. . . providing scientific research, consulting, and evaluation services in all areas of authentication

Intuitive Touchless Fingerprinting
The Pressure's Off

Valorie S. Valencia, PhD

Design Considerations for Biometric Systems Panel
Moderator: Dr. Eric Kukula, Purdue University
24 September 2009

Contactless Fingerprinting

- Benefits
  - Lack of physical contact alleviates public health concerns
  - More comfortable for user
  - Cleaning and sanitation of sensor not necessary
    - No latent fingerprints
  - No deformation of fingerprint pattern
- Challenges
  - Deformation-free fingerprint is distorted relative to traditional contact-based images
  - Guiding the user to correctly present their finger/hand to the sensor

Touchless Fingerprinting: The Pressure's Off

	System Designer	User Experience
Physical	Solvable challenges	No physical contact
Emotional	Excited, rise to the challenge	Relief, no potential transfer of communicable diseases
Mental	Make it so	

High-Level Technical Challenges

- Obtain high contrast image from low contrast object
- Orientation and position of finger/hand within collection volume
- Large collection volume
  - Enhanced depth of field
- Magnification calibration
- Conformance to standards
- Undistorted fingerprint images distorted relative to contract-based fingerprint images
- Contactless spoof resistance
  - During unsupervised operation

The Pressure's Off?

	System Designer	User Experience
Physical	Solvable challenges	No physical contact
Emotional	Excited, rise to the challenge	Relief, no potential transfer of communicable diseases
Mental	Make it so	Uh, what do I do?

Balancing Technology and Human Requirements

- Address technical issues with the user in mind
  - Users often under stress, uneasy or anxious
    - Sympathetic nervous system engaged
  - Don’t require the user to engage the neocortex
    - Rather engage limbic portion of brain
  - Interface must be intuitive, instinctual, ergonomic and easy to use
  - No posters, no instruction ideal ➡ good affordance
  - Consider engrained social norms of intended population
- Need to balance performance (e.g., accuracy, speed and cost) goals with usability (e.g., convenience, ease of use, user satisfaction)
  - Tradeoffs depend on particular operational implementation

Contactless Fingerprinting Solutions

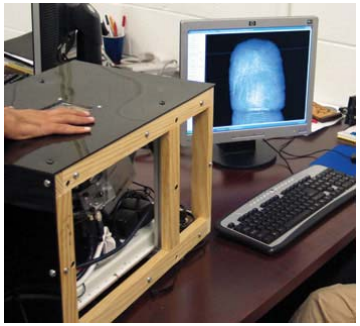
Mitsubishi

TST

TBS Single-Finger

TBS Ten-Finger

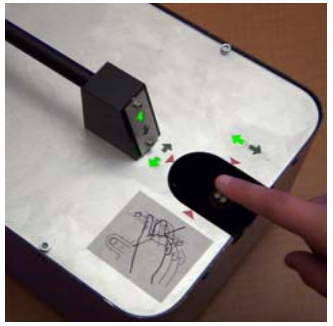
Sagem Sécurité



FlashScan3D/ U of Kentucky

UMass Lowell

GE Global Research



Authenti-Corp/ U of Arizona

Some User Challenges*

- Some users are:
  - Unable to walk without aid or in a wheelchair (~5%)
  - Speech or language impaired (~6%)
  - Dyslexic or intellectually impaired (~4%)
  - Physically weak or uncoordinated (~4%)
  - Blind or vision impaired (~2%)
  - Deaf or hard of hearing (~6%)
  - Left handed (~10%)
  - Color blind (~0.5% women, ~8% men)
  - Very old or very young
  - Non-English speaking

*www.johngilltech.com

Food for Thought

- Design for “walk-up-and-use” operation
  - A design that works for people with impairments is often a good design for everyone
- System should adapt to user
  - Rather than requiring the user to adapt to the system
- Do not divorce technology development from the human experience
  - Usability (like security) must be considered at early stages of design process
    - Not as an aftermarket add on!
  - Technology needs to work in operational environments with real people
    - Brad Wing
  - Quantify performance in terms of usability & inclusivity
    - Mary Theofanos & Eric Kukula