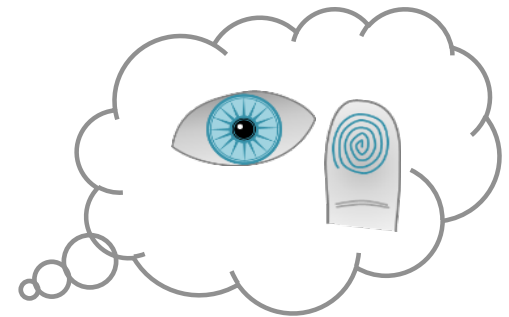
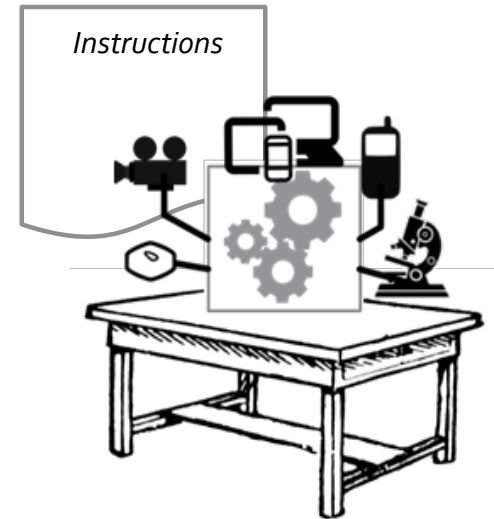


Usability and user perceptions of self-service biometric technologies.

Yevgeniy B. Sirotin, Ph.D.

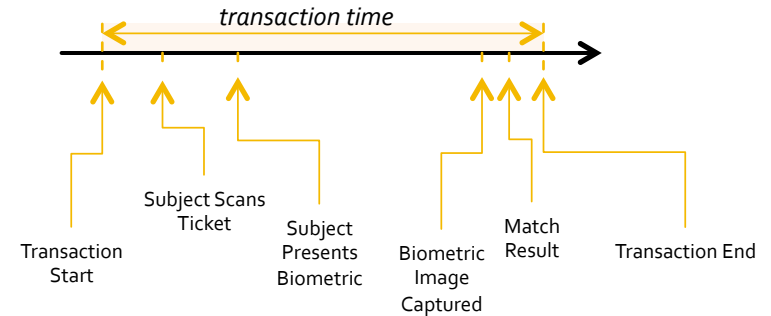
Outline

- Part 1:
 - Usability challenges for biometrics in self-service with naïve subjects
 - Face/Iris Biometrics: Where do I stand and where do I look?
 - Finger Biometrics: What do I touch? How do I touch?
- Part 2:
 - User-perceptions of biometric systems
 - Concepts associated with preferred and non-preferred biometric modalities



Usability Performance

- **Efficiency**
 - Record timestamps for each event in the interaction between user and device
- **Effectiveness**
 - Failures to match the biometric
 - Failures to **acquire** the biometric
- **Satisfaction**
 - System usability scale surveys
 - Debriefing questionnaires
- In our testing, usability was main differentiator of different biometric technologies
 - How long to successfully submit biometrics
 - Fraction of users able to succeed
 - User satisfaction with the device
- Usability issues differed by modality (Face/Iris vs. Finger)



AEER Post Test Interview Questions
AEER Scenario Test Sequence #1

Subject GUID: _____

Run#: 1 2 3

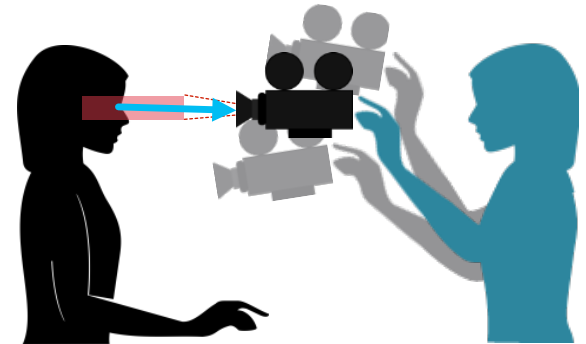
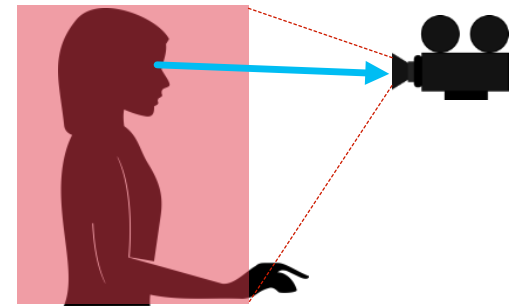
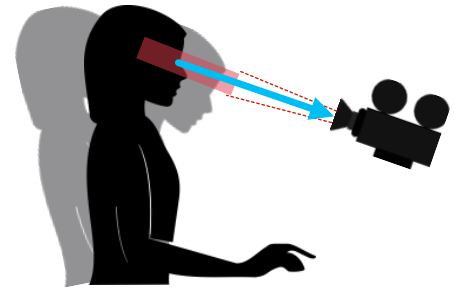
Entry Station – Iris Device 2

	Strongly Disagree	1	2	3	4	5	Strongly Agree
1. I think that I would like to use this iris device whenever I travel.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I found the iris device unnecessarily complex.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I thought the iris device was easy to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I think that I would need the support of an operator to be able to use this iris device.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I found the iris device to be well integrated into the entry process.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I thought there was too much complexity in the entry process with the iris device.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Usability of Face/Iris Biometric Methods

Face/Iris Methods Tested

- Iris (User)
 - User responsible for placing eyes within narrow capture volume
- Face/Iris (Standoff)
 - Device finds users' face & eyes within large capture volume
- Face/Iris (Operator)
 - Device operator responsible for placing users' face & eyes within narrow capture volume



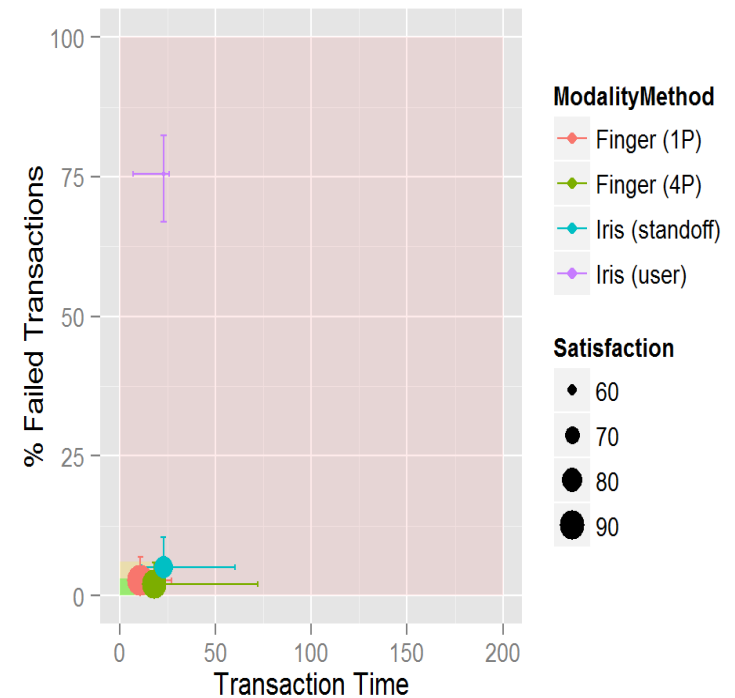
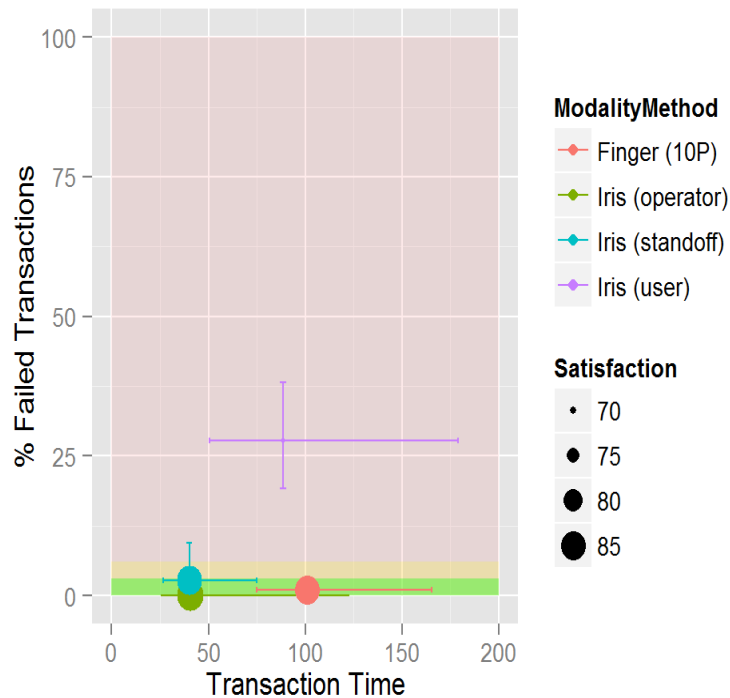
Usability of Face/Iris: Metrics Results



Entry

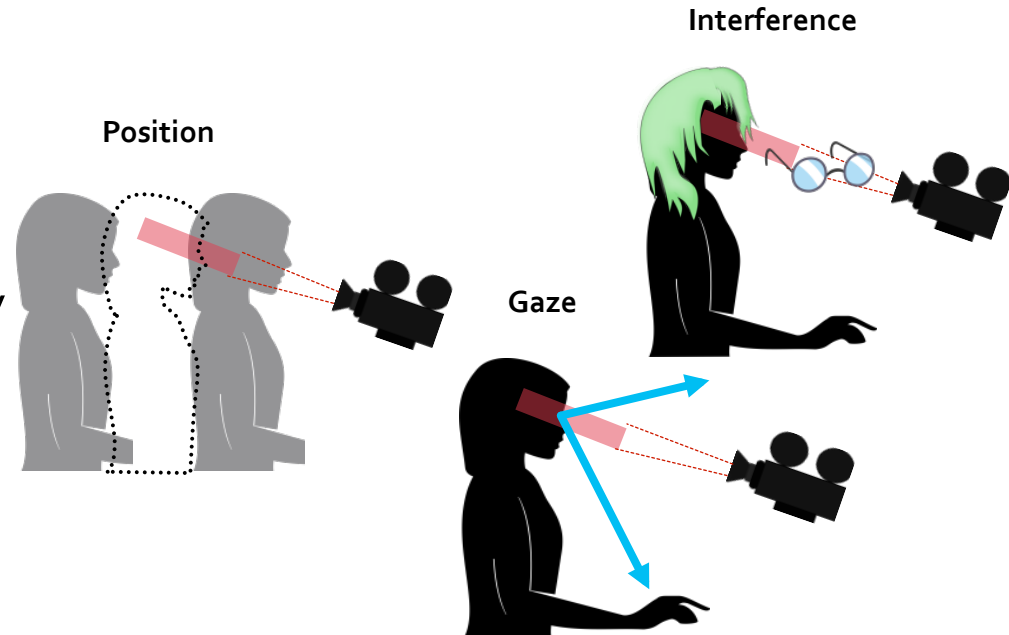
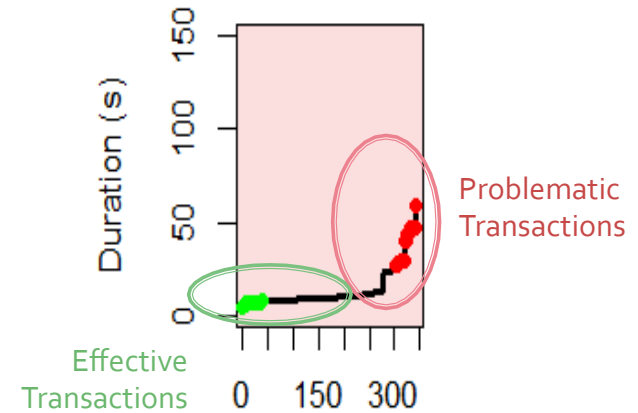


Exit



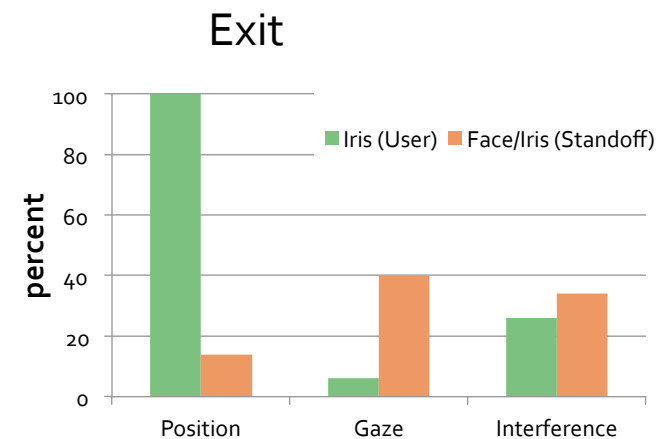
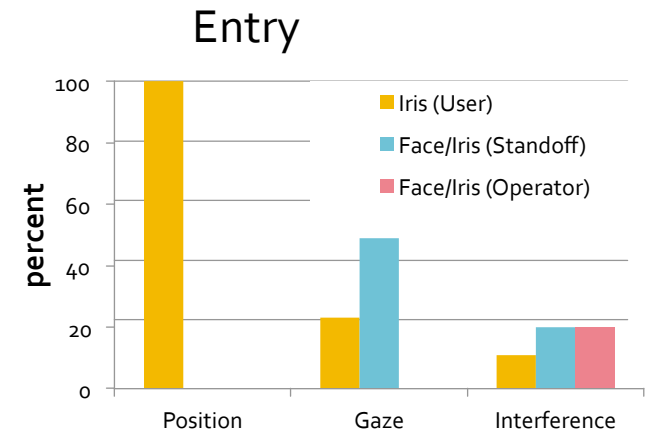
Usability of Face/Iris: Video Analysis

- While most transactions were effective and efficient, some were slow and resulted in failure
- Carried out open coding analysis of video associated with iris devices
- Scenarios
 - Staffed booth
 - Unstaffed gate
- Identified categories of usability issues
 - Position
 - Gaze
 - Interference



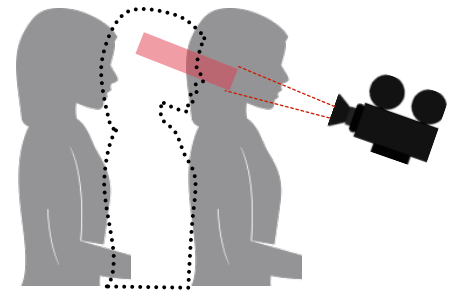
Usability Face/Iris: Major Issues

- Analysis:
 - Tabulated percentage of slow transactions associated with each usability issue
- Iris (User)
 - Major position issues (100% of slow transactions)
 - Performed most poorly for each scenario
- Face/Iris (Operator)
 - Performed best at entry (no failures)
 - Only interference issues contributing
- Face/Iris (Standoff)
 - Intermediate performance
 - Users were able to position appropriately
 - Gaze and interference issues remain

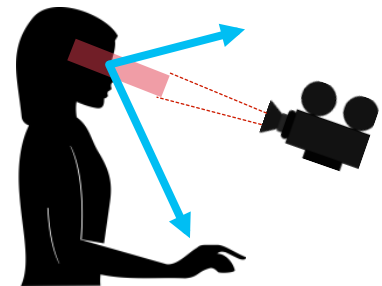


Usability of Face/Iris: Takeaways

- Reduce need to learn new movements
 - Hard to communicate verbally OR by signage
 - Recommendation:
 - Do not ask users to move (Standoff)
 - Keep movements similar to what users already know



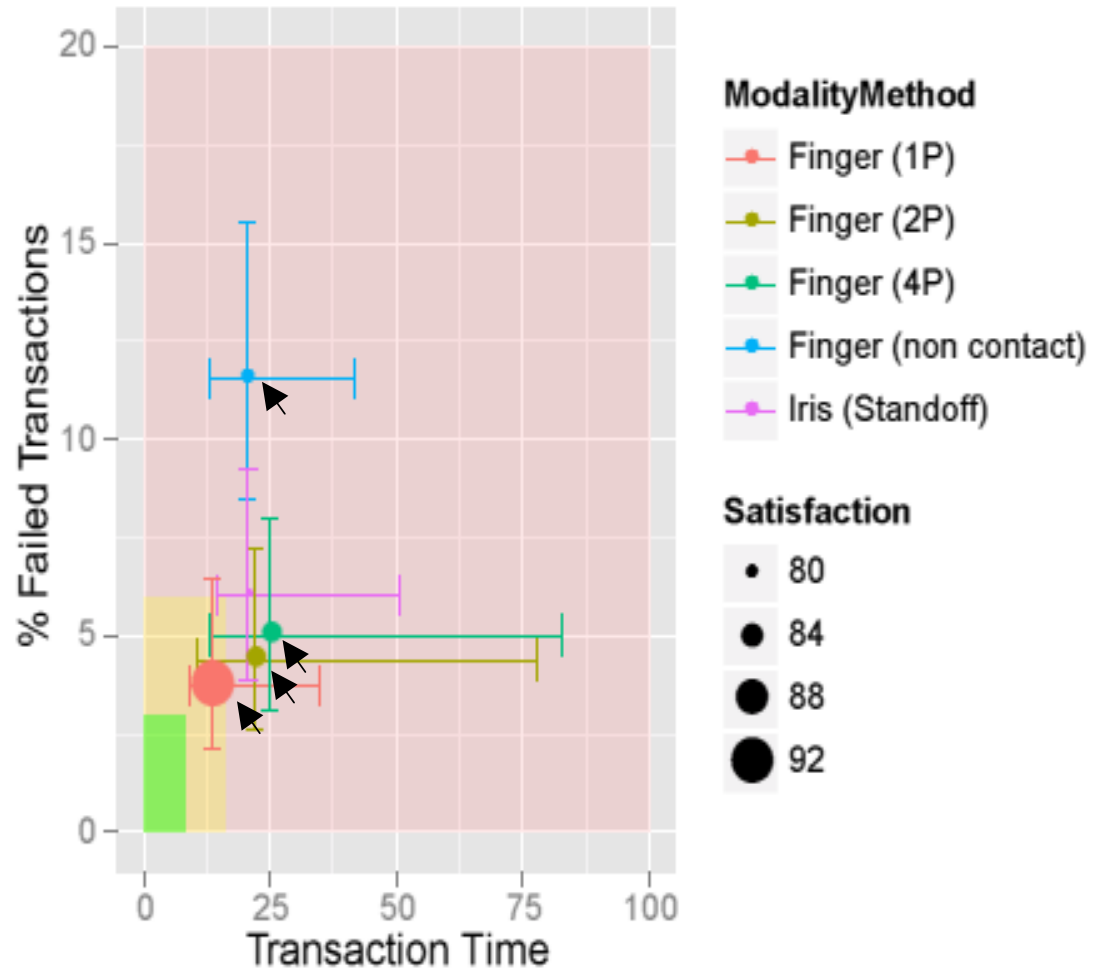
- Reduce need for long steady gaze
 - Natural saccadic eye movements (normally 3-5 Hz)
 - Blinking (at least 0.1 Hz)
 - Recommendation:
 - Acquisition ~300 msec
 - Improved feedback regarding when / where to look



Usability of Finger Biometric Methods

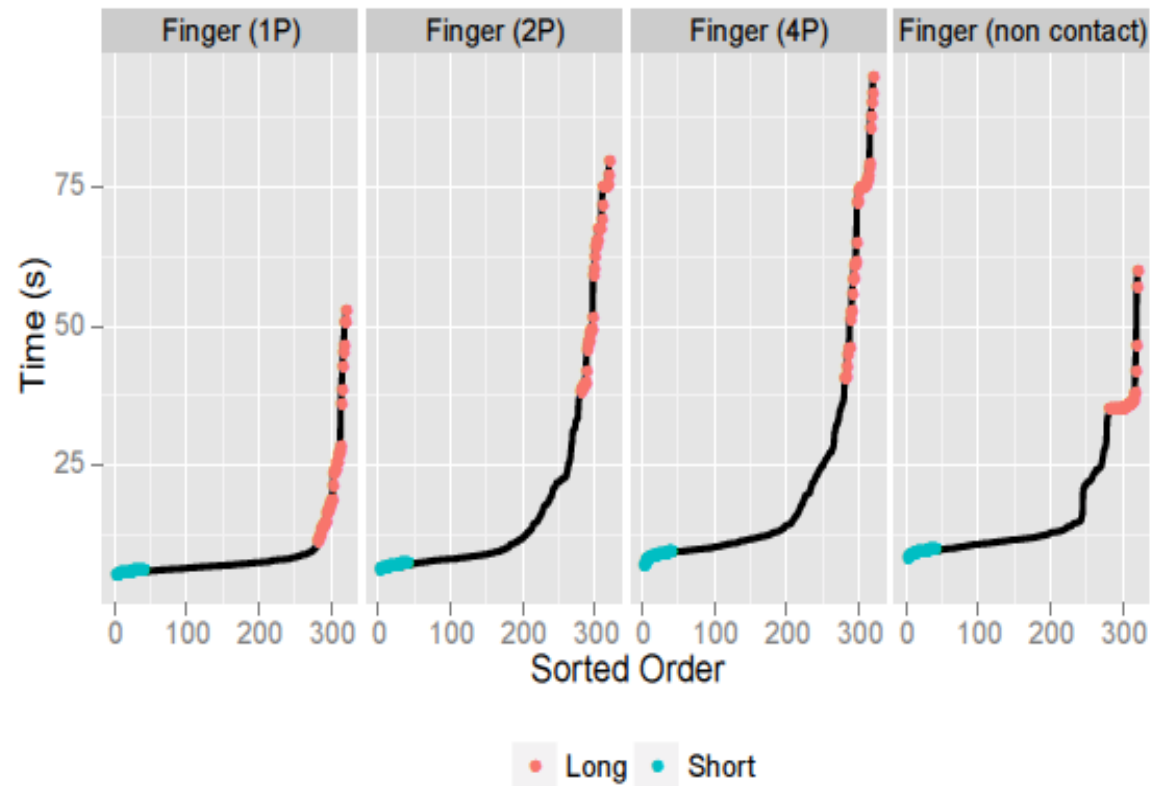
Usability of Finger: Metrics Results

- Tested finger modality in exit scenario
- Tested finger collection methods
 - 1P, 2P, 4P, Non-Contact



Usability of Finger: Video Analysis

- All methods generated some level of confusion, errors

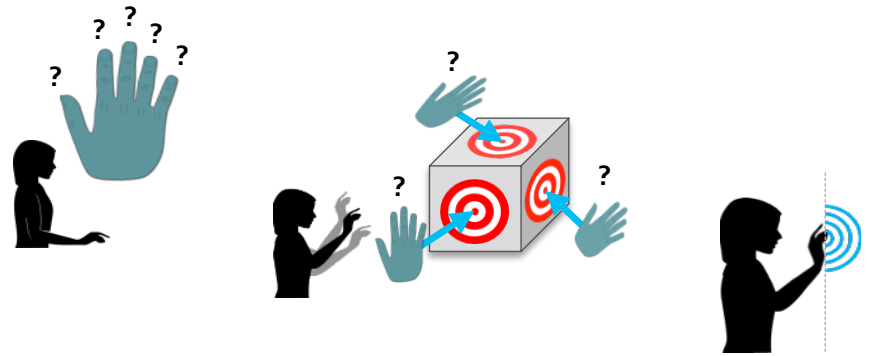


Usability of Finger: Major Issues

- Identified categories of usability issues

- Presentation

- Which finger?
- Where/how to place?
- How hard to press?



- Stability / Duration

- How long to hold?



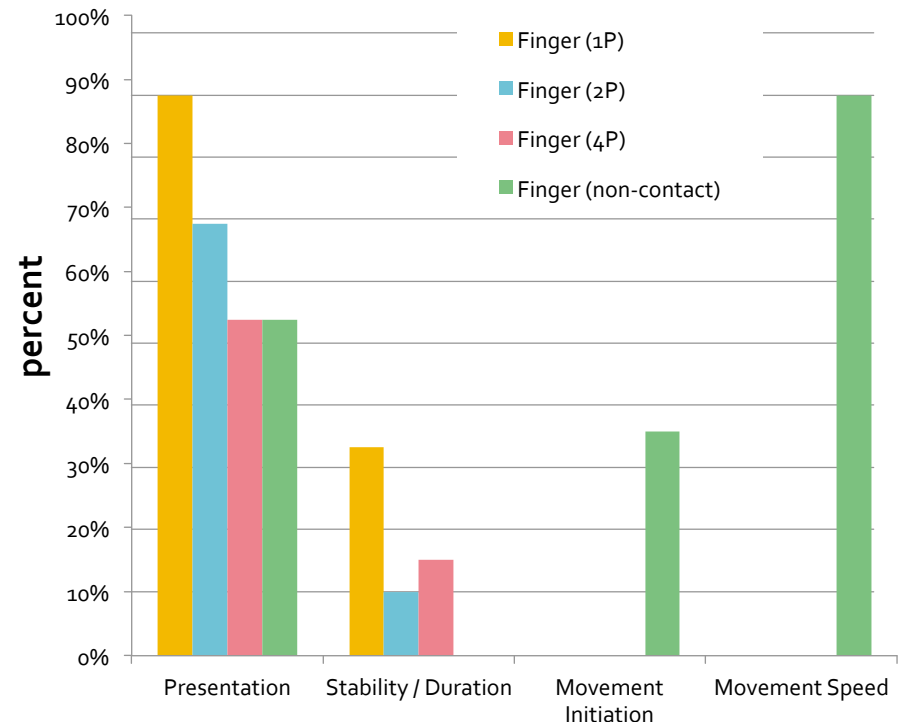
- Movement

- When to start?
- How fast to move?



Usability of Finger: Major Issues

- All long transactions:
 - Presentation
 - At least 50% of long transactions
 - Mostly where and how to touch
 - Stability
 - How long to keep finger on the scanner was an issue observed for all contact devices
- Non-Contact:
 - incorrect movement initiation time
 - incorrect movement speed



Usability of Finger: Takeaways

■ Device should communicate

- Which finger to use
 - Visual signage at time of use regarding required finger or physical constraint
- Where to place finger
 - Visual cues at time of use or physical constraints on device
 - Wide open platen leads to uncertainty
 - Reduce other “touchable” surfaces (flat, grooved, or lighted areas)
- How long to hold finger
 - Minimize amount of contact time required
 - Provide feedback on contact and progress indicator



■ Non-contact

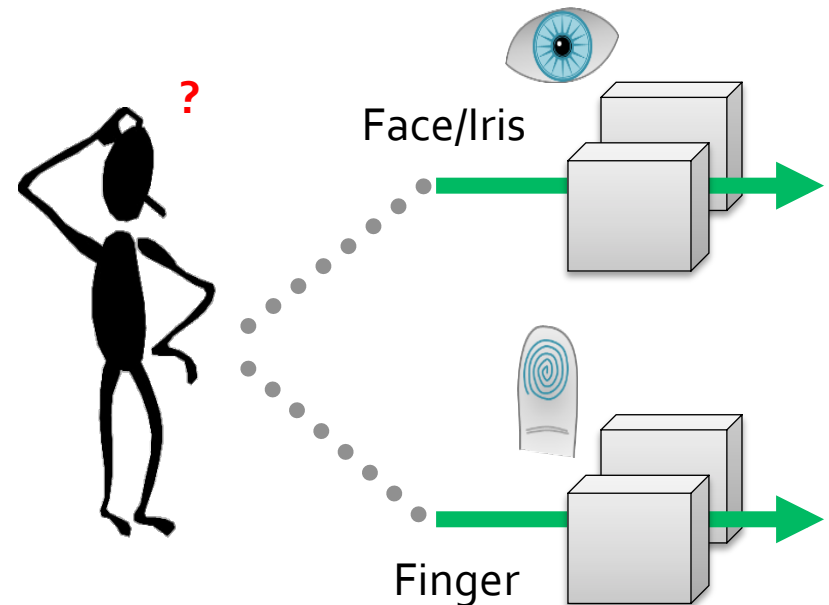
- Reduce need for learning a new movement
- Impart appropriate model of device operation
 - Requiring fast movement can be counterintuitive



User Perceptions of Biometric Tech

Choice Experiment

- Selected Finger and Face/Iris methods with comparable (high) usability
 - Finger (1P) and Face/Iris (Standoff)
 - Biometric exit scenario
- Users performed an exit scenario with each modality
- Examined user preference by choice experiment:
 - Asked users to choose one of the two gates to use again
 - Users provided brief rationale for their choice

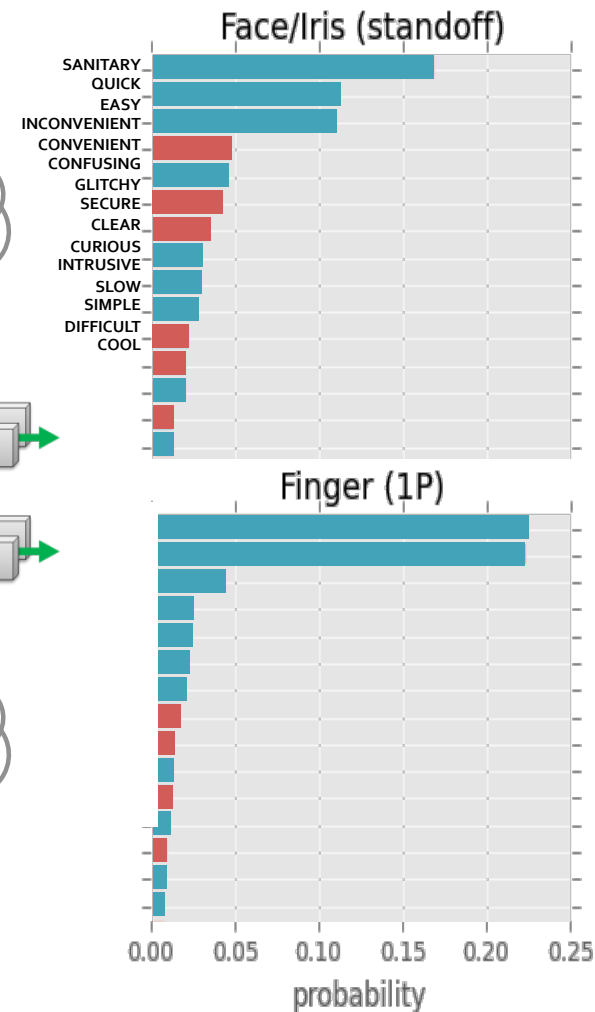
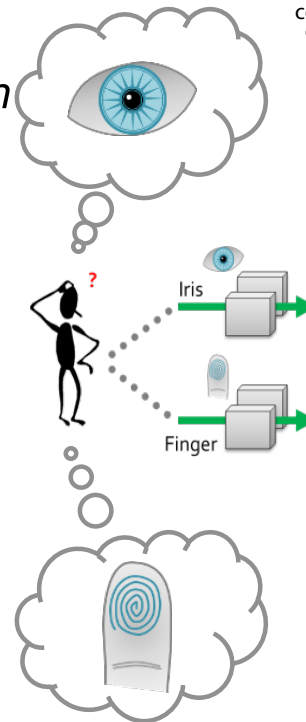


Overall Traits of Biometric Devices

- Typical responses:
 - Chose Face/Iris:**

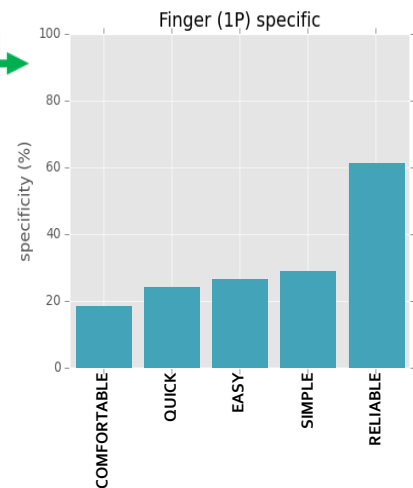
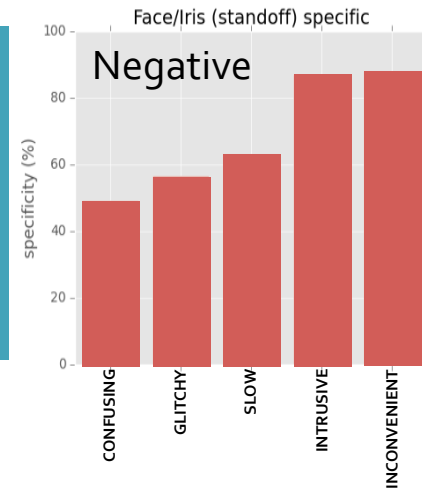
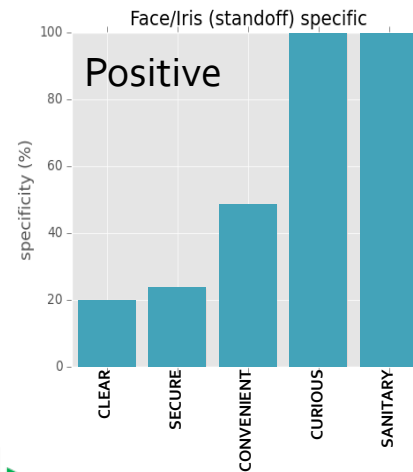
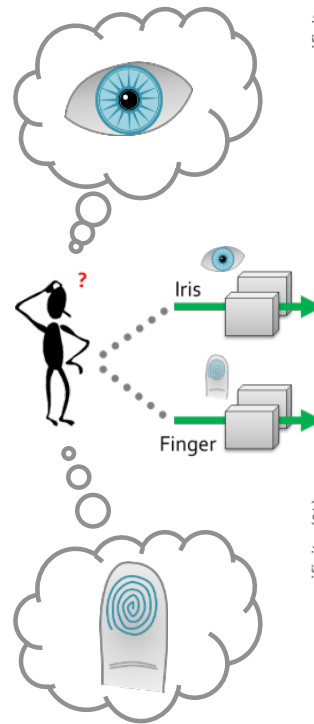
"The camera does not require touching anything, so you are not in contact with any germs."
 - Chose Finger:**

"While Gate B was just as easy to use, it took a little longer because it told me that it couldn't see my eyes. I am always in a hurry."
- Open coding revealed specific associations between Finger and Face/Iris
 - Negative** and **positive** concepts were tabulated



Specific Traits

- **58%** of subjects preferred Finger (1P) to Face/Iris (Standoff)
- Specific traits:
 - Those frequently mentioned for one modality but not for the other
- Face/Iris Specific:
 - Positive
 - Sanitary, Curious, Convenient
 - Negative
 - Inconvenient, Intrusive, Slow
- Finger Specific:
 - Reliable, Simple, Easy



User Perception: Takeaways

- Users characterized preferred methods as:
 - Quick, easy, and sanitary
- Non-preferred methods as:
 - Confusing, inconvenient, and glitchy
 - Largely based on whether tech worked for them, amount of feedback required
- Most users chose Finger
 - Stronger specific association with positive concepts
 - No specific association with negative concepts
- Reducing negative perceptions of Face/Iris:
 - Inconvenient:** Reduce need to remove hats/glasses
 - Intrusive:** Differentiate from Face, assure face image not acquired, make device less appear more friendly
 - Slow:** Having to look feels longer than having to touch, reduce time required for looking at scanner

PREFERRED:
quick
easy
sanitary
simple
convenient
clear
secure

Non-PREFERRED:
confusing
inconvenient
glitchy
slow
intrusive
invasive
complicated

Reliable
Simple
Easy

Sanitary
Curious
Convenient
Inconvenient
Slow
Intrusive



Thank You!

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