12^{TH} ICCRTS
Adapting C2 to the 21^{st} Century
Constraint processing for C^2
Track 1 : C2 Concepts, Theory, and Policy

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Abstract

This paper explains how we can build an efficient C^2 for a tactical naval defense with the use of Constraint Processing (CP). An arduous problem in a C^2 system is to resolving the Weapon Target Allocation (WTA) problem. Our WTA problem consists to find valid weapons assignation for a frigate equipped with different kinds of weapons view as resources. We begin by map the WTA problem for a frigate into a Constraint Satisfaction Problem (CSP). We use resources as variables and we put constraints on them (blind zone, maximum range, etc). It's also possible to use constraints to take in consideration interactions between different kinds of resource. This model is used in a new process named engageability. Engageability consists to find all feasible solutions by eliminating candidate solutions that violates one or more problem constraints. This can be done with CSP algorithms that pruning the search space quickly by exploiting constraints. Engageability takes in input a CSP that reflex our WTA problem definition and gives as output a threats list ranked by engageability score. The first element (higher score) represents the threat on which we have more allocation options and the last represents the one with the less option. Consequently, our weapons assignment process doesn't use only the threat level but takes also in consideration the engageability score. Our first results show some gain on survivability and on planning speed.

1 Introduction

Introduce the problem, the C2 context, define different CSP classes.

2 Dynamic constrained WTA

Explain in details the weapon target allocation problem with dynamics constraints.

3 Formalize WTA in CSP

Show how we encoded WTA problem in CSP and resolve it.

4 Engageability

Define the engageability and show how constraints are important.

5 Weapons Assignment

Give details on how we can do the weapon assignments using the engageability score and threat level.

6 Results

Show what are the advantages to use engageability score in a C^2.

7 Conclusion

Extension, Discussion.