Research on Intelligent Decision of Fire Distribution in Remote Control Weapon Station

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Introduction

If the remote control weapon station adopts the way of separating the remote control terminal from the weapon system, the weapon system is equipped with different fire attack weapons, and the remote control terminal adopts the intelligent command and control system, the fire control system can obtain the enemy's real-time situation and weapon types (light tank, heavy tank, infantry combat vehicle, anti tank helicopter, air defense missile vehicle, artillery) according to the sight system. Consider the self-attributes of targets, this paper establishes a dynamic threat assessment model for a large number of different types of attacking targets.

Establishment of target attribute model

Target classification

X1: large bomber, cruise missile;
X2: fighter, small aircraft, command aircraft;
X3: air to ground missile, anti radiation missile and tactical missile;
X4: reconnaissance aircraft, armed helicopter;
X5: false target, decoy, unknown target

Target attribute threat assessment model

Threat assessment value is obtained according to the assessment functions of target type, target size, target distance, flight speed, arrival time, flight altitude, electronic interference intensity, and the threat matrix of the incoming target attribute a_{ij}.

Research of fire distribution

According to the principle of "great threat of target and favorable shooting", fire distribution assigns shooting tasks to the subordinate tactical units or fire unit assigns shooting mission. The specific principles are as follows:

(1) First, shoot close targets, then shot far; (2) Shoot fast targets first, then slow targets; (3) Shoot low targets first, then high targets; (4) Give priority to targets designated by superior commanders.

Target threat assessment model

Calculation of weight coefficient

$$\omega_i = \frac{\dfrac{1}{\sum_{i=1}^{n} \dfrac{1}{\sum_{j=1}^{m} D^2(a_{ij}, v_j)}}}{\sum_{j=1}^{m} D^2(a_{ij}, v_j)} = \frac{1}{\sum_{j=1}^{m} D^2(a_{ij}, v_j) \times \sum_{i=1}^{n} \dfrac{1}{\sum_{j=1}^{m} D^2(a_{ij}, v_j)}}$$

Target threat assessment function

$$p = \sum_{i=1}^{n} a'_{ij}\omega_i \qquad q = \frac{p1 + p2}{2}$$

Target threat assessment results

Target attribute threat assessment results

attribute / target	target type	target size	target distance	flight speed	arrival time	flight height	interference intensity
X_1	0.85	0~0.4	0.3247~0.6065	0.7408~0.7878	0.4868~0.8825	0.4290~0.8383	0.5
X_2	0.55	0.6~0.8	0.4868~0.6670	0.8647~0.9179	0.0060~0.1353	0.9440~0.9857	0.8
X_3	0.92	0.8~0.98	0.6670~0.8825	0.9997	0.9438~0.2125	1.0000	1
X_4	0.43	0.6~0.8	0.1979~0.5461	0.6321~0.8262	0.7261~0.8825	1.0000	0.8
X_5	0.04	0.88~0.99	0.1979~0.4296	0.7534~0.7769	0.2870~0.5103	0.6809~0.9297	0.2

The comprehensive threat degree q = [0.3680, 0.4318,0.5709, 0.4068, 0.2225]. X3>X2>X4>X1>X5.

Conclusion

The evaluation results are consistent with the evaluation results of battle commanders, which can not only guide the distribution of battlefield firepower accurately and reasonably, but also can eliminate the influence of human subjective factors on command decision-making, which has high credibility and provides technical support for the decision-making research of firepower distribution.