Equipment Contribution Analysis in Task-Oriented Heterogeneous Combat Network with Conflicting Edges

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Abstract : Modern warfare emphasizes that the combat system-of-systems (CSoS) includes various combat units and powerful information exchange capabilities. Therefore, these units have formed a complex Heterogeneous Combat Network (HCN), where enemy and friendly combat forces engage within this network. To better accomplish an assigned task, equipment contribution analysis aims to identify important nodes within the HCN. However, constraints such as equipment payload often give rise to conflicting edges within the HCN. Hence, this paper focuses on analysing equipment contribution within task-oriented HCN from the perspective of Course of Action (COA). Specifically, this paper defines the HCN with constraints and proposes an approach to compute COA within the HCN. Then, the COA Capability Index (COACI) and COA Capability Change Index (COACCI) are proposed to analyse equipment contribution in the HCN. Finally, the effectiveness of the above method is validated through a case study. This paper provides a quantitative analysis approach for equipment contribution analysis within task-oriented HCN and offers valuable insights for designing more effective combat system-of-systems (CSoS).

Keywords : equipment contribution, heterogeneous combat network, conflicting edges, course of action, kill chain