

Biometrics: Calibration and Systems Engineering

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Army-Contract MOIE

The logo for the MITRE Technology Program, featuring a stylized graphic of stacked blocks in yellow, orange, and blue to the left of the text.

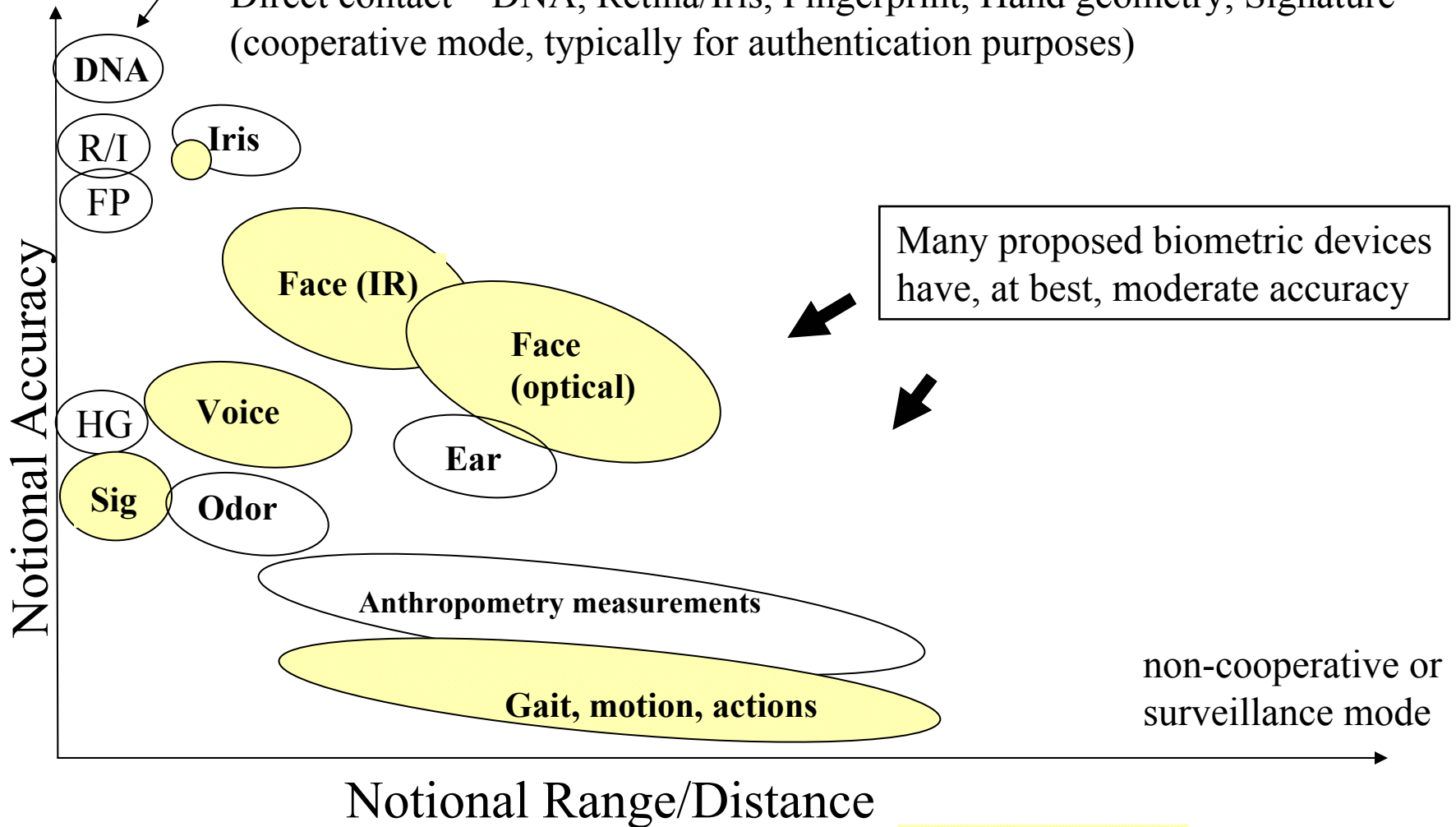
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Problem

- What are the **engineering issues, conflicts, and interoperability challenges** that must be addressed for **selecting and integrating** biometrics into systems with **predictable** performance characteristics?

Background (technology landscape)

Direct contact—DNA, Retina/Iris, Fingerprint, Hand geometry, Signature
(cooperative mode, typically for authentication purposes)



Many proposed biometric devices have, at best, moderate accuracy

non-cooperative or surveillance mode

Behavioral component: Furtive Behavior

Objective

- **Overall:** To explore scenarios for authentication, identification, and detection of furtive behavior using a predictive model in conjunction with an actual sensor environment
 - Understand the appropriate uses of biometrics per environment and mission
 - Identify integration and interoperability issues for data, scoring, decisions, alarm management, and reporting
 - Identify environmental factors that most affect robustness
- **Current Fiscal Year Objectives:**
 - Select scenario modeling and testing -- BioGame laboratory
 - Use synthetic 3D face models to augment and extend biometric test methodology (FERET)

Activities

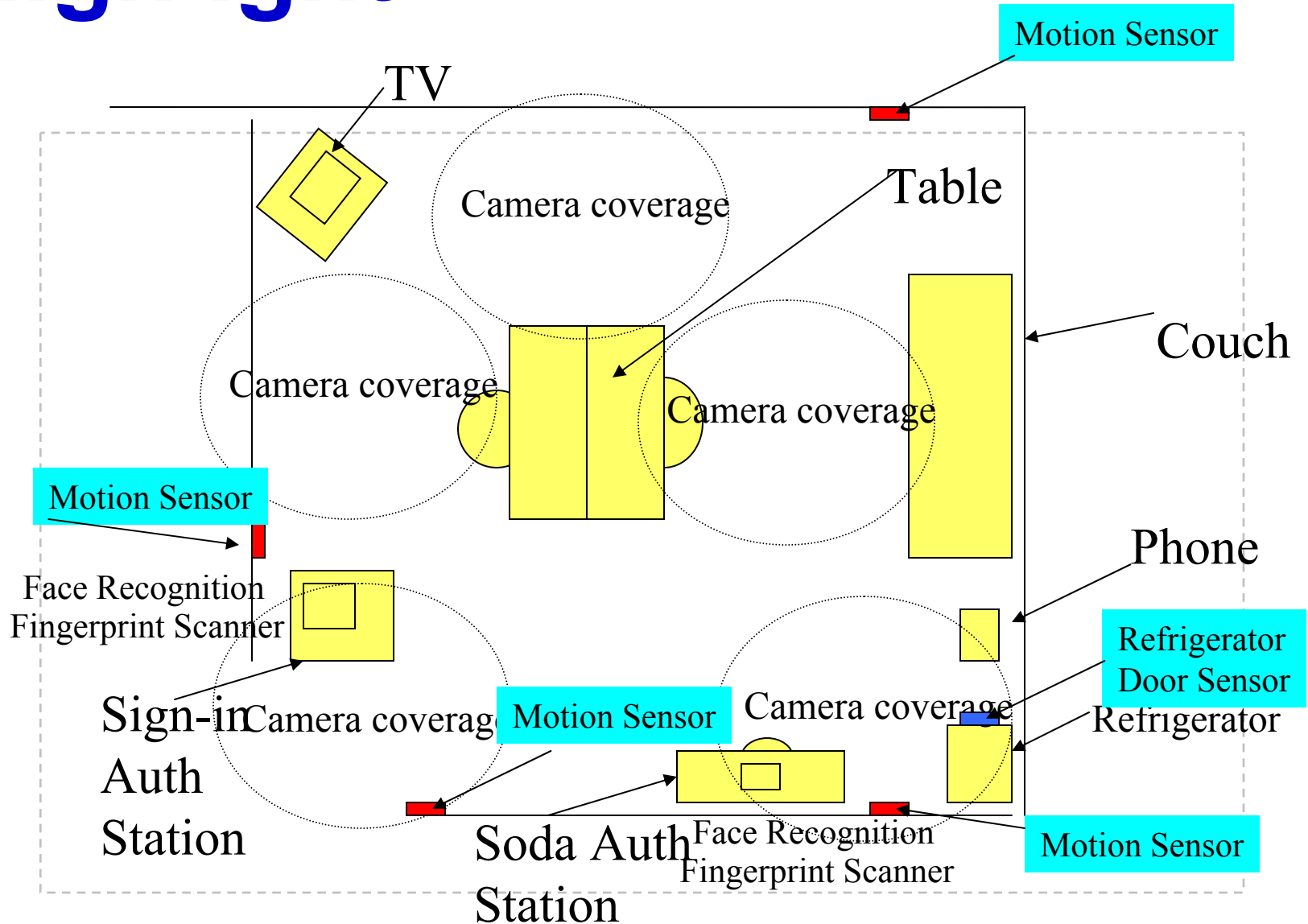
■ BioGame Laboratory

- Predictive modeling in conjunction with actual sensor environment
- Exploration of sensing scenarios for authentication, identification, and detection of furtive behavior (DFB)
- Soda stealing scenario (identification & behavior/event detection)
- Ground truth versus sensor accuracy (event reasoning)

■ 3D Synthetic Face Generation

- Significantly improved resolution, measurement, and understanding of performance and environmental factors (e.g., pose, lighting, temporal gaps)
- Ability to isolate and parametrically alter features (sensitivity analysis)
- Ability to generate arbitrarily large galleries that conform to known statistical models
 - e.g., gender, age, race, phoneme expression, emotion expression, glasses, occlusion

Highlight

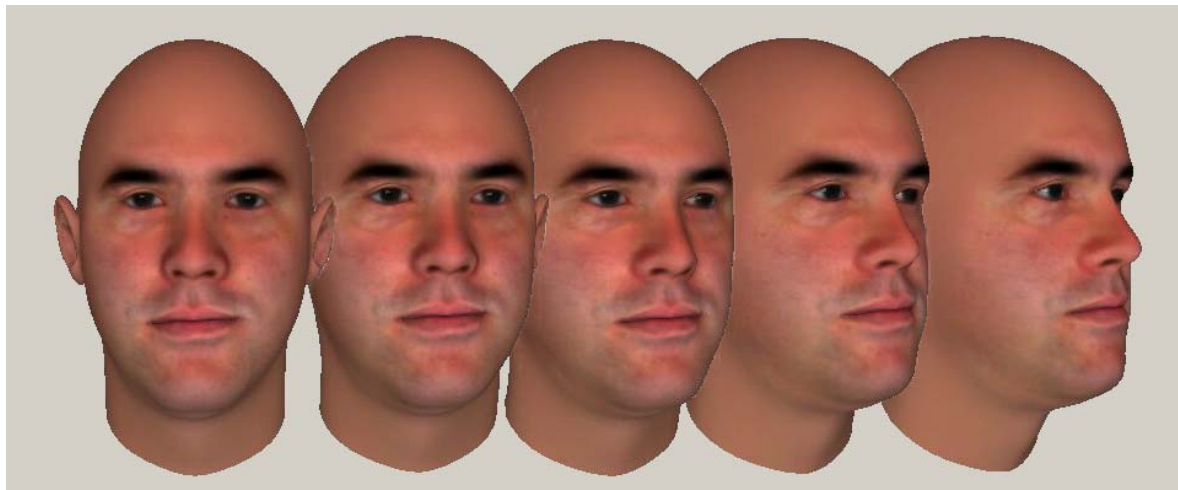


Demonstration

Temporal Experimentation (simulated aging)



Pose Experimentation (rotating pose angle)



Impacts

- **Paper** (pending) “Parametrically Controlled Synthetic Imagery Experimentation for Facial Recognition”
- **Conference** presentation on Biometrics at the 10 October 2002 Federal Information Assurance Conference, University of MD
- **Consultation** with DISA/JPO per scenario development for incorporating biometrics into an ACTD
- **Collaboration & Coordination** with relevant projects
 - DISA/D-Force Biometrics/Wireless (M. Brooks)
 - AFC Biometrics (M. Leonard)
 - Biometrics Management Office (G. McPherson)

Future Plans

- **BioGame Laboratory**

- Collect and analyze biometric sensor data
- Model sensors and predict performance based on actual environment
- Extend sensor coverage (add complexity)
- Consider additional scenarios

- **FaceGen Experimentation**

- Publish dataset, generate additional test data per request
- Support and transfer techniques (as dictated by results)

- **Knowledge Management Efforts**

- Internal:

- Project Web site <http://rcf.mitre.org/~norlans>
- Biometrics site <http://biometrics.mitre.org>
- Biometrics mailing list
- Participation in TEMs, TIES
- Coordination/collaboration with sponsor work

- External:

- Submit papers for peer-reviewed publication, present results at appropriate venues