Visual Sensing and Tracking:
Enhanced Battlefield Awareness and Change Detection

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“Tracking is one of the best sources of immediate-use intelligence”, “…information about the enemy that can be put to use immediately.”

Current U.S. Tactical Limitations

The adversary has identified our main weakness; a reliance on vehicle road movement, and uses IEDs or landmines to exploit it.

We have identified a re-occurring weakness of our enemy; the physical emplacement of IEDs or EH (landmines), and in doing so leave behind evidence of footwear impressions, marks, and indicators; on their way into site, activity at the site, and departure.

**Asymmetric Warfare** exploits an enemy’s weakness through strategy and tactics.
Foot patrols enter villages typically avoiding rough terrain due to time, excess equipment, radio communication limitations, and cordon and search operational limits.

They have usually deployed from their vehicles and walk into an area trying to make contact with the insurgents, conducting what the soldiers on the ground have come to call, “movement to ambush.”
Current U.S. Tactical Limitations

U.S. forces attempting to control or limit insurgent activities are often hampered by:

- Slow organizational and operational methodology
- Centralized control
- Large scale unit movements
- Often compromised upon and prior to departure, allowing insurgents time to react
- Slow to react due to their larger unit size
- Tendency to conduct defensive operations over long term in insurgent infiltrated areas
- Activities easily monitored and reported to insurgent network
As pointed out at the JIEDDO Conference April 10-12, 2007 “We need to go back to the basic skills”

Visual Sensing and Visual Tracking, are basic skills that are inherent in every man. Wired into our genetic makeup from the time we were hunter-gathers. –Mark Sexton, VisTA Tracking

With the proper training these skills can be reacquired, honed and utilized by soldiers to identify IED/EH.
Majority of current technology and techniques are academic theory and detection based on technology.

Visual Tracking techniques are proactive and can be implemented immediately by all personnel trained and is a low tech cost effective solution to IED/EH detection.

Detection of IED/Explosive Hazards

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Detection (290 Papers)
- Acoustics: 10
- Nuclear: 14
- Optical: 70
- RF / Radar: 29
- Thz & mm Wave: 30
- Trace Detection: 43
- Other: 36

adapted from the Naval Research Enterprise PowerPoint, 2006
A Persistent Global Threat

The threat form IED/EH has been around since the advent of Modern warfare and explosives. The threat is Global and persistent. From January to November 2011 the IED/EH incidents worldwide (excluding Afghanistan and Iraq) were:

- 6,832 or about 621/month
- 12,286 casualties
- Support and conducted by individuals Affiliated or members of regional, transnational terrorist or “threat” networks
- 49 incidents and 29 casualties were in the United States

Source: JIEDDO
Information: The Ultimate Weapon

- The most reliable intelligence in a given area is from the soldier there on the ground, on patrol

- Every Soldier is an information collector

- Visual Sensing provides the critical ingredient needed to paint the intelligence picture

Visual Sensing Training teaches soldiers techniques on seeing indicators in the environment of enemy activity and how to perceive and interpret them.

It is enhances cognitive ability and perceptual abilities.
BOYD’S OODA LOOP APPLIED TO VISUAL SENSING

TO DECREASE OUR DECISION CYCLE IN RELATION TO THE ADVERSARY WITHOUT RADICALLY CHANGING OUR CURRENT COMMAND STRUCTURE:

- REQUIRES US TO BREAK THE ADVERSARY OPERATIONAL CYCLE INTO PARTS

- GO THROUGH THE CYCLE FASTER THAN THEIR SMALLER COMPONENTS TACTICALLY!

- VISUAL SENSING TRAINING GETS SOLDIERS INTO THE OBSERVE PHASE OF THE OODA LOOP FASTER

- OBSERVATIONS AFTER VISUAL SENSING TRAINING WILL BE MORE ACCURATE AND CONSISTENT
Visual Sensing Training

Visual Sensing training instructs soldiers in techniques that are:

- Based on developing inherent sense of Sight and Observational and cognitive ability
- cost-effective
- multi-environmental and multi-mission
- Practical and usable in different theaters
- Apply in varying roles depending on the specific operational requirements

Visual Sensing Training augments the proper use of optics, night vision, and thermal devices
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Visual Sensing Training

EVERY SOLDIER A SENSOR

Visual Sensing comprised of Visual Tracking and Advanced Observational Techniques is an activity that requires a concentrated, constant and cohesive use of human senses; sight, hearing, touch, smell and intuition.

Intelligence personnel can apply Visual Sensing in imagery analysis, HumInt operations, collection, and ISR (UAV and Sensor) tasking's.
Visual Detection

• A high percentage of explosive hazards are identified by unaided visual detection.

• VisTA Tracking Services recommends the incorporation of Visual Sensing training to increase the soldiers capability to recognize changes in the environment and better detect and avoid IED and explosive hazards (EHs).
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INDICATORS (SIGN) SURVEY AREA

PROXIMAL AND DISTAL INDICATOR(S) (SIGN) SURVEY AREA

Search for Indicators from the ground to head height 360 degrees

HEAD HEIGHT

PROXIMAL INDICATORS

0-6 FEET

DISTAL INDICATORS

6-45 FEET

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VISUAL SCANNING “S” METHOD
Look ahead out to 30-45 feet
Instructor and student conduct visual sensing scanning techniques

Student and instructor continue change detection lane exercise

Instructor asks student to identify and point out specific environmental change

Instructor points out missed environmental change to student and explains what and where it is

Instructor verifies and reinforces students correct identification

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We can only be aware of changes we detect.

Change that has occurred and we have not noticed cannot inform us as to our ability to see or observe change, and be used to educate or modify our behavior.

IN OTHER WORDS; LEARNING HAS NOT TAKEN PLACE!
To teach change detection and overcome the paradox of unknown change a specially trained instructor in visual change detection and techniques are used.

Student Instructor interaction creates a feedback loop

Validates to the instructor that the student is and can identify environmental change
The instructor and student are paired together during the training on the lane.

Communication between Instructor and student create the feedback loop that drives student training.

The Instructor is able to change student awareness (behavior) in change detection by knowing what the student does or does not see.
The instructor points out environmental baseline normal states and change indices to the student, who then acknowledges seeing the normal or change indices by verbally describing and point directly to the indices.

The instructor then verifies and reinforces by describing and explaining to the student indices the student misses or does not identify.

This student and instructor feedback loop continue for the entire duration of the Change detection Lane.
This methodology of using specific change detection training lanes precisely laid out and with instructors using the feedback method of instruction is the most effective method for teaching visual sensing and change detection for IEDs.
Visual Sensing

- Trains individuals in the observational skills and change detection capability of Visual Trackers.

- Emphasis is different from visual tracking

- Focus is less on shoe prints and sign to follow as a tracker

- Visual Sensing is to detect change from environmental baseline due to IED activity
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Disturbance from environmental baseline from IED emplacement

2 meter wide by 25 meter long training lane
• 1 meter by 1 meter square

• Average ground cover of baseline vegetation versus open ground

• Training lane will reflect average of ground cover for operational environment
TRAINING METRICS ARE TO IDENTIFY BY VISUAL SENSING IED EMPLACEMENT CAUSED DISTURBANCE TO ENVIRONMENTAL BASELINE

- WITH OPTICS
- UNAIDED EYE

Disturbance from environmental baseline from IED emplacement
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Visual Sensing Three Day Training Course Subjects

• Day one
  – What is Visual Sensing
  – Environmental Baseline and Indices
  – Ambient Sign
    • Footprints full/partial, vehicle tracks
  – Visual Sensing Lanes
    • Ground, Vegetation Lanes
Visual Sensing Three Day Training Course Subjects

• Day Two
  – IED *Ground* Indices
    • Shape, shine, contrast, texture, color
  – IED *Device* Indices
    • Disguised Devise; covered, hidden
    • Exposed Components; full and partial
  – Visual Sensing Lanes
    • Footprints and IED devices and components
    • Ground, Vegetation Lanes
Visual Sensing Three Day Training Course Subjects

• Day Three
  – IED Ground Indices and Site Exploitation
  – Advanced Observation Techniques
  – Visual Sensing Detection Lanes
    • Disguised Devise; covered, hidden
    • Exposed Components; full and partial
  – Visual Sensing Lanes Complex Ambient Sign
    • Footprints and IED devices and components
    • Ground, Vegetation Lanes
VISUAL SENSING AS TARGETING AND F3EAD CYCLE
Find, Fix, Finish, Exploit, Analyze, Disseminate)

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Where can we theoretically expect to locate sign?

The physical area where the abilities and resources of the trackers intersects that of the subjects disturbance to the environment overlap.

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Physical location of track and sign of Subject and Visual Trackers abilities and resources for detection.

Visual tracking skill
Terrain and weather
Number of Personnel/resources

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VISUAL SENSING:
TRAIN ON WHAT, WHERE AND HOW TO LOOK FOR INDICATORS SUCH AS FOOTPRINTS/SIGN, AND IED/EH

This is why visual sensing training is so effective. Learning observation skills is the base skill soldiers must acquire and develop to be proficient in all operational environments.

The Tracking Flow Drill is the basic Procedure, and posture key to environmental indicators when conducted properly.
VisTA Sensing Course Capabilities

• VisTA training creates Enhanced Awareness by teaching Visual Tracking and Advanced Observation Techniques

• Increases survivability and Force Protection as individual and unit on the battlefield /operational environment

• Students are trained to act as a battlefield and environmental sensor (ES2) learning to fully engage their senses instead of relying mostly on technology and limited information “pushed” down from higher echelon intelligence analysts
Advanced Observational Techniques

- Ground change
- “See” into and through vegetation
- Object attenuation
- Visual Scanning techniques
  - Urban and rural
  - Day and night
- Technology aids
  - Night vision devices
  - Thermal
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Enhanced Awareness and Change Detection: Visual Tracking and Advanced Observation Techniques

Force Protection “STAND OFF”

Change Detection
Visual Tracking

VISUAL OBSERVATION TECHNIQUES AIDED AND UNAIDED
Footwear impressions at IED sites may be used to determine the identity of an individual (identification indicators), and are often obvious once looked for.

Tracking the more subtle signs of the IED maker/layers, and then interpreting track and sign will provide more information than just collecting a footwear impression alone.

Combining footwear impression evidence with tracking and track interpretation may allow the visual tracker to determine the actions before, during and after an IED attack or site has been located.
• Visual Trackers identify specific individuals emplacing explosive devices or executing attacks through; track and sign interpretation, biometric evidence, and intelligence collection.

• Visual Trackers follow the enemy to learn his support network – where he came from, what he did while in an area, where he went.
IED/EH INDICATORS

Movement around and through IED scene

• **Direction** - entry and exit points to scene and direction(s) of travel

• **Number** - persons (insurgents)

• **Location** - of scene and insurgents, witnesses, and victims

• **Interpretation Indicators** - action and identification

• **Relative Aging** - use to determine the order impressions occurred

• **Activities** – (stalk, walk, run, injury, etc.)
IED/EH INDICATORS
Movement around and through IED scene (cont’d)

• Litter in conjunction with tracks – wiring, electronics, batteries, clothing, wrappers, etc.

• Blood – if injured

• Associated tracks – vehicle tracks, cars, bicycle, wheel carts, animals, etc.

• Connection between IED attack sites – Insurgents may place one or more IED’s/EH in an area

• “Sign” - subtle disturbances on the ground from a person’s footsteps
Possible accomplice to film, channel, and/or slow vehicle into IED, or innocent bystanders?

INDIVIDUALS GO SEPARATE DIRECTIONS

IED emplacement site

Possible prep/observation area?

Checking road or alternate IED site?

Observation/film, Trigger site?
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IED Layer’s Footprints
Body marks and impressions

Tracks leading away from triggerman site
Paradigm
- Visual Sensing is a cognitive perspective through the use of human senses to detect environmental change; particularly the ground and vegetation ‘signs’ of man to include footprints and litter and Advanced Observation Techniques

Operational Experience
- Understands tactics and strategy of conventional and unconventional warfare (small unit actions)

Pedagogical Method
- Teaching methods instructing students how to detect or see change
- Teaching anticipation and prediction to identify IED/EH and adversary TTPs
Training Approach:

- VisTA instructional methods and system for its Visual Sensing course addresses capability gaps in intelligence, networks, and identification of direct and potential threats as identified by the Joint IED Defeat Organization in the tactical level battle space or operational environment.

- VisTA Visual Sensing course provides training in Visual Tracking and Advanced Observational Techniques to create an enhanced level of awareness and ability to detect environmental change at the tactical level, including identifications of the indicators of Improvised Explosive Devices and Hazards.
Training Approach (cont’d):

- VisTA Visual Sensing training coupled with basic technology gives greater tactical level awareness and can give credence to the US Army tagline “every soldier is a sensor (ES²)”.  

- VisTA Visual Sensing training will aid in the identification of insurgent nodes, links and operational personnel to include; location and physical, human, and social “anchor points” in an operational area, within the scope of the US Army F3EAD framework.
INSTRUCTIONAL APPROACH

**VisTA Tracking Services** approach for training soldiers in Visual Sensing CONUS and OCONUS:

Train soldiers in: 1 day, 3 day, 5 and 10 day course depending on time, operational need, and budgetary constraints.

- Train soldiers in current operational areas.
- Train soldiers in staging areas and in rear areas
- Train active duty soldiers at home base
- Train reserve soldiers at mobilization stations
VisTA Tracking Services Background

- Founded in 2010 to address the gap in observational skills focusing on Awareness and change detection by Mark Sexton who has instructed hundreds of military and law enforcement personnel in these skills since 1998
- Training has evolved from just visual tracking to keep up with US Armed Force's needs and lessons learned in training and on operations
- Experienced in Infantry, Reconnaissance and Surveillance and Special Forces, and deployed and contracted to Afghanistan and Iraq.
- Have trained US forces in Afghanistan and during Pre-mobilization Training (CONUS and OCONUS)
VisTA Tracking Services is capable of providing highly qualified instructors, trackers and other required Subject Matter Expertise to support the development, training and deployment of specialized visual tracker training for Improvised Explosive Device (IED)/EH detection and exploitation.

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