

## Heuristic Algorithms for Time Based Weapon-Target Assignment Problem

**Authors :** Hyun Seop Uhm, Yong Ho Choi, Ji Eun Kim, Young Hoon Lee

**Abstract :** Weapon-target assignment (WTA) is a problem that assigns available launchers to appropriate targets in order to defend assets. Various algorithms for WTA have been developed over past years for both in the static and dynamic environment (denoted by SWTA and DWTA respectively). Due to the problem requirement to be solved in a relevant computational time, WTA has suffered from the solution efficiency. As a result, SWTA and DWTA problems have been solved in the limited situation of the battlefield. In this paper, the general situation under continuous time is considered by Time based Weapon Target Assignment (TWTA) problem. TWTA are studied using the mixed integer programming model, and three heuristic algorithms; decomposed opt-opt, decomposed opt-greedy, and greedy algorithms are suggested. Although the TWTA optimization model works inefficiently when it is characterized by a large size, the decomposed opt-opt algorithm based on the linearization and decomposition method extracted efficient solutions in a reasonable computation time. Because the computation time of the scheduling part is too long to solve by the optimization model, several algorithms based on greedy is proposed. The models show lower performance value than that of the decomposed opt-opt algorithm, but very short time is needed to compute. Hence, this paper proposes an improved method by applying decomposition to TWTA, and more practical and effectual methods can be developed for using TWTA on the battlefield.

**Keywords :** air and missile defense, weapon target assignment, mixed integer programming, piecewise linearization, decomposition algorithm, military operations research

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