



# **BORDERS**

*A Department of Homeland Security Center of Excellence*

## **A Resilient Border Security System**

**Jay F. Nunamaker**

**The University of Arizona**



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# A “Resilient System” Defined

- **Resilient systems encompass**
  - **Processes**
  - **Disciplines**
  - **Infrastructure**
- **Resilient systems allow an organization to**
  - **Anticipate and prevent major accidents**
  - **Survive unprecedented disruptions**
  - **Maintain systems operation**

# Agenda

- **Resilient Border Concerns**
- **Understanding the Borders**
- **Field Study of US Border Agencies**
- **Our Resilient Position**
- **Model for Resilient Governance**
- **Integration of Policy and Technology Development**
- **New Technologies Under Investigation**
- **A Resilient Border Security System**

# Resilient Border Concerns

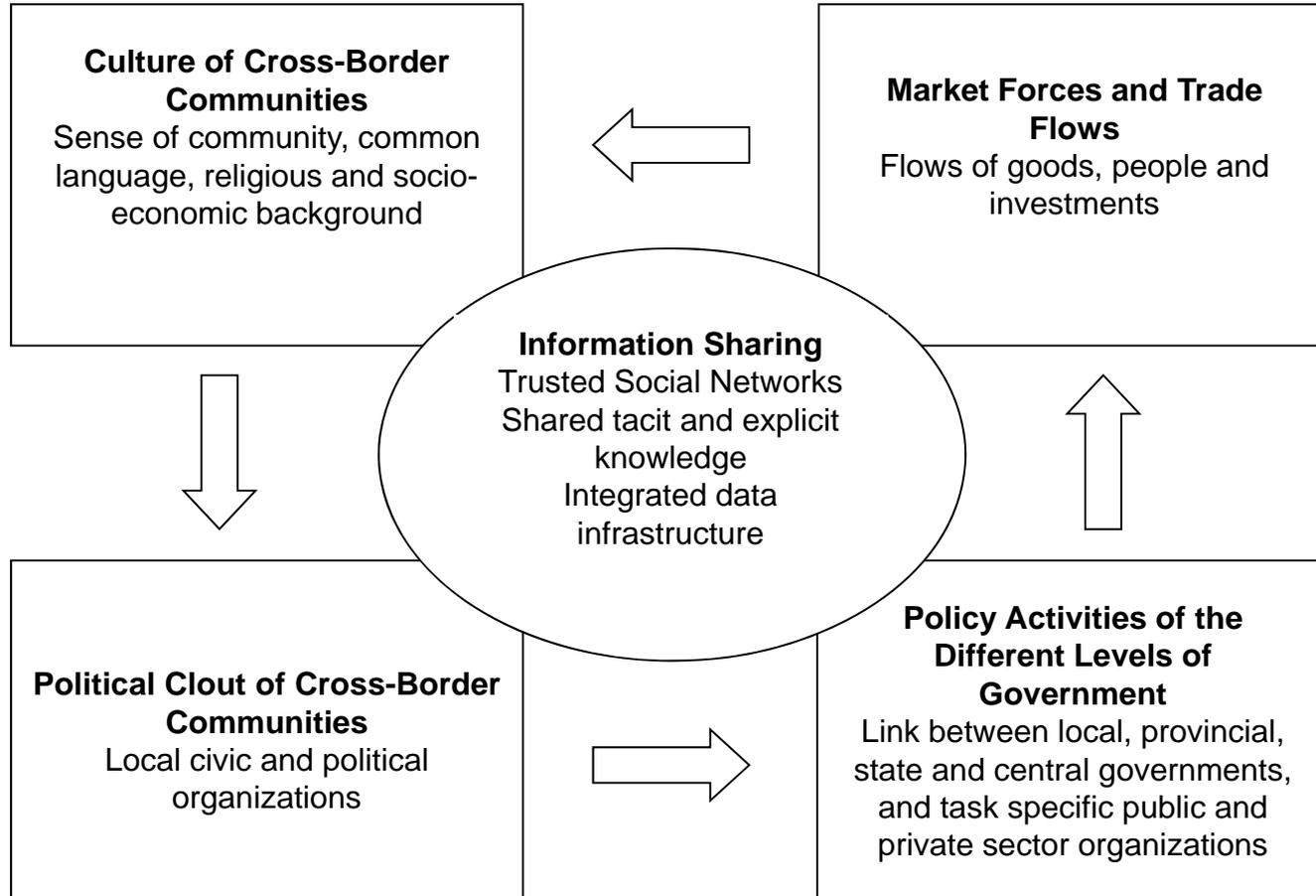
- **Globalization and Free Trade Agreements (NAFTA)**
- **9/11 raises concerns about border security**
- **Immigration as a concern in our countries**
- **Convergence of immigration, security and trade is a complex and dynamic issue leading to two competing goals:**
  - **Allowing access to people and goods**
  - **Securing against illegal activity**

# Resilient Border Concerns

- **Commerce**
  - **250 million legal border crossings each year**
  - **\$584 billion/year in trade**
- **Security**
  - **Approximately 288,000 illegal entrants captured in the southwestern US in the first six months of 2009**
- **Immigration**

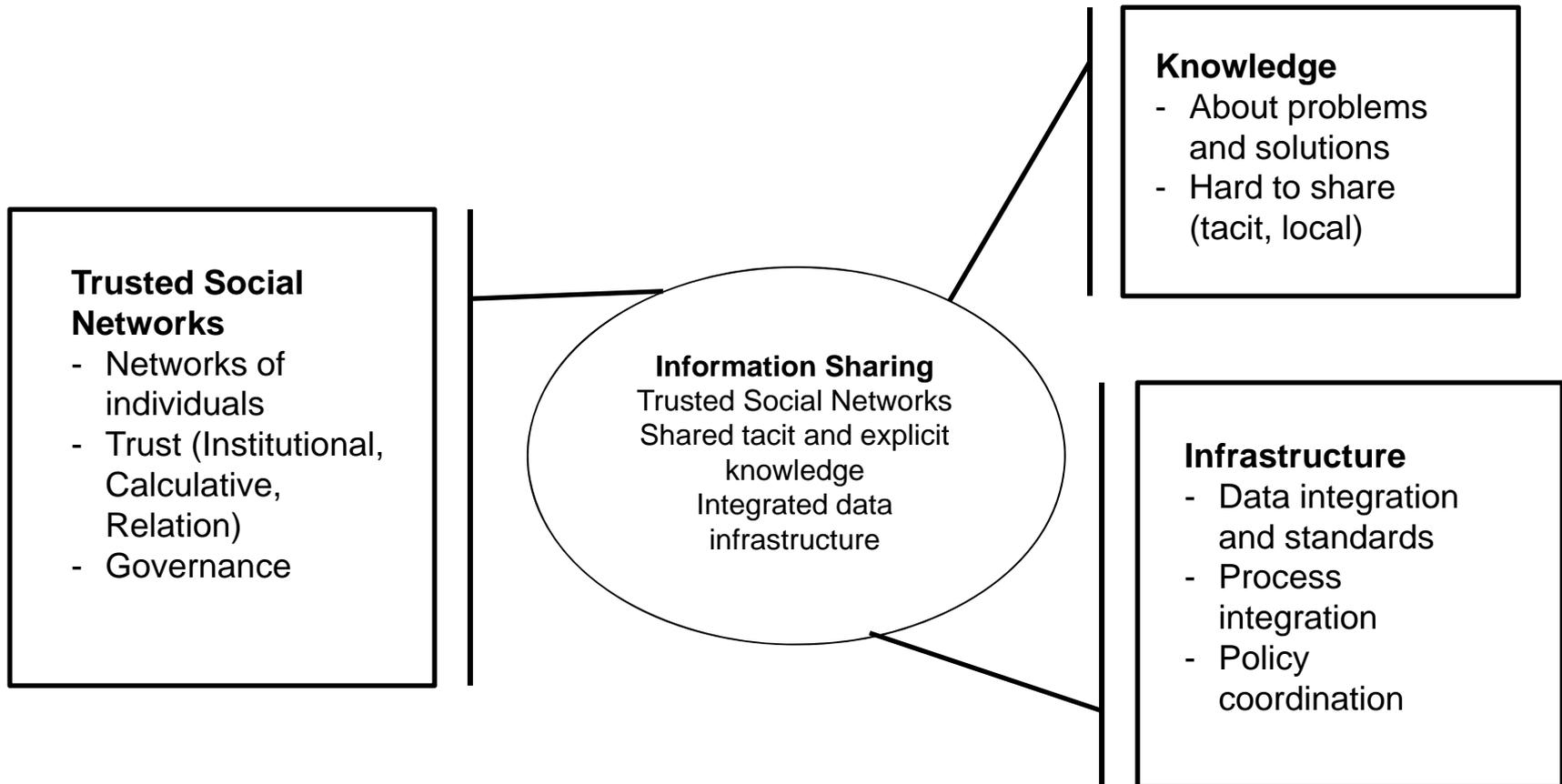


# Understanding the Borders



(Navarrete et al. 2009)

# Understanding the Borders



(Navarrete et al. 2009)

# Field Study

- **Agent Surveys and Working Groups**
  - **Customs and Border Protection**
  - **Border Patrol**
  - **Immigration and Customs Enforcement**
  - **Federal Bureau of Investigation**



# Field Study

- **Specific Challenges Identified**
  - **Interagency coordination – especially information sharing**
  - **Managing disparate databases**
  - **Field communications**
  - **Standard operating procedures when working between agencies**
  - **Technology that will aid in detection of hostile intent, and deception**

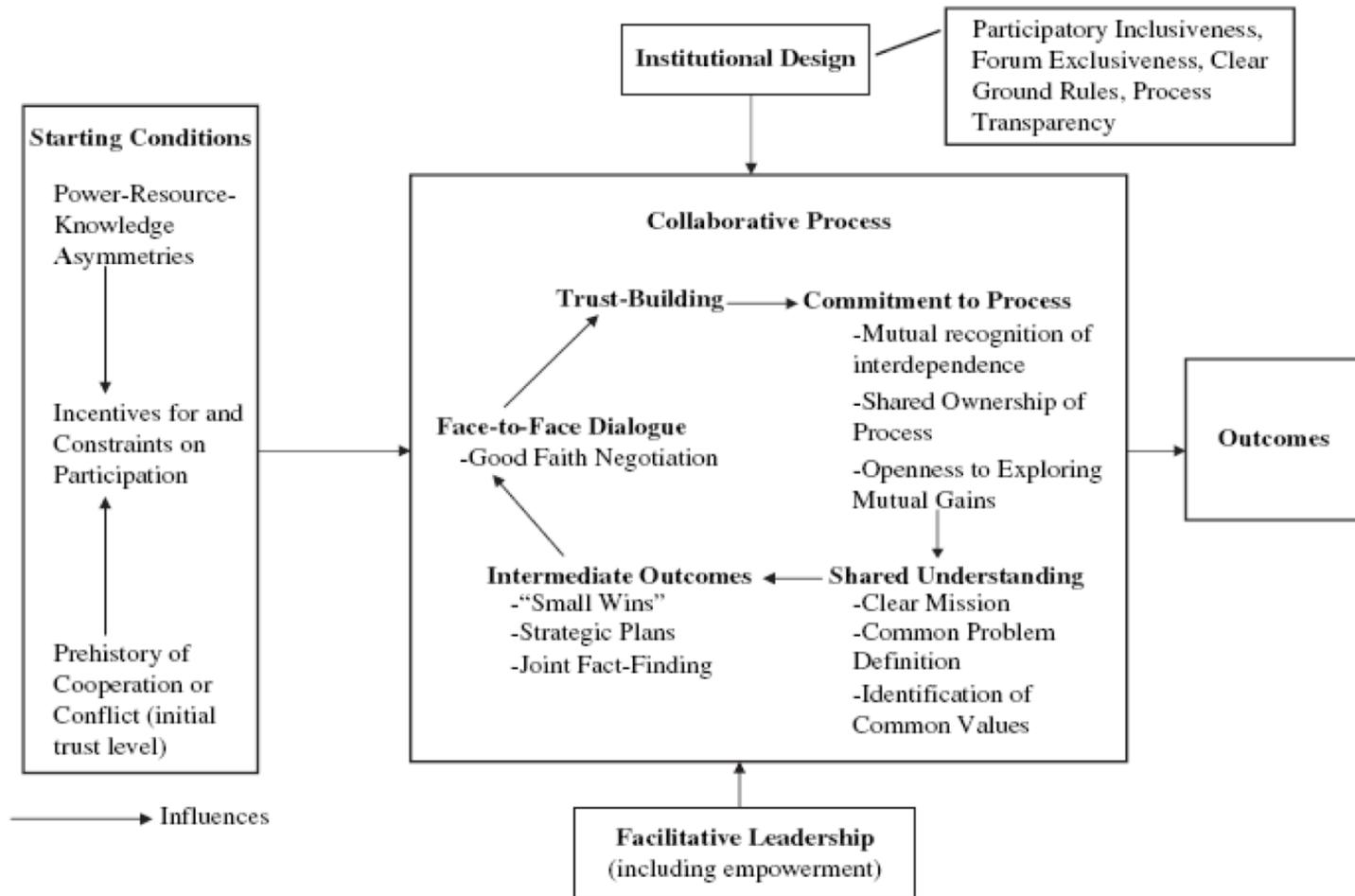


# Our Resilient Position

- **Must improve cross-border collaboration**
  - **Trust**
  - **Information Sharing**
  - **Technical Infrastructure**
- **Must have integration of policy development and technological innovation**
- **Must create technological aids for border screening**

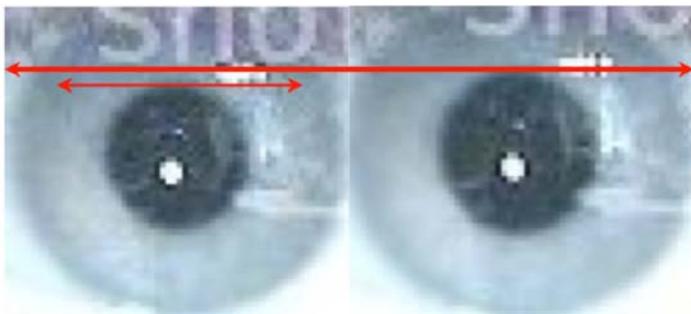


# Model for Resilient Governance



# New Screening Technologies Under Investigation

## Pupil Dilation – Infrared Camera



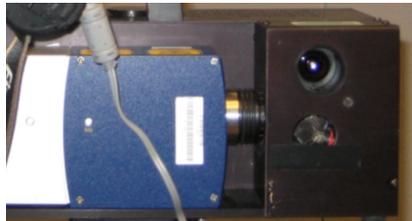
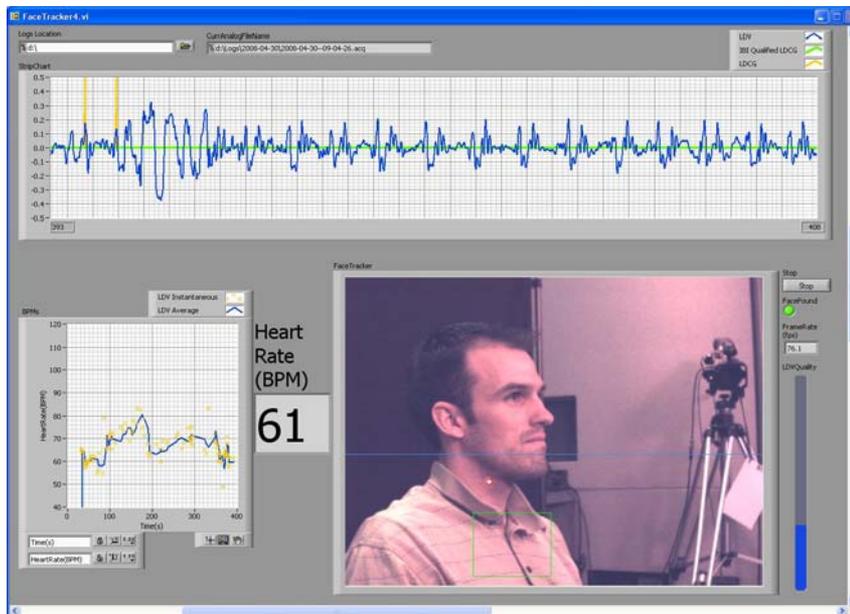
## Body Temperature – Thermal Imaging

A screenshot of a thermal imaging software interface. The interface is divided into several sections: 'Information' with fields for Interview Desc, Subject Number, Collection Place, and Folder; 'Recording' with a 'Start Recording' button and statistics for Frames, Stream Size, and Disk Space; 'Hardware Devices' with status for a camera connected on COM4 and a target surface; and 'Calibration' with a 'Calibrate Thermal Camera' button and a table of calibration data. A large central window shows a thermal image of a man's face with a color scale from blue (cooler) to red (warmer). A small inset window in the top right shows a live video feed of the man. At the bottom, there are sliders for 'Invert', 'Equality' (Min/Max), and 'Zoom'.

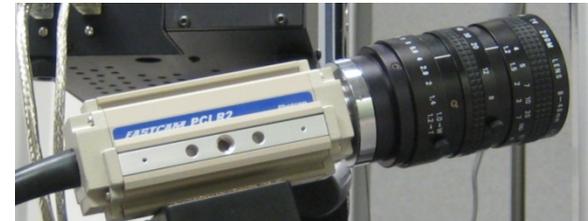
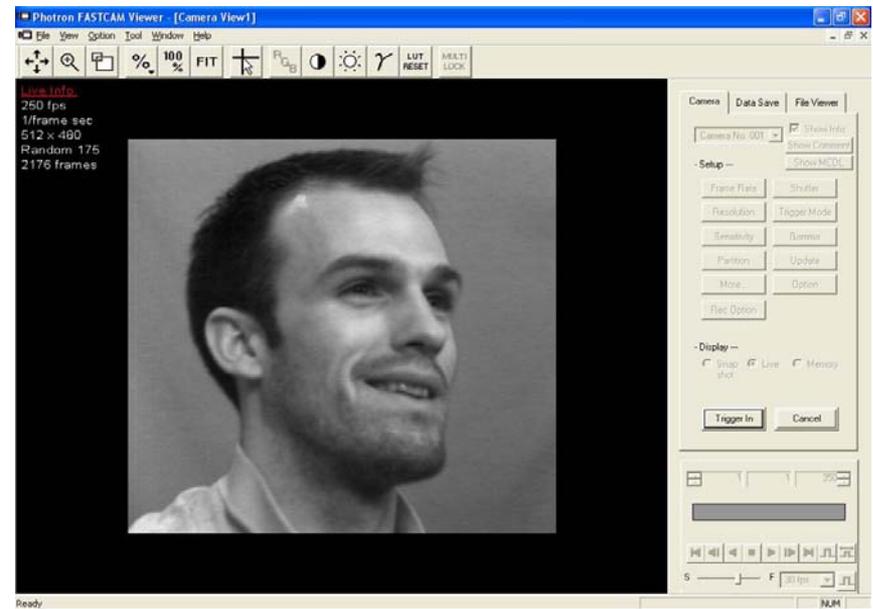


# New Screening Technologies Under Investigation

Cardio-respiratory Measures -  
Laser Doppler Vibrometer

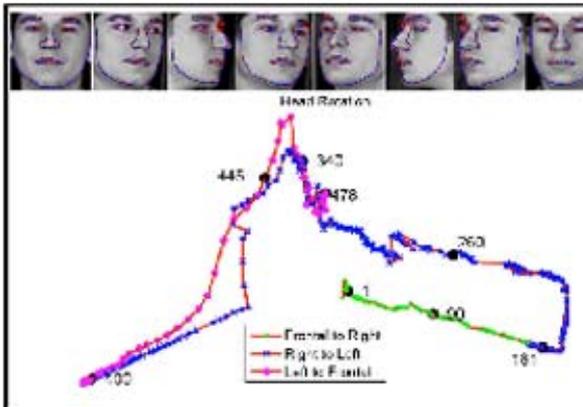
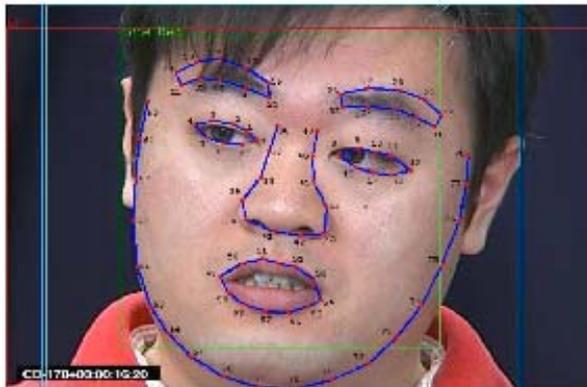


Blink Response -  
Ultrafast IR Camera

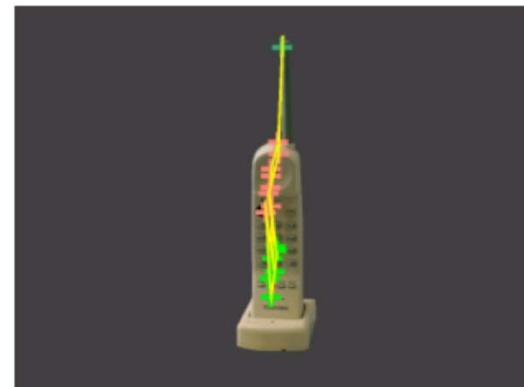
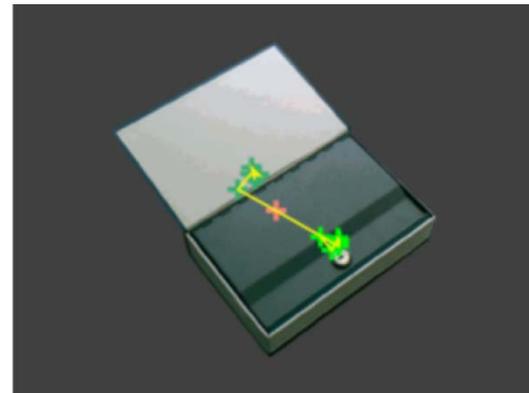


# New Screening Technologies Under Investigation

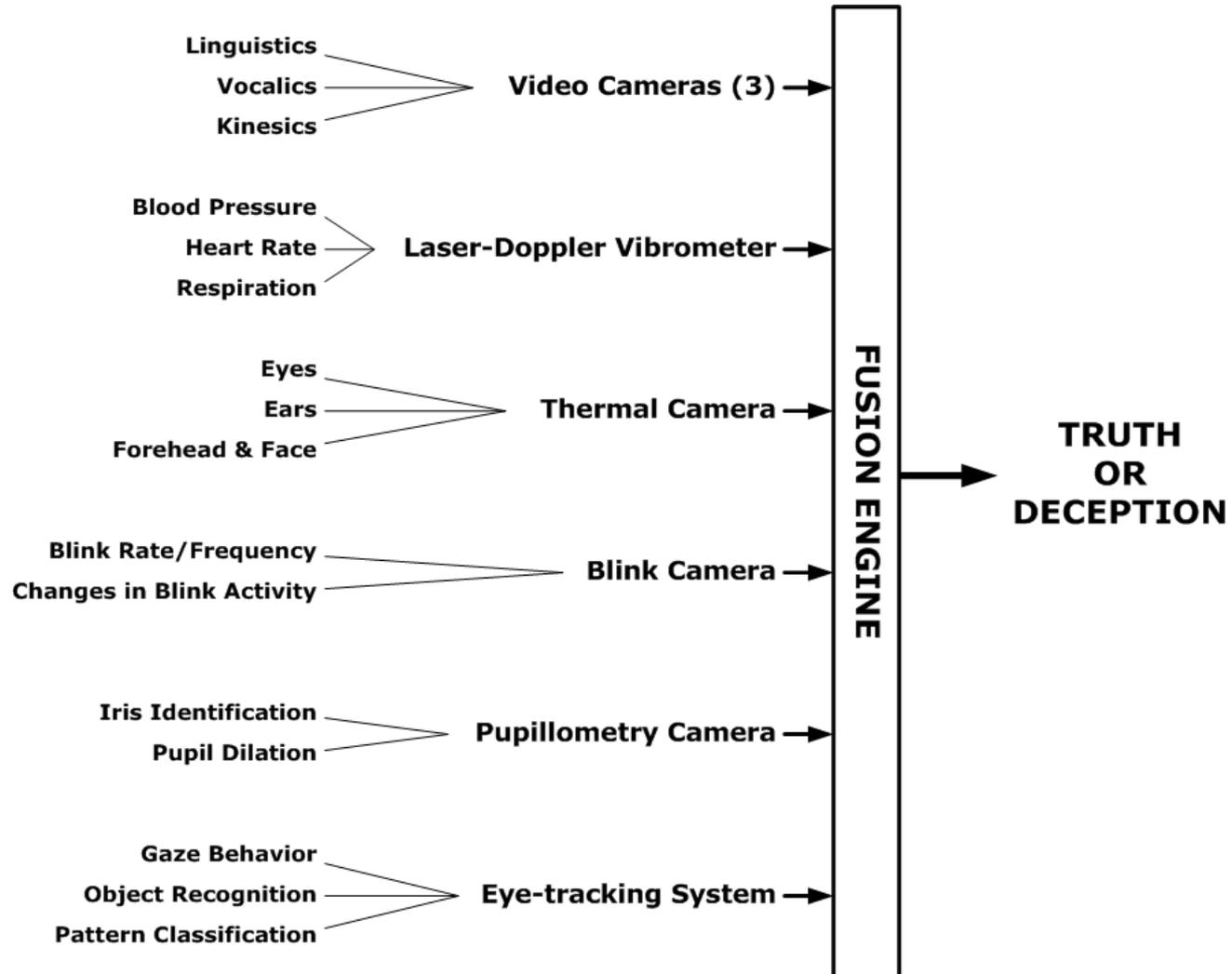
## Kinesic Analysis - Video Blob Analysis



## Eye Movement - Eye Tracking



# Sensor Fusion

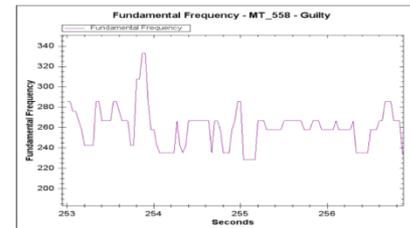


# New Screening Technologies Under Investigation

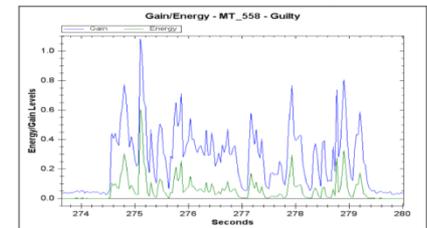
## Kiosk - Embodied AI



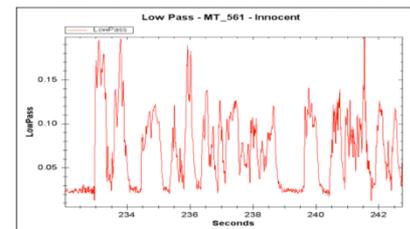
## Vocalic Data - Layered Voice Analysis



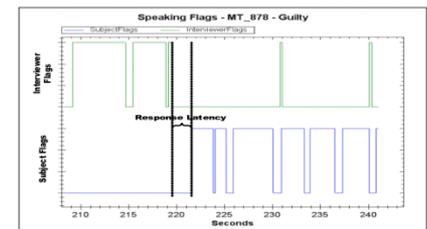
A) Fundamental Frequency



B) Gain and Energy



C) Low-pass filter



D) Speech/Silence Flags and Response Latency

# Policy Recommendations

- **Promoting the creation of a bi-national network to address border control problem**
  - **Developing working principles**
  - **Build legitimacy**
- **Characterizing main problem areas**
  - **Network participants**
  - **Research Community**

# Policy Recommendations

- **Building trust**
  - International agreements
  - Network work in projects
- **Prototyping approach to technology development**
  - Network participants
  - Technology vendors
  - Research community

# A Resilient Border Security System

