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DHS Science and Technology Directorate
Screener's Auto-Diagnostic Adaptive Precision Training (ScreenADAPT) System

DHS needs enhanced X-ray Threat Detection Training (Baggage Screening)

TSA Security Officers (TSOs) are tasked with, among other things, screening every bag boarding commercial aircraft within the United States within one of 7,000 baggage screening areas at over 700 security checkpoints. Baggage screener accuracy is very important, and screeners are required to complete training both before going on the job and while employed, including one-on-one mentoring and software-based training that adapts difficulty based on behavioral response. ScreenADAPT was built as an innovative and adaptive training module that captures eye tracking to capture visual search process measures in addition to behavioral responses. Because so much of visual search and detect happens "in the head", much of what people are considering and basing their decision on are unobservable. ScreenADAPT makes the unobservable – observable by using advances in eye tracking technology. ScreenADAPT further enhances diagnosis deficiencies/inefficiencies in visual search, resulting in individualized training solutions.

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Baggage Screening Training Challenges

Screening is a repetitive visual search task that often has a low probability of encountering a threat, but extremely high consequences if a serious threat is missed. Learning to interpret X-ray images and make sense of their context is a challenging perceptual task, as objects are presented in a different manner than under natural light. Thus, TSOs must learn the distinct combinations of perceptual cues that are indicative of potential threats Learning to identify specific cues, including color, orientation, and spatial location requires extensive training to allow Officers to build up an 'internal image library' that is indicative of threat items. Designing training on only performance outcomes limits the effectiveness, as this often results in extended exposure not necessarily targeted on specific deficiencies/inefficiencies for a particular trainee.

New Training Opportunity

ScreenADAPT leverages a proven framework to deliver an adaptive checkpoint baggage screening training system that uses eye tracking and behavioral threat detection responses, to evaluate trainee skills, and deliver individualized training content and methods in real time to improve training effectiveness and efficiency.

ScreenADAPT Individualized Feedback

ScreenADAPT System

ScreenADAPT is an adaptive training system for threat detection that:

1. Captures 'unobservable' perceptual and cognitive processes in threat detection tasks using eye tracking and behavioral responses,
2. Incorporates eye tracking, and behavioral measures into a diagnostic engine that classifies error patterns based upon gaze patterns, performance outcomes, and image and threat characteristics (e.g., placement, orientation, type of threat; bag clutter) ,
3. Includes two distinct training methods, Exposure and Discrimination training, which are applied to address specific performance errors and provide enhanced engagement in training,
4. Includes a library of cleared bags of varied clutter levels as well as threat items, providing almost endless combinations of imagery sets for training, and
5. Has been validated in the lab to enhance training.

Phase III of ScreenADAPT will include field-based validation studies to show training improvement with TSOs.

Anticipated Benefits from ScreenADAPT

- Increased training effectiveness and efficiency of visual search and detect skills
- Individualized training solution that continually adapts to skills throughout TSO career
- Training solution that can be easily modified to include emerging threats into the threat detection library.
- Trainees that can find threats faster with fewer secondary searches resulting in increased throughput

Homeland Security
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To learn more about Training and Performance Optimization projects, please contact Darren P. Wilson, Program Manager, at Darren.Wilson@hq.dhs.gov.

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