# Fusion for DoD Applications
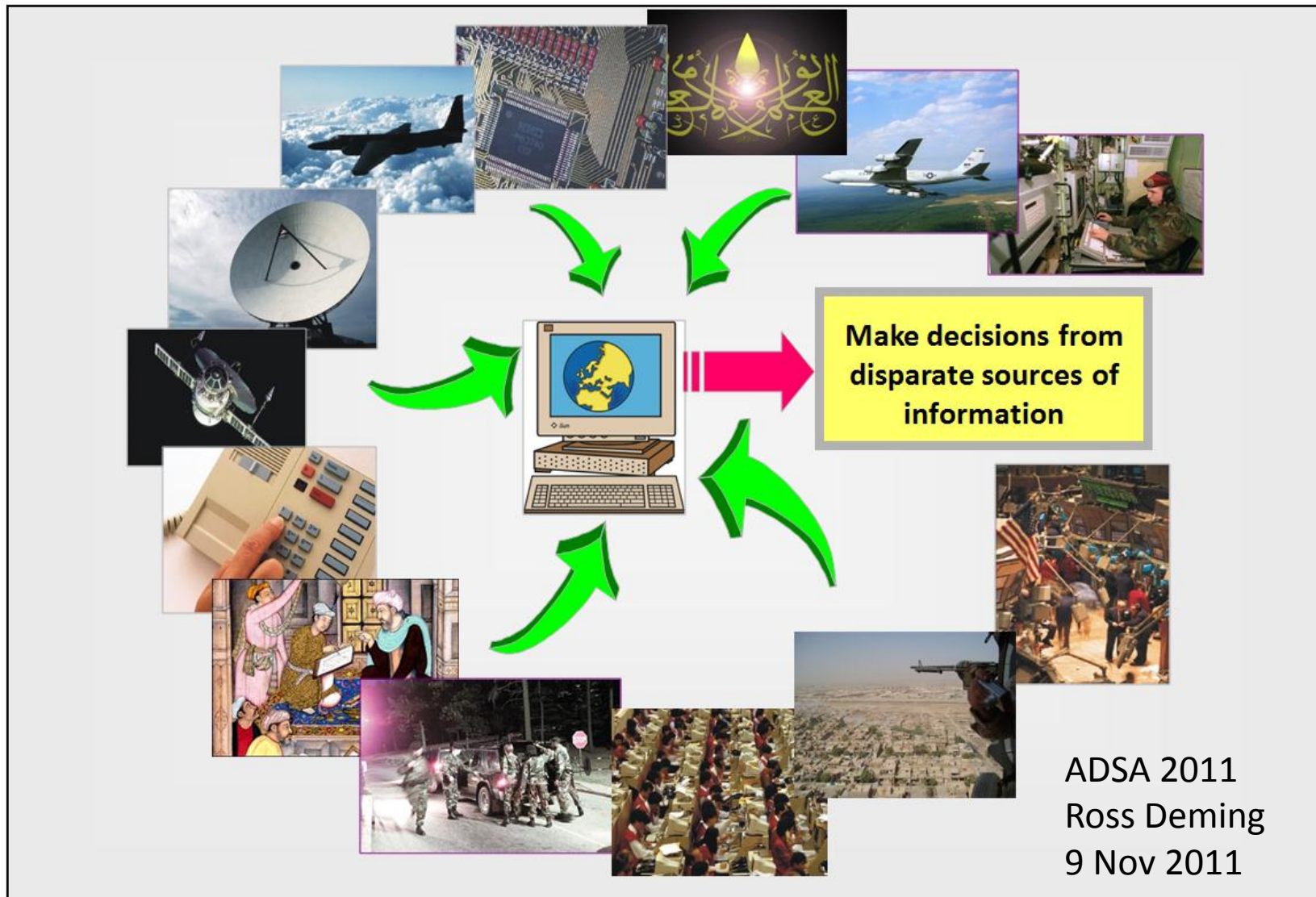


Make decisions from disparate sources of information

ADSA 2011
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# Information Overload

-  We are "awash" in data, e.g.,

- **Radar**,

- **EO/IR**,

- **Low Frequency EM Induction**,

- **Intel reports**,

- **SIGINT, etc**.

-  A huge fraction of this information is never exploited, since there can never be enough man-power for human analysts to keep up.

# Information Overload

- Must better utilize computers to ease the burden on analysts:

- **provide analysts with tools to increase productivity**,

- **automatically "flag" suspicious activities**,

- **make complicated decisions**,

- **train a computer to "think" like a human (only faster)!**

**Intriguing Idea**: we can sometimes make great decisions based upon mediocre information if we have lots of independent sources.

**Think of "Bones"!**

Sensor #1

Sensor #2
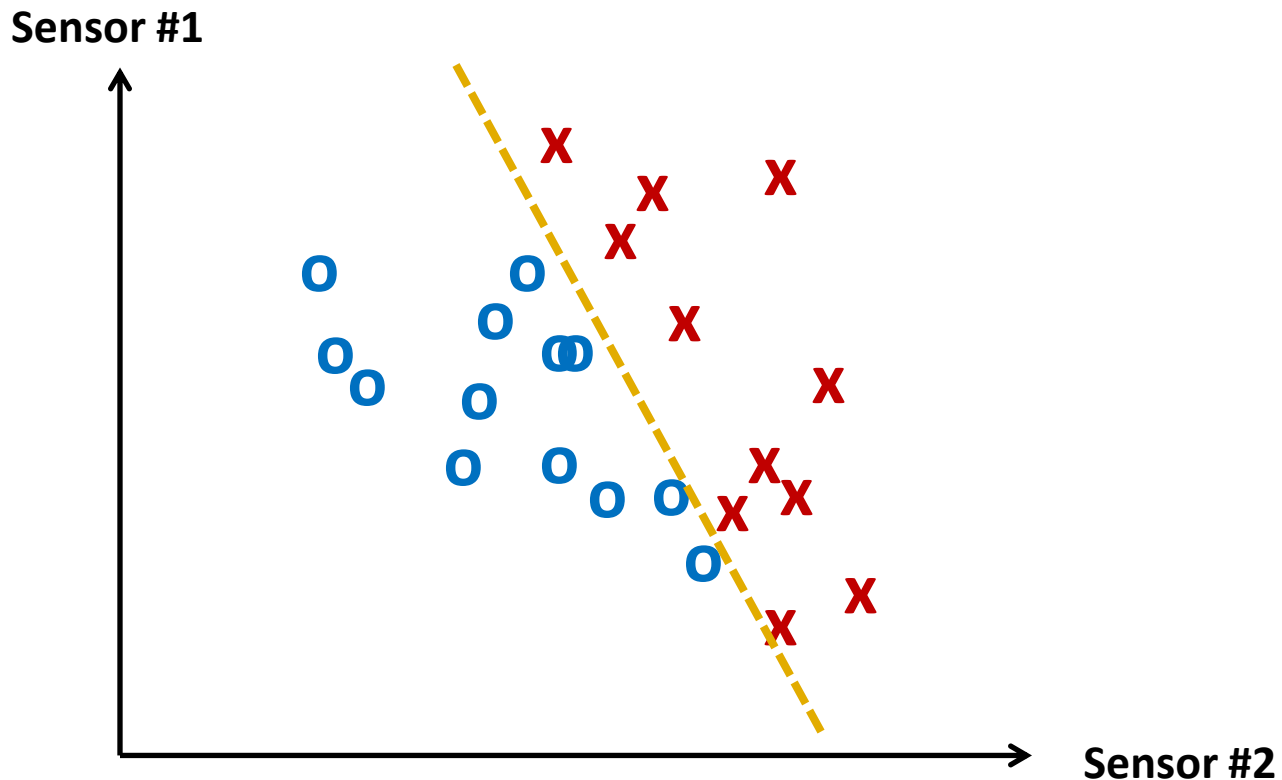
**Adding dimensions increases class separation**

# Specific DoD Applications for Fusion

- Concealed weapon detection,

- Cargo inspection,

- Roadside IED prevention,

- Ballistic missile defense,

- De-mining, locating unexploded ordnance,

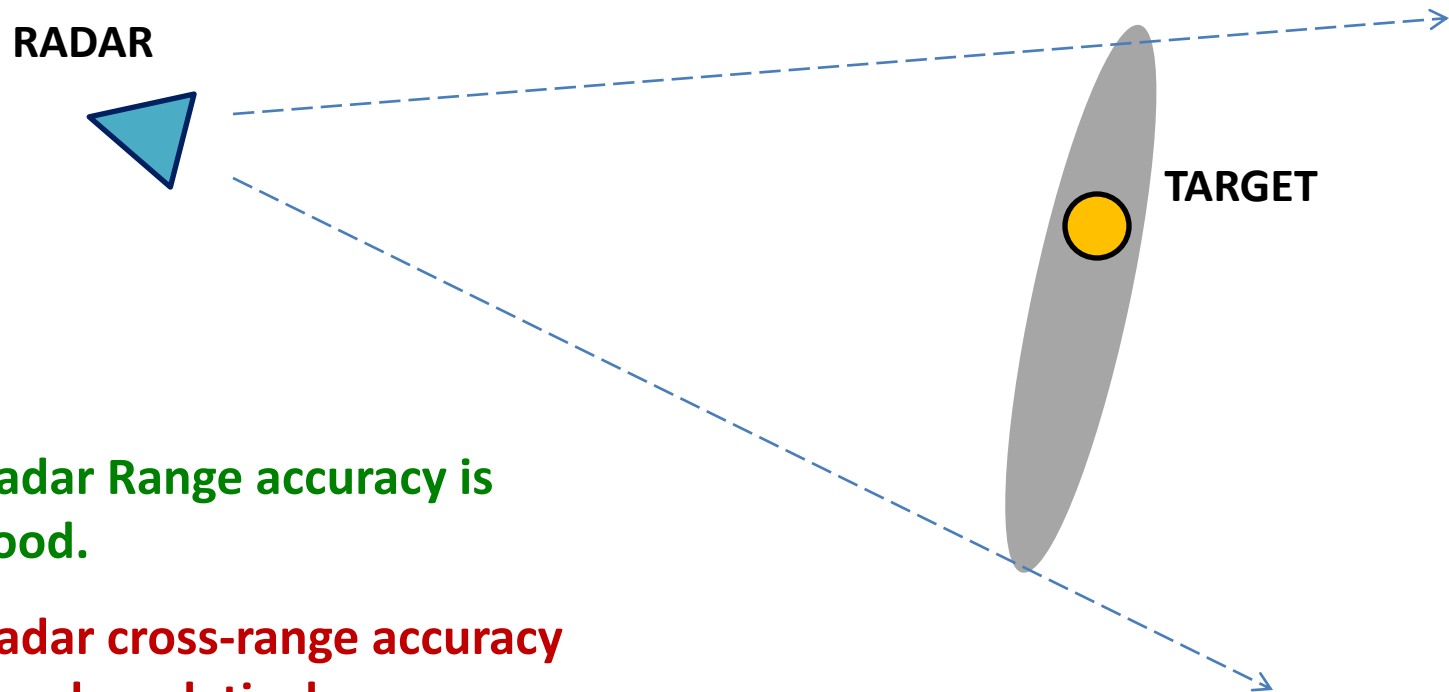- Uncovering networks of insurgents.

- …many more....

# Fusion Example #1

- Different sensors may yield complementary information which can be used to reduce false alarms.
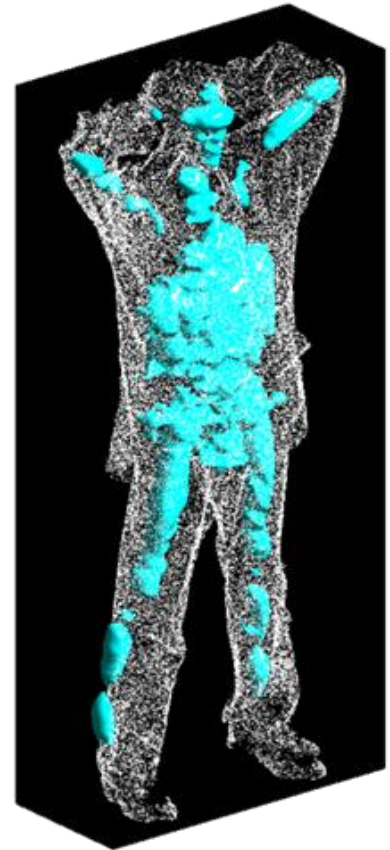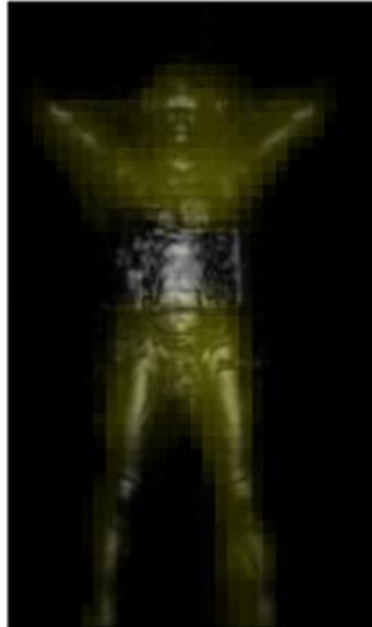
# Fusion Example #2

- Improve tracking accuracy by exploiting orthogonality of different sensors.
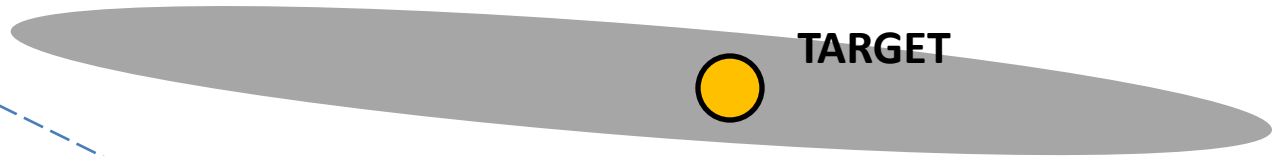
RADAR

TARGET

**Radar Range accuracy is good.**

**Radar cross-range accuracy may be relatively poor.**

# Fusion Example #2

- Improve tracking accuracy by exploiting orthogonality of different sensors.

**EO/IR CAMERA**

**TARGET**

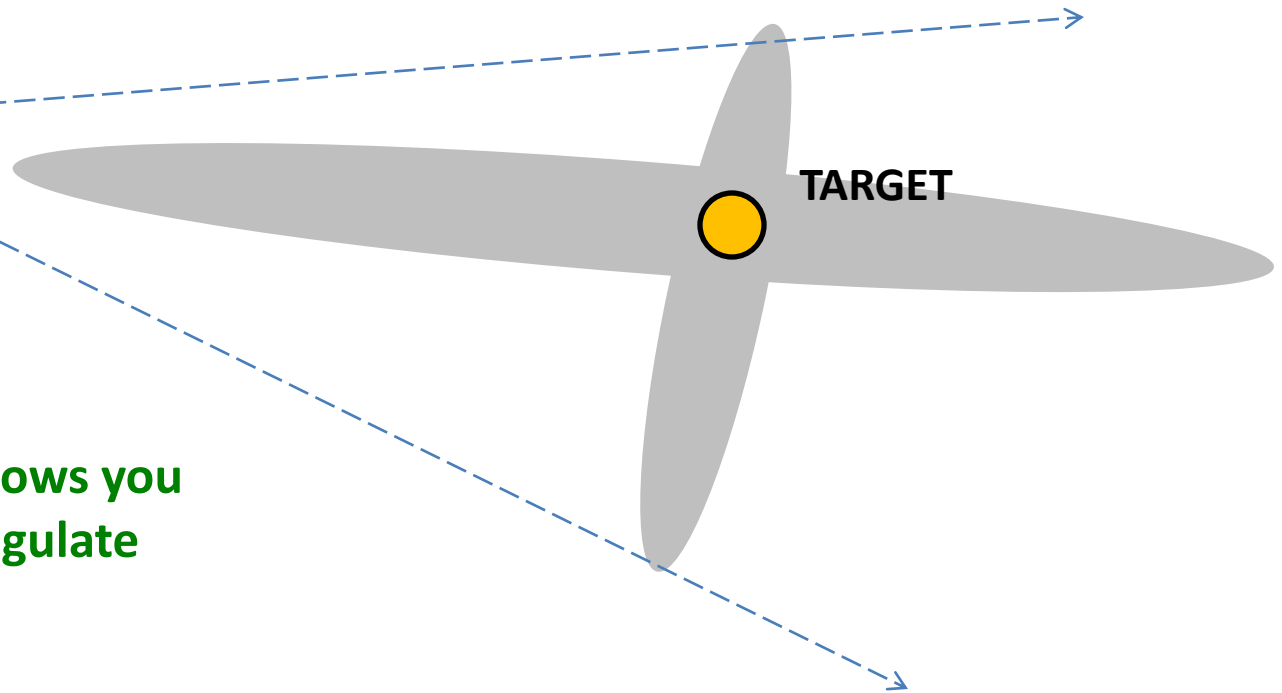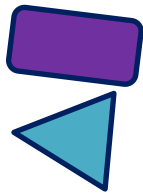**EO/IR gives no range measurement.**

**EO/IR cross-range accuracy is excellent.**

# Fusion Example #2

- Improve tracking accuracy by exploiting orthogonality of different sensors.
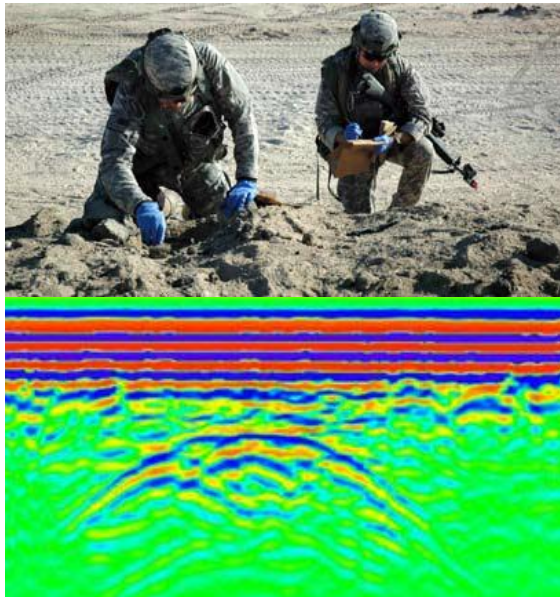
**RADAR + EO/IR**

**TARGET**

**RADAR + EO/IR allows you to accurately triangulate target position.**

# Fusion Example #3

- **Huge Problem!** How can we perform fusion for IED Detection and Prevention?

**Local sensor data**

**Wide Area Surveillance**

**Intel**

# Major Challenges in Fusion for DoD

-Data Association
- combinatorial explosion!

-Feature Extraction
- How to quantify subtle information?

-Integration of disparate information
- e.g., text with sensor data.

-Development of Models
- Incorporate prior knowledge and human understanding.

-Queuing/scheduling sensor resources
- e.g., large scale surveillance can queue cameras.

- How can we get researchers access to classified/sensitive information to develop and test algorithms?.

# Questions?