



STANDARDIZED UXO DEMONSTRATION SITES

AUTOMATED PERFORMANCE SCORING SYSTEM

RESPONSE STAGE

The response stage scoring evaluates the ability of the system or sensor to detect emplaced targets without discriminating ordnance from other anomalies. The user provides the location and signal strength of anomalies that may warrant further evaluation and/or processing as potential ordnance items. This list is generated with minimal processing, representing the most inclusive list of anomalies.

DISCRIMINATION STAGE

The discrimination stage evaluates the ability of the system or sensor to correctly identify ordnance and reject clutter based on the list developed during the response stage. A discrimination stage list is generated that contains the output of algorithms applied in processing. This list is prioritized based on the users' determination that an anomaly location is likely to contain ordnance. It is the application of a signal processing algorithm or human judgment to response stage data that discriminates ordnance from clutter. This stage identifies anomalies and ranks them as ordnance, clutter or background returns. The demonstrator then ranks them in priority with ordnance being the highest and background signals as the lowest.

For both stages, the probability of detection (P_{det} ; where $P_{det} = \text{No. of detections}/\text{No. of emplaced ordnance in test site}$) and false alarms are reported as receiver-operating characteristic (ROC) curves. ROC curves plot P_{det} vs. background alarms. False alarms are divided into anomalies that correspond to emplaced clutter items, measuring the probability of false positives (P_{fp}) and those that do not correspond to any known items, the background alarm rate (BAR) or probability of background alarm (P_{ba} ; where $P_{ba} = \text{No. of background alarms}/\text{No. of empty grid locations}$). The user is also scored on efficiency (E , where $E = P_{det} \text{ Disc } (t \text{ Disc}) / P_{det} \text{ Res } (t_{min} \text{ Res})$) and rejection (R_{fp} ; where $R_{fp} = 1 - [P_{fp} \text{ Disc } (t \text{ disc}) / (P_{fp} \text{ Res } (t_{min} \text{ Res}))]$ ratios, which measure the effectiveness of the discrimination stage processing. Efficiency measures the amount of detected ordnance retained after discrimination, while the rejection ratio measures the fraction of false alarms rejected. Both measures are defined relative to the entire response list. Results are then posted to a performance scoring report.

PERFORMANCE SCORING SYSTEM

Demonstrators submit their raw data prior to leaving the test site. Demonstrators then have 30 days to manipulate their data and develop the detection and discrimination reports and priority lists in accordance with the procedures contained in the Standardized UXO Technology Demonstration Sites Handbook found on the UXO Web site (www.uxotestsites.org). The reports must be electronically submitted

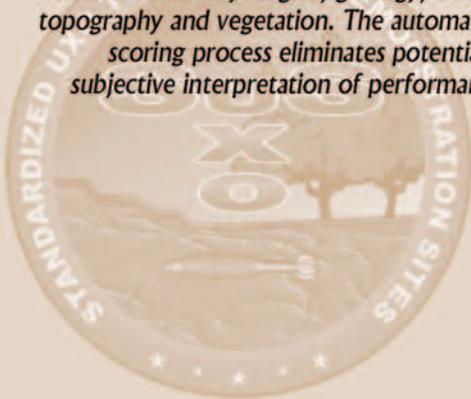


SCIENTISTS EVALUATE DETECTION AND DISCRIMINATION UNDER REALISTIC SCENARIOS.

Automated Performance Scoring System

The Standardized UXO Technology Demonstration Sites Program uses an automated scoring system to provide objective analysis of sensor and system performance during both the response and discrimination stages of operation.

Performance in the calibration, blind grid, open field and challenge areas are all recorded and scored using a computer program that compares electronically submitted data against ground truth data. Detection and discrimination are evaluated under realistic scenarios that vary targets, geology, clutter, topography and vegetation. The automated scoring process eliminates potentially subjective interpretation of performance.



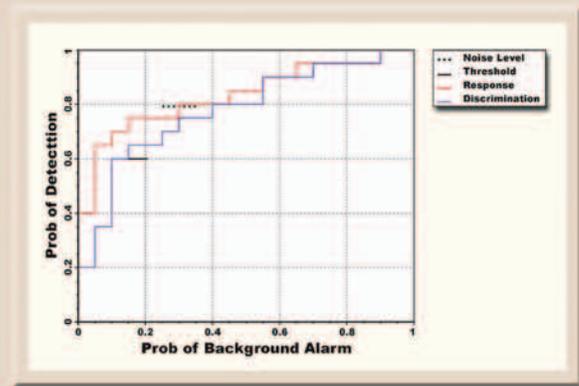
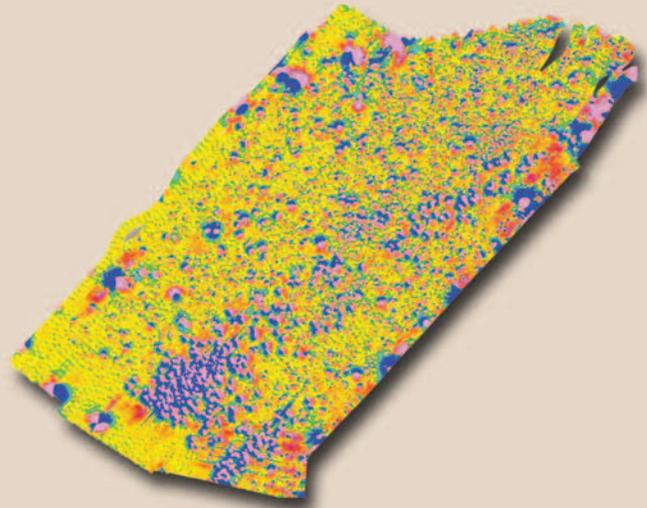
by the end of the 30-day period. The demonstrator's data is entered into an automated performance scoring system that compares the submitted results against the known ground truth to generate the Performance Scoring Report. The report is posted to the UXO Web site and available to users and stakeholders. Standardizing and automating the process allows for objective scoring, analysis and comparison of the data.

Comparisons

Standardization of site attributes and the automated performance scoring system allow for comparisons in several categories. Results can be compared between test scenarios (Blind Grid, Open Field, and Site Specific Scenarios) in order to determine if the feature introduced in each case has a degrading effect on the system performance. Comparisons can also be made on standard versus non-standard targets, between scored areas, across different technologies or platforms and from site-to-site.

Doing Business with the Program

Access to the site may be gained through referencing site use in a Strategic Environmental Research and Development Program or Environmental Security Technology Certification Program proposal or through the Environmental Quality Technology program. Prospective users may also elect to pay for the usage of the sites themselves. To request the use of a site, prospective user must submit an application 60 days prior to the desired demonstration date. The application is available at www.uxotestsites.org. The user must also submit a demonstration plan, including field operations, equipment description and quality assurance/quality control plans, 30 days in advance of the desired demonstration date. Final approval authority rests with the program manager.



	YPG Blind Grid	YPG Open Field	YPG Site Specific	YPG Electric Overhead	YPG Electric Underground	YPG Cluster Clouds	YPG Dismal	YPG Dismal Extreme	YPG Dismal Fence	YPG Dismal Grass	YPG Dismal Overhead	YPG Dismal Underground	YPG Dismal Cluster Clouds
01 APG BG	X	X	X	X	X	X	X	X	X	X	X	X	X
02 APG OF	X	X	X	X	X	X	X	X	X	X	X	X	X
03 APG Moqals	X	X	X	X	X	X	X	X	X	X	X	X	X
04 APG Woods	X	X	X	X	X	X	X	X	X	X	X	X	X
05 APG Wet	X	X	X	X	X	X	X	X	X	X	X	X	X
06 APG Electric Overhead electric Lines	X	X	X	X	X	X	X	X	X	X	X	X	X
07 APG Grass of Pal	X	X	X	X	X	X	X	X	X	X	X	X	X
08 APG Fence	X	X	X	X	X	X	X	X	X	X	X	X	X
09 APG Cluster Clouds	X	X	X	X	X	X	X	X	X	X	X	X	X
10 YPG BG	X	X	X	X	X	X	X	X	X	X	X	X	X
11 YPG OF	X	X	X	X	X	X	X	X	X	X	X	X	X
12 YPG Moqals	X	X	X	X	X	X	X	X	X	X	X	X	X
13 YPG Dismal Extreme	X	X	X	X	X	X	X	X	X	X	X	X	X
14 YPG Fence	X	X	X	X	X	X	X	X	X	X	X	X	X
15 YPG Grass	X	X	X	X	X	X	X	X	X	X	X	X	X
16 YPG Electric overhead	X	X	X	X	X	X	X	X	X	X	X	X	X
17 YPG electric underground	X	X	X	X	X	X	X	X	X	X	X	X	X
18 YPG cluster clouds	X	X	X	X	X	X	X	X	X	X	X	X	X

