Fused, Multi-Spectral Automatic Target Recognition with XCS

Avinash Gandhe, Ssu-Hsin Yu, Raman Mehra
Scientific Systems Company, Inc.
Woburn, MA 01801-6580
+1 (781) 933 - 5355
{avinash, syu, raman.mehra}@ssci.com

R. E. Smith
RESystems, Inc.
Bokeelia, Florida 33922
+1 (239) 247-5865
robert.elliott.smith@gmail.com

ABSTRACT
We present new results from our most recent efforts in applying XCS to automatic target recognition (ATR). We place particular emphasis on ATR as a series of linked problems, which include pre-processing of *multi-spectral* data, detection of objects (in this case, vehicles) in that data, and identification (classification) of those objects. Multi-spectral data contains visual imagery, and additional imagery from several infrared spectral bands. The performance of XCS, with robust features, notably exceeds that of a template-based classifier on the pre-processed multi-spectral data for vehicle identification.

Categories and Subject Descriptors
I.2.6 [**Artificial Intelligence**]: Learning: Induction

General Terms
Algorithms

Keywords
Rule learning, automatic target recognition

1. INTRODUCTION
This paper reviews our most recent efforts in using XCS in Automatic Target Recognition (ATR) 000. We are developing a vehicle identification scheme that includes registration, detection and classification modules, all of which are important components of a higher-level, end-to-end ATR scheme.

2. CLASSIFICATION SCHEME
Our proposed vehicle classification scheme broadly comprises two stages: a *detection* stage and a *classification* stage. The goal of the *detection stage* is to isolate the objects of interest (vehicles) from the background. The *classification stage* will then classify the object into vehicle types. Depending on dataset used *registration* may be a necessary pre-processing stage. Details of the scheme, and further results, are presented in 0.

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3. CLASSIFCATION RESULTS

	Car	SUV	Truck
Car	97.5/97.5	0.0/0.0	2.5/2.5
SUV	0.0/3.3	100/93.3	0.0/3.3
Truck	5.0/10.0	0.0/0.0	95.0 /90.0

Table 1. XCS Training/Testing vehicle classification % correct.

	Car	SUV	Truck
Car	100/87.5	0.0/5.0	0.0/7.5
SUV	3.3/23.3	96.7/70.0	0.0/6.7
Truck	5.0/30.0	0.0/5.0	95.0/65.0

Table 2. Training/Testing vehicle classification % correct with a template matching classifier.

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