in an uncertain and time-changing context. The approach pays special attention to how computational systems can overcome mental limitations as well as to how experienced users can overcome system limitations – both with an eye towards making better decisions in C2 applications. The product of our analysis is a system concept that employs dynamic diagrams in order to improve human-system interaction for the problem of weapon-target pairing in time-sensitive targeting.

Our system’s diagrams are informative in that they allow a targeteer to visualize the results computed by an optimal weapon-target pairing algorithm as well as to visualize the underlying reasons for these results. Without an understandable illustration of reasons as well as results, expert users are (and should be) reluctant to accept and apply the output of any algorithm no matter how optimal it is purported to be.

Our system’s diagrams are also interactive in that they allow a targeteer to develop manual solutions using the same graphical interface that is used to present the system’s optimal solution. This allows the user to perform sensitivity studies and to exercise expert judgments in selecting a solution (manual or automatic), which is especially important in situations for which the system’s input is known to be incomplete and/or uncertain.

Taken together, the informative and interactive features of our dynamic diagrams allow users to better understand the system’s calculations and to better overcome the system’s limitations with their own expertise. The latter is critical for practical applications because the optimal solution computed by any system is only as good as the input provided to that system, and this input is often uncertain and time changing in ways that human expertise captures better than available data.

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