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**UGLARES: Hostile Optics Detection System for IED  
 Attack Anticipation**


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 Hostile IEDs - A Forum on Improvised Explosives Devices  
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Canada


**Context & Rationale**

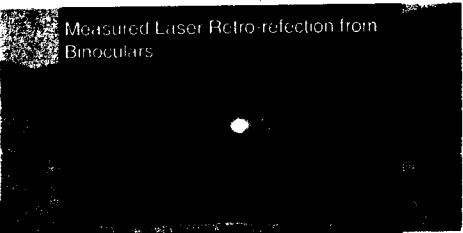
- IEDs
  - Difficult to detect & defeat despite state-of-the-art technology
  - Observers play central role in IED usage, preparation of attacks
  - Observation fundamental to insurgents information gathering
- Detection of hostile optical devices helps
  - Anticipate attacks
  - Increase available reaction time
- UGLARES: Urban Gated LAser REtroreflection Scanner
  - EO sensor for *on-the-move* detection of hostile optical devices
  - *Eye-safe* retro-reflection
  - Not fine-tuned for any particular IED configuration
    - Equally applicable to most IED technologies
  - Prevention, detection by anticipation of pre-attack event sequence

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**Input Scene, Target Result**


■ **Efficiently detect hostile optics systems from this...**

Measured Laser Retro-reflection from Binoculars



Note: Green = safest, Red = riskiest.


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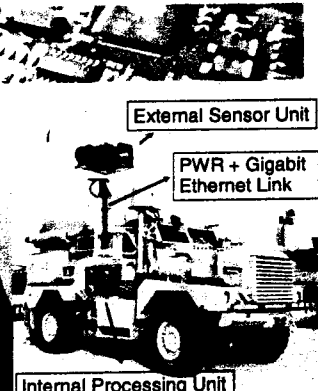

**Challenges**

The technique is well known and mature however ...

- **Unconstrained environment**
  - Small signal returned by the optics of interest
  - Improved signal to noise ratio
  - Low false alarm rate
  - Large background noise
  - Monotonal scenes (in VIS spectrum)
- **Mobile system & dynamic scene**
  - Wide field of view → fast scanning
  - Finite scene lifetime, emergency
  - Hard real-time execution
- **Little *a priori* information available**
  - No training data → no learning
- **Eye safe**
- **Human machine interface (HMI)**
- **Geo-localization of threats**

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**External Sensor Unit**


**PWR + Gigabit Ethernet Link**

**Internal Processing Unit**



- TRL 6
- Industrial or mil-grade components
- MIL-STD-810F
- Active cooling
- Simple 2-cable interface
- ~50 x 40 x 30 cm


**A 3-Phase Process**



- **Environment analysis**
  - Reduction of scanning/processing time
  - Goal: Inspection of < 30% of scene (typical)
  - Detection of significant, high-risk areas in FOV
    - Windows, doors and roofs
    - Vehicles, bushes, towers, hiltops, etc.
- **Interrogation of high-risk areas**
  - Obtain, analyse active gated camera image
  - Process image, FAR reduction
- **Logging, warning & display**
  - FAR reduction
  - User feedback

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**Environment Analysis & Scene Scanning**

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**Operating Modes**

- **Automatic**
  - System continuously loops through all 3-phases of process
- **Manual**
  - User points at region of interest
  - System cycles through phases 2 & 3
- **Deep Scan**
  - Phase 1 is skipped; all areas are considered high-risk
  - Available when vehicle is idle

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**User Interface**

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**Conclusion**

- A preliminary version of UGLARES was successfully tested in October of 2008:
  - Afghan like environment.
  - Typical optical systems, and
  - Ranges varying between 50m and 1350m.
- The current version will be tested this summer.
  - Assess the effectiveness of UGLARES to vehicle survivability.
  - Technical / tactical evaluation w real operators.

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