

Multispectral Imaging of Concealed Explosives

Presented to ADSA14

**Presented by
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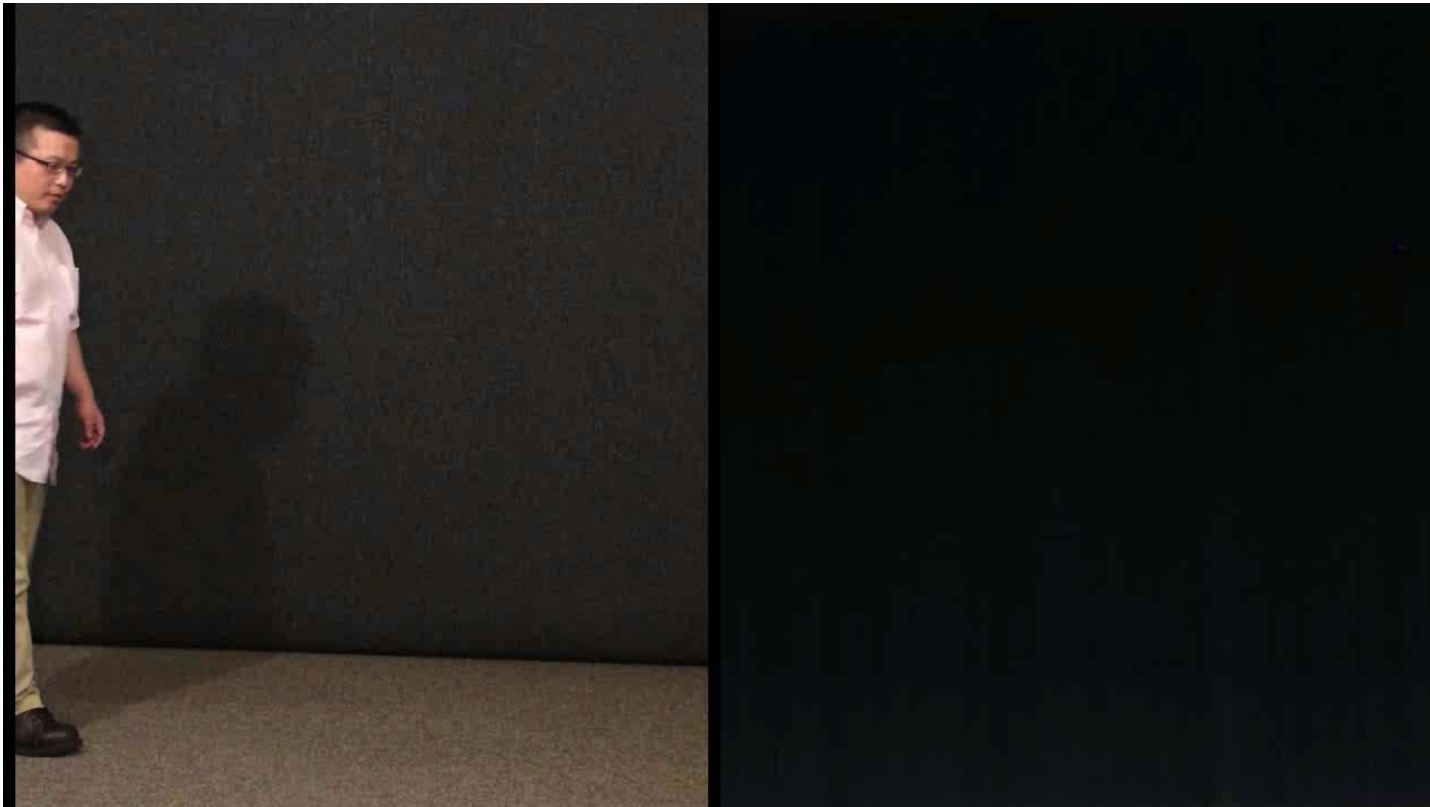
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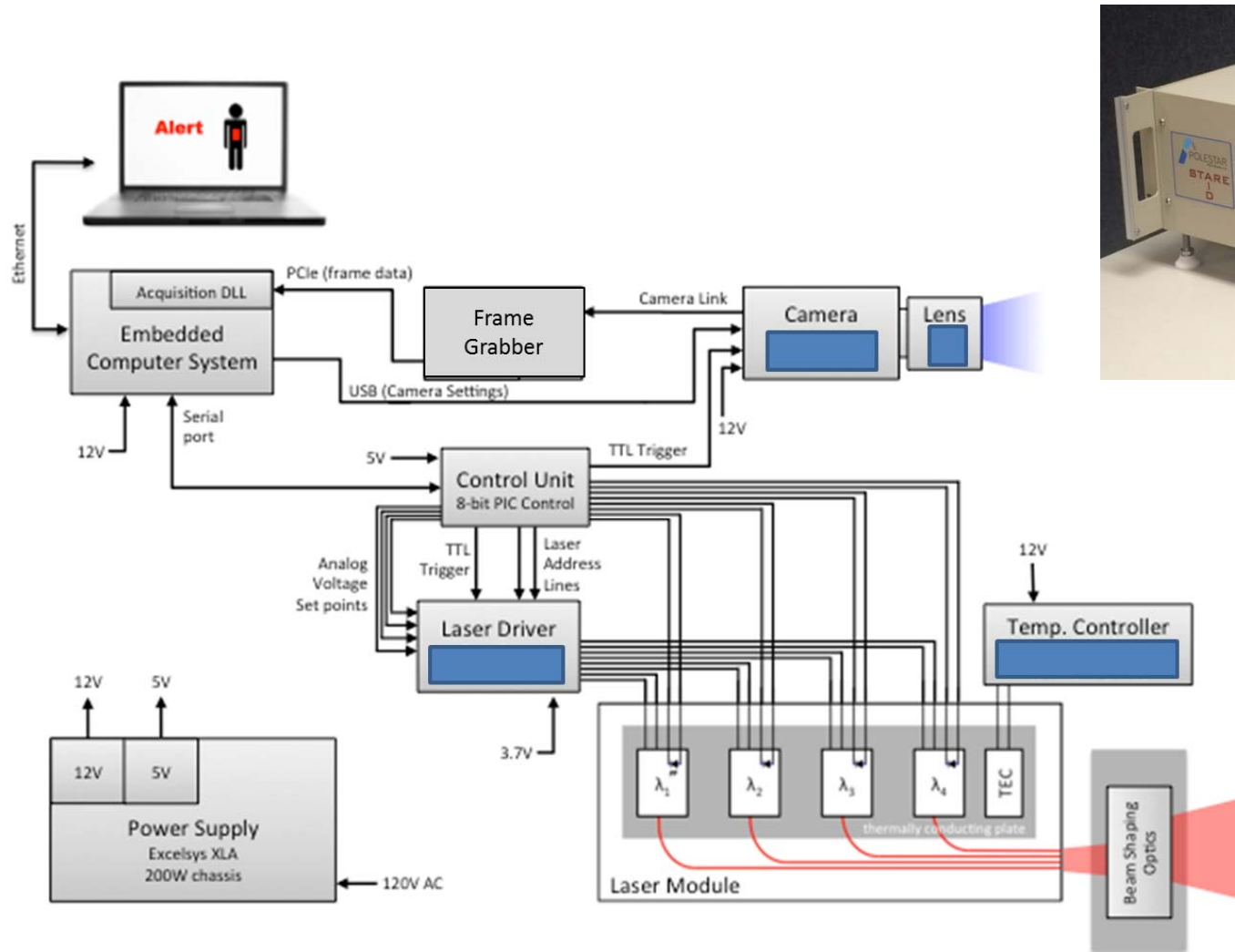
May 11, 2016

So what? Who Cares?

- What space/topic/area is being addressed? **Passenger inspection.**
- What problem have you solved? **Stand-off detection and identification of concealed explosives.**
- How have you solved the problem? **High-speed multispectral imaging in region outside the visible range where cloth does not absorb.**
- So what? Who cares? **An ability to locate and identify concealed threats without disrupting the normal flow of activity will improve safety without adding additional delay.**

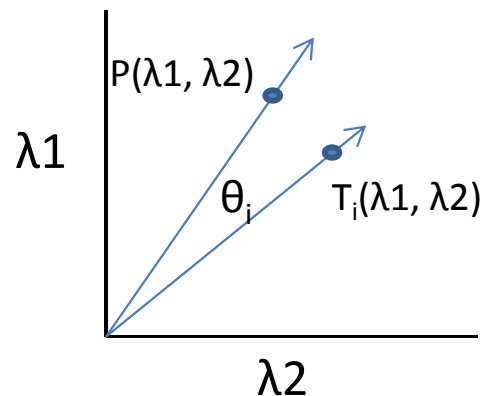


STARE System Block Diagram



The STARE Process

1. Sequential λ illumination and image capture
SOD 3-20m, @20 m FOV 3.8 x 2.9m, GSD 12mm
2. High-speed image transfer
3. Feature extraction
4. Pixel-by-pixel vector-based matching filter analysis
for threat detection and identification



$$\cos \theta_i = \frac{P \cdot T_i}{|P|}$$

5. Threshold on $\cos \theta$, $|P|$ and contiguous nature of threat
6. Red-scaled image showing threat locations and probable types

- Can detect both military and home-made explosives
TNT, DNT, C4, PETN, RDX, HMX, AN, TATP, HMTD
- Probability of detection >90% based on independent testing
- Demonstrated ability to spectrally differentiate explosives from 70+ common clutter agents (*e.g.*, foodstuffs, plastics, wood)
- Can detect and identify threats through multiple layers of cloth and packaging materials
- Detection limit ~ 5g
- Detection rate 8 frames per second
- Can detect on moving subjects (1 meter per second)
- Does not require subjects' cooperation
- Does not alert subject that interrogation is being performed
- Eye safe (IEC 60825-1 2007, FDA Title 21 part 1040.10)
- No ionizing radiation source
- No privacy concerns

Special thanks to the following groups for contributing to Polestar's development of the STARE system

