



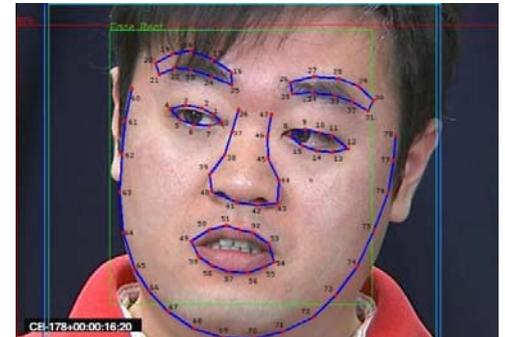
BORDERS

A Department of Homeland Security Center of Excellence

Non-Invasive, Automated Screening for Concealed Information



Nathan W. Twyman
Douglas C. Derrick
Jay F. Nunamaker, Jr.



March 29, 2011

Non-Invasive, Automated Screening



Concealed Information Test (CIT)

- **An interviewing method for determining whether someone is hiding their knowledge of something**
- **Interviewer asks 3-5 Multiple Choice Questions**
 - **Yes/No or Repeat-After-Me responses**
 - **Looks for significant psychophysiological changes during presentation of the significant option:**
 - **Skin Conductance**
 - **Pulse**
 - **Respiration**
 - **Response Time**

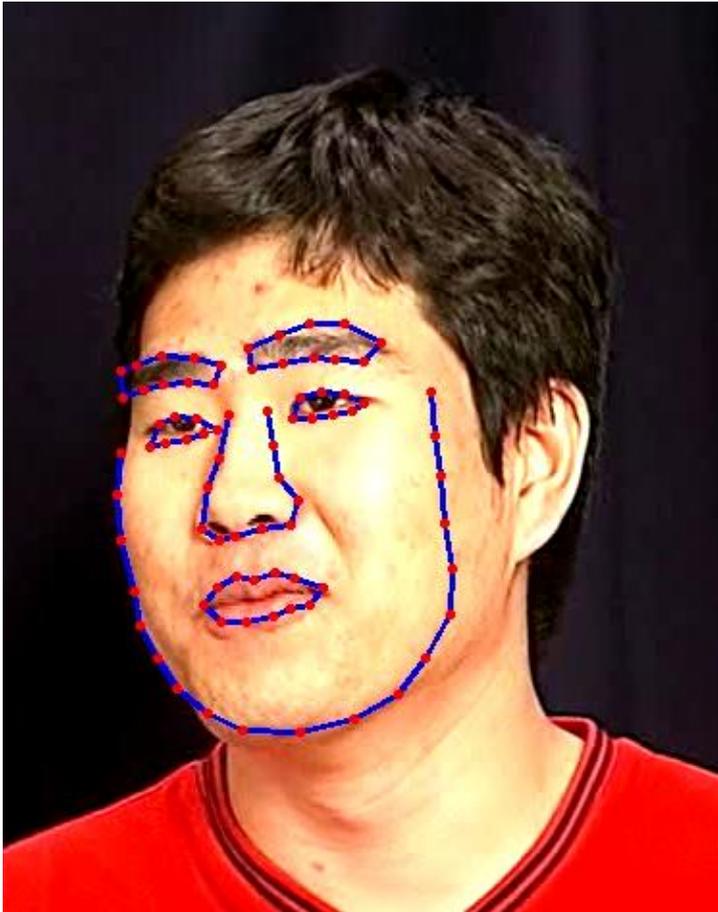


Why the CIT for Screening?

- **Valid**
- **Short**
- **Easily Automated**
- **Compares the individual only to himself**



Automated Movement Detection



Individuals With Guilty Knowledge Try To Move Less



“If you are the person who stole the ring, you moved an object in the desk drawer to locate the cash box containing the ring. Repeat after me these objects:”

- Notepad
- Telephone book
- Woman’s sweater
- Laptop bag
- Tissue box
- Brown purse

Individuals With Guilty Knowledge Try To Move Less



“If you are the person who stole the ring, you know what type of ring it was. Repeat after me these types of rings:”

- Emerald ring
- Turquoise ring
- Amethyst ring
- Diamond ring
- Ruby ring
- Gold ring

Designing A Rapid Screening CIT

- **Found Potential In:**
 - **Body Movement**
 - **Vocalic Attributes**
 - **Cardiorespiratory fluctuations**

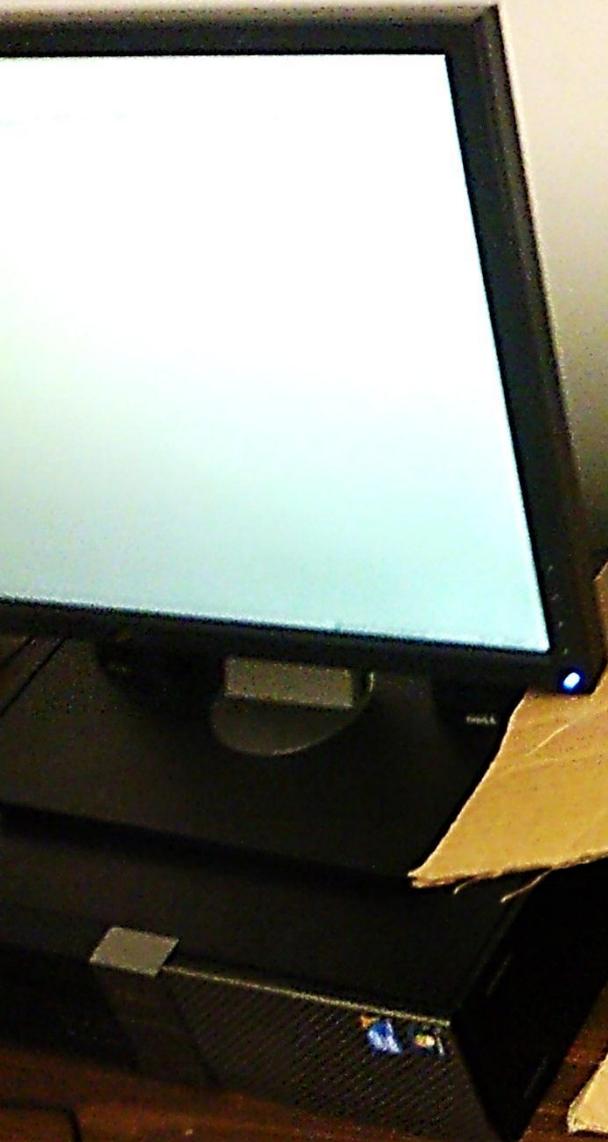
- **Another possibility:**
 - **Oculomotor (eye behavior)**

Oculomotor Indicators of Concealed Information

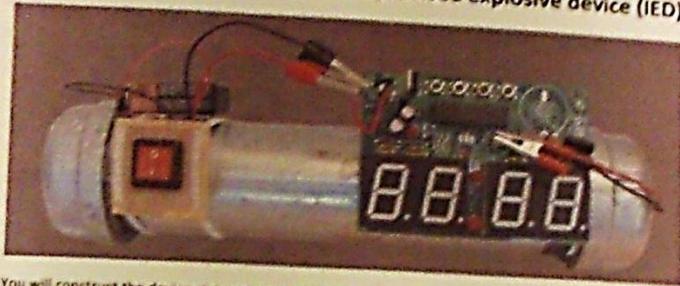
- **Already being done!**
 - in Marketing
 - in HCI
- **...but not in security**
 - Can it betray guilty knowledge and/or concealed intentions?







Instructions for constructing the improvised explosive device (IED)



You will construct the device pictured above using the materials provided. After passing through security screening, you will deliver the device to the man pictured below. Be sure you do not give the device to any other person.

Follow the steps below in exact order to replicate the IED shown above.

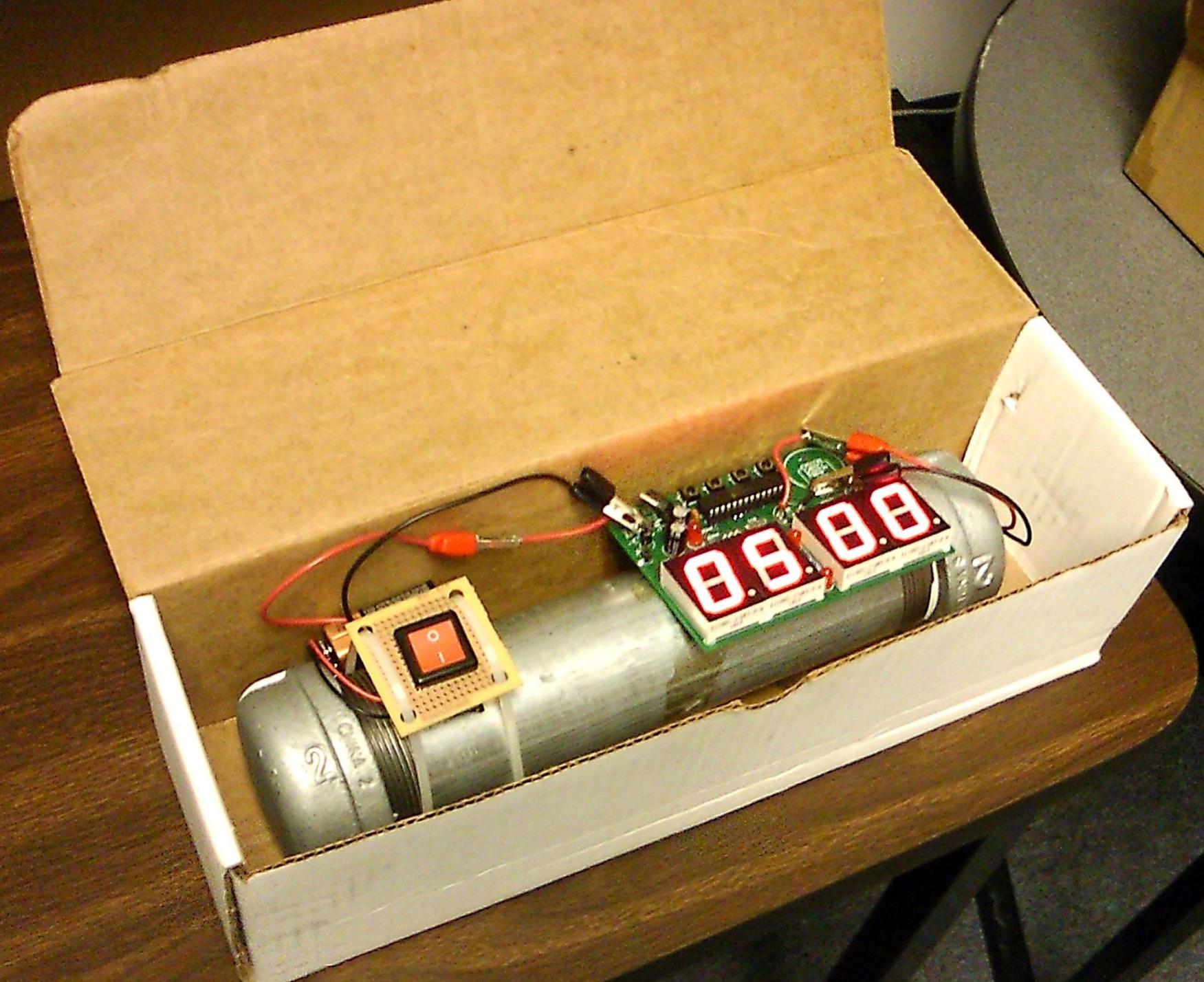
Materials list:

- Pipe
- Switch
- Zip ties
- Timer
- Battery

1. Orient the switch so the "1" is on the bottom. Firmly attach the switch to the left hand side of the pipe with two zip ties. Make sure the back of the switch is pressed against the white piece of Velcro already attached to the pipe. Make sure you don't break the switch module by tightening the zip ties too tight.
2. Attach the 9V battery to the 9V battery connector coming from the switch module.
3. Attach the Velcro on the 9V battery to the pipe above the switch module as shown in the picture. Make sure the connections on the battery are facing to the left (outward).
4. Orient the timer so the 4 digital numbers are at the bottom. Attach the timer to the pipe by placing the white Velcro on the back of the timer onto the black Velcro on the metal pipe. Position the right edge of the timer flush with the inside edge of the pipe cap.
5. Clip the red alligator clip coming out of the end of the pipe to the red wire coming out of the timer as shown above. Do the same with the black clip.
6. Clip the red alligator clip coming from the switch to the red wire coming from the left side of the timer as shown in the picture above. Do the same with the black alligator clip.



DELIVER THE DEVICE TO THIS PERSON



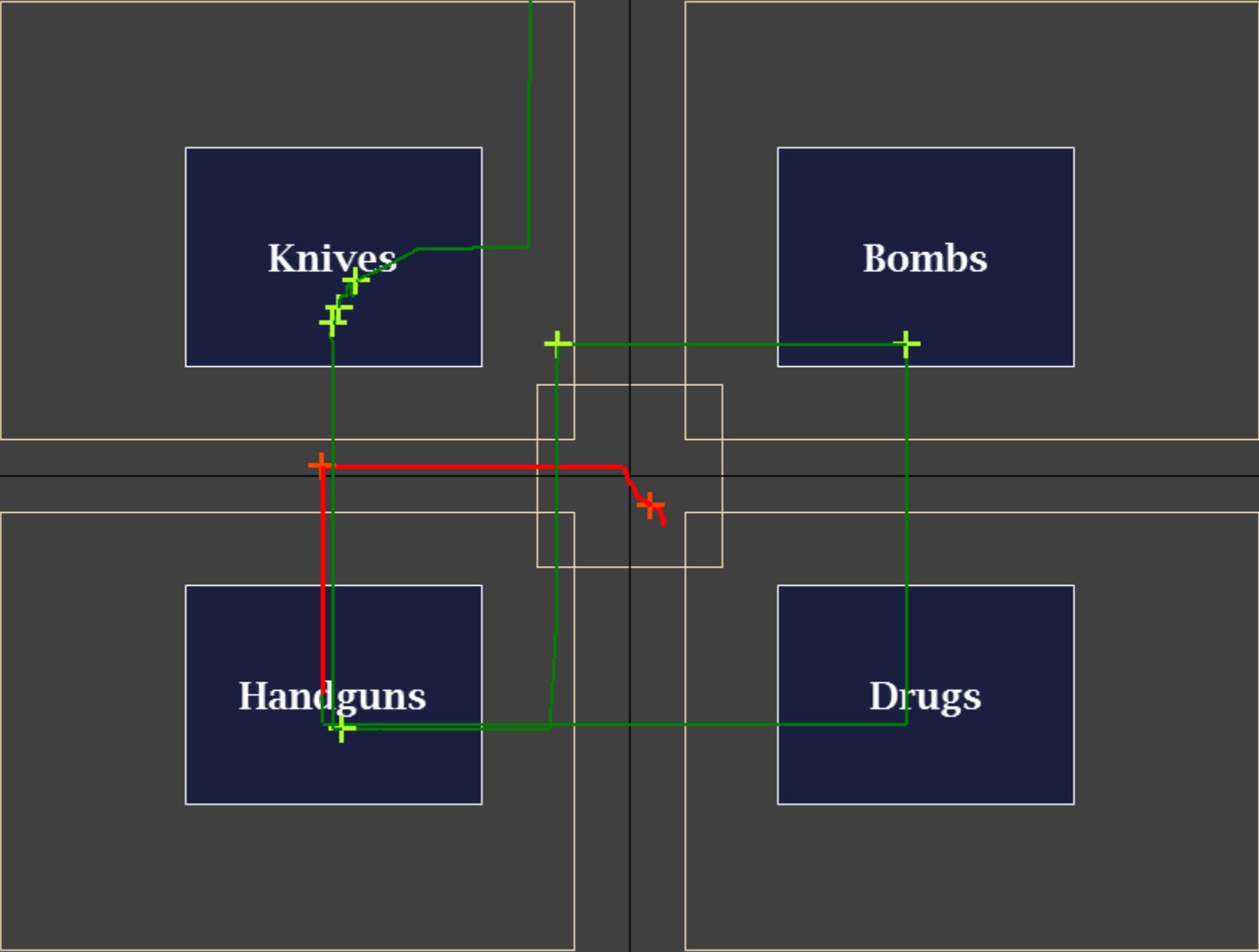








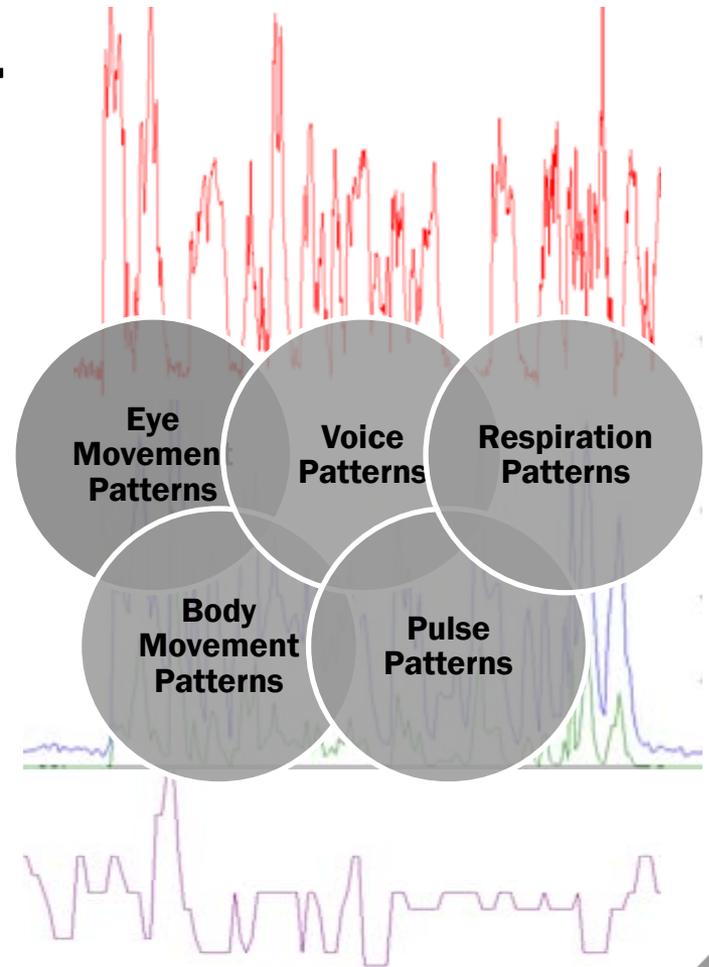






A Work In Progress

- **70-80% prediction accuracy for body movement and eye movement individually**
- **Next Steps:**
 - **Fusion**
 - **Include Vocalic and Cardiorespiratory Cues**
 - **Field Testing at US-Mexico Border**
- **Challenges:**
 - **Simultaneous Measurement**
 - **Near-real-time assessments**
 - **Public Opinion?**





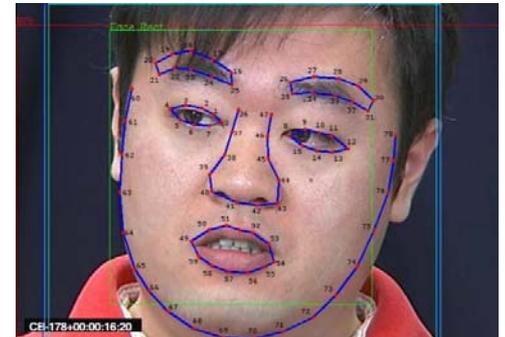
BORDERS

A Department of Homeland Security Center of Excellence

Non-Invasive, Automated Screening for Concealed Information



Nathan W. Twyman
Douglas C. Derrick
Jay F. Nunamaker, Jr.



March 29, 2011