Homeland Security
Science and Technology

Summary

U.S. Department of Homeland Security

SAVER
System Assessment and Validation for Emergency Responders

The U.S. Department of Homeland Security (DHS) established the System Assessment and Validation for Emergency Responders (SAVER) Program to assist emergency responders making procurement decisions.

Located within the Science and Technology Directorate (S&T) of DHS, the SAVER Program conducts unbiased operational tests on commercial equipment and systems and provides those results along with other relevant equipment information to the emergency response community in an operationally useful form. SAVER provides information on equipment that falls within the categories listed in the DHS Authorized Equipment List (AEL). The SAVER Program mission includes:

- Conducting impartial, practitioner relevant, and operationally oriented assessments and validations of emergency responder equipment;

- Providing information that enables decision makers and responders to better select, procure, use, and maintain emergency responder equipment.

Information provided by the SAVER Program will be shared nationally with the responder community, providing a life-saving and cost-saving asset to federal, state, and local responders.

The SAVER Program is established and supported by a network of technical agents who perform assessment and validation activities. Further, SAVER focuses primarily on two main questions for the emergency responder community: "What equipment is available?" and "How does it perform?"

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Automated Video Surveillance Assessment and Validation Report

In an effort to provide helpful purchasing and evaluation information about Automated Video Surveillance (AVS) systems, the Space and Naval Warfare Systems Center, Charleston has been tasked by the U.S. Department of Homeland Security, Systems Support Division, to conduct an assessment of seven commercial off-the-shelf AVS products. The fundamental assessment evaluated the ability of AVS products to detect, recognize, and identify a Point of Interest (POI) in various scenarios as well as unique capabilities of the AVS systems. In addition, specific capabilities of AVS products were confirmed in the operational validation. This report focuses on AVS systems for security activities. The full assessment report can be found on https://www.rkb.us/saver.

The assessment and validation of AVS products was conducted based on two needs: (1) the need for an independent assessment and validation of an AVS product's capability and (2) the need to define a process for taking an unbiased look at technology changes, which occur rapidly in the AVS industry.

This study did not recommend or single out a specific AVS product as the "best." Rather, it provides a listing of AVS alarming capabilities and assessed and validated selected features and functionalities for each product.

Background

For the past 15 years, the closed-circuit television (CCTV) industry has utilized AVS technology. CCTV systems use AVS technology to detect stationary and/or moving objects in live video feeds based upon criteria that a user establishes and alerts personnel of preconfigured activity or constraints requiring investigation. AVS systems rapidly digitize the video signal and process the digital video on a dedicated digital signal processing device or personal computer.

Organizations can use AVS Systems to detect objects within a video scene for security, operations, maintenance, and investigation purposes. Generally, AVS systems are used for surveillance in areas, such as marine ports, waterside facilities, airports, warehouses, parking garages, and office buildings.

Assessment and Validation Approach

The primary goal of this assessment and validation was to provide an impartial and unbiased review of the performance capabilities of selected commercial off-the-shelf equipment/systems. Systems, software, or equipment still in the development process was not part of this study. Several AVS products were identified during a market research initiative. This research involved interviewing subject matter experts, attending technical conferences, issuing an industry Request for Information announcement, and conducting an extensive World Wide Web search. The results of this market research are available in the AVS Tools Vendor and Product Catalog report, available at https://saver.fema.gov.

A representative group of vendors were invited to participate in the AVS assessment. Table 1 lists the vendors that participated.

AVS Operational Test Facility

An *Automated Video Surveillance Assessment and Validation Plan* (hereafter referred to as The Plan) was created and utilized for the evaluation of AVS products in actual field conditions. The Plan was implemented at a government-owned test facility that provided an environment for the assessment of large-scale AVS systems, or smaller stand-alone AVS platforms. Figure 1 shows the test facility.

Table 1. Participant Information

Company	Address	Website	Product
Cernium Corporation	1943 Isaac Newton Square Suite 200 Reston, VA 20190	www.cernium.com	Perceptrak®
ioimage Ltd.	109 S. Woodrow Lane Suite 700 Denton, TX 76205	www.ioimage.com	Total Track
Lenel Systems International	1212 Pittsford-Victor Rd. Pittsford, NY 14534	www.lenel.com	IntelligentVideo Environment™
Magal Security Systems Ltd.	43180 Osgood Rd. Fremont, CA 94539	www.magal-ssl.com	DreamBox
Nice Systems	301 Route 17 North 10th Floor Rutherford, NJ 07070	www.nice.com	NiceVision®
SYColeman Incorporated (L3 Communications)	241 18th Street S. Crystal Square #4 Suite 900 Arlington, VA 22202	www.sycoleman.com	Praetorian Intelligent Surveillance Systems
VistaScape Security Systems	5901B Peachtree-Dunwoody Rd. Suite 550 Atlanta, GA 30328	www.vistascape.com	Site IQ

Figure 1. AVS Operational Test Facility (OTF)

The AVS OTF location presented operational and realistic advantages for supplying useable video content for the AVS product assessments. Vehicles on nearby roadways, maritime traffic, and human activity near trees and fenced areas were available for image capture on a CCTV system.

Due to considerations illustrated in the report, live video was used for all assessment activities. For record purposes, the live video, as well as the output of the AVS products, was recorded for post assessment review.

Information on the standard equipment components at the AVS OTF is contained in the report. All participating vendors were provided individual facilities at the OTF.

AVS Video Analysis Capabilities

AVS products vary in their ability to recognize and automate alarm events. An alarm event is a predefined visual or audible notification detecting a Point of Interest (POI) that an operator must acknowledge. Based on video analysis capabilities, the performance of the AVS products were categorized as *standard*, *advanced*, and *unique*. Descriptions of each capability can be found in the full report.

The seven vendors completed product questionnaires to document the capabilities as claimed by each of the participating vendors. All products evaluated had *standard*, *advanced*, and *unique* capabilities.

Assessment Process

Capabilities in assessing the AVS systems included the ability to analyze video and to detect, recognize, identify, and track a POI. AVS systems work by comparing video frames; differences in these frames are analyzed for the generation of alarms. Video frames are composed of small picture elements referred to as pixels. The AVS systems analyzed the variations of these unique pixels along with adjacent pixels when compared to the previous image to determine when an alarm should be sounded. The fundamental process of analyzing AVS systems was broken down into the following:

- Detection – Pixel Cluster Analysis

- Recognition – Aspect Ratio and Categorization

- Identification – Color, Contrast, and Resolution

- Tracking – Direction and Velocity

- Analyzing – Specific Analysis.

Applications

Based on the requirements identified by emergency responders and a wide variety of security officials, the following applications were considered in the assessment and validation of the AVS systems:

- Perimeter surveillance

- Vehicle surveillance

- Internal building surveillance

- Waterside surveillance.

Assessment and Validation Findings and Results

The fundamental assessment consisted of scenarios designed to evaluate limitations of specific criteria (size, movement, and contrast) used in an AVS system to detect, recognize, and identify a POI. In the assessment, all products were equally adept at detecting an upright POI, dressed to contrast with the surrounding environment, and moving across the scene (parallel) of the camera's field of view. In comparison, by moving towards (perpendicular) the camera, a camouflaged, upright POI was able to evade detection more easily due to less contrast and movement in the digitized image.

The scenarios used for recognition, identification, and tracking required the different systems to demonstrate unique capabilities. For example, the Lenel system demonstrated the ability to recognize the difference between a human and a canine and identify a person based on the color information obtained from their clothing. Another system was able to independently track (autonomous—no helper camera needed) a POI with a Pan-Tilt-Zoom camera.

The operational validation was specifically designed to target various capabilities of AVS systems based on specific indoor and outdoor applications. Scenarios included fast moving vehicles, abandoned objects, loitering, and small thrown objects. All of the AVS systems performed well in transportation and fence line applications.

All the data generated in this report were based on a careful review of recorded video and post assessment discussions with vendors. The findings are unique to the environment, equipment, time of year, and lighting conditions of the AVS test facility location. The results and findings clearly indicate AVS products are a viable method of internal and external facility protection. The results listed in table 2 indicate the AVS systems that met the established criteria for each scenario. The results are divided into categories related to the type of applications used for AVS systems.

The full assessment results are available in the assessment report located on the SAVER Web site.

For information on this and other technologies being assessed by the SAVER Program, visit the SAVER Web site at https://www.rkb.us/saver.

Table 2. Assessment Results

Operational Categories	Scenarios	Cernium	ioimage	Lenel	Magal	Nice	SYColeman	Vista Scape
Fence Line/Object Size Applicartion	Fence Line/Softballs	✓	✓	✓	✓			✓
	Fence Line/Boxes	✓	✓	✓	✓	✓	✓	✓
Multiple Applications	Multiple Scenario	✓	✓	✓	✓			✓
Indoor Applications	Tailgating	✓		✓	✓			
	Non-Tailgating	✓	✓	✓	✓	✓	✓	✓
	Distress	✓	✓	✓	✓	✓	✓	
	Loitering	✓		✓	✓	✓	✓	✓
	Abandoned Object by POI		✓					
	Abandoned Object Appears	✓		✓	✓	✓	✓	
Transport Applications	Vehicle/Person	✓	✓	✓	✓	✓	✓	✓
	Excess Speed	✓	✓	✓	✓	✓	✓	✓
	Waterside		✓	✓	✓	✓		✓