

APPLYING INTERVAL-VALUE VAGUE SET FOR MULTI-SENSOR TARGET RECOGNITION

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ABSTRACT. *Interval-value Vague set is used to represent the information of measurement, a new multi-sensor target recognition method is proposed. The operations of addition and scalar multiplication for interval-value Vague set are defined. The interval-value Vague set weighted arithmetic average operator is presented. The model of multi-sensor target recognition is constructed based on interval-value Vague set. The method uses the optimization of maximizing the overall score functions for the targets to determine the weight vector of sensors. The overall evaluation value of the target is obtained through the interval-value Vague set weighted arithmetic average operator. The fusion result is given by the score function of the overall evaluation value. The example analysis proves the effectiveness of the method.*

Keywords: Multi-sensor, Target recognition, Interval-value Vague set, Score function, Interval-value Vague set weighted arithmetic average operator

1. **Introduction.** Multi-sensor target recognition is a very complex problem of system discrimination, which involves distilling of target characters, data acquisition, information representation, constructing model and fusion algorithm, etc (See Figure 1).

Distilling of characters is to extract the most useful and expressive features from the targets. This step is very difficult and important in information fusion. Then, use sensors to measure these characters to obtain characteristic information. As for the information representation, currently, the measurement information of sensor is generally represented by exact real number [1-6], fuzzy set [7-11], interval number [12], triangular fuzzy number [13] and Vague set [14,15]. The corresponding fusion theories and techniques adopted in the target recognition include Shafer-Dempster evidence theory [1-3], fuzzy set theory [7-11], interval number method [12], triangular fuzzy number method [13] and Vague set theory [14,15], etc. This paper focuses on the constructing model, and fuzzy fusion algorithm for multi-sensor target recognition.

Fuzzy set (FSs) theory has long been introduced to handle inexact and imprecise data by Zadeh's seminal paper in [16]. In fuzzy set theory, each object $u \in U$ is assigned a single real value, called the grade of membership, between zero and one. (Here U is a classical set of objects, called the universe of discourse.) In [17], Gau et al. pointed out that the drawback of using the single membership value in fuzzy set theory is that the evidence for $u \in U$ and the evidence against $u \in U$ are in fact mixed together. In order to tackle this problem, Gau et al. proposed the notion of Vague Sets (VSs), which allow using interval-based membership instead of using point-based membership as in FSs. The interval-based membership generalization in VSs is more expressive in capturing vagueness of data. Gorzalczany substituted the single membership value by interval value,