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Authentication Using Pulse-Response Biometrics

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- 1 Background on Biometrics
- 2 Pulse-Response
- 3 Security Application
- 4 Experimental Results

Biometrics

Mechanism to identify people by characteristics or traits.



Behavioral

Includes: keystroke timings, speech pattern analysis, gait recognition, and analysis of stylus pressure, acceleration and shape in hand-writing

Physiological

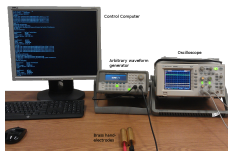
Includes: fingerprints, hand geometry, facial recognition, speech analysis, and iris/retina scans

Pulse-Response Biometric



- Pulse signal applied to the palm of one hand.
- The biometric is captured by measuring the response in the user's hand.





Voltage (V)	1	1.5
Max Current (mA)	0.1	500+
Exposure	100ns	~500ms

- **Universal**: Usable by everyone that needs to use it.
- **Unique**: within the target population.
- **Permanent**: Consistent over the time (stable).
- **Unobtrusive**: Does not disrupt the user's work flow.
- **Difficult to circumvent**: Unable to modify the biometric or impersonate others.

Identification

Obtain the identity of a user.

vs.

Authentication

Confirm the identity of a user.

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Authentication

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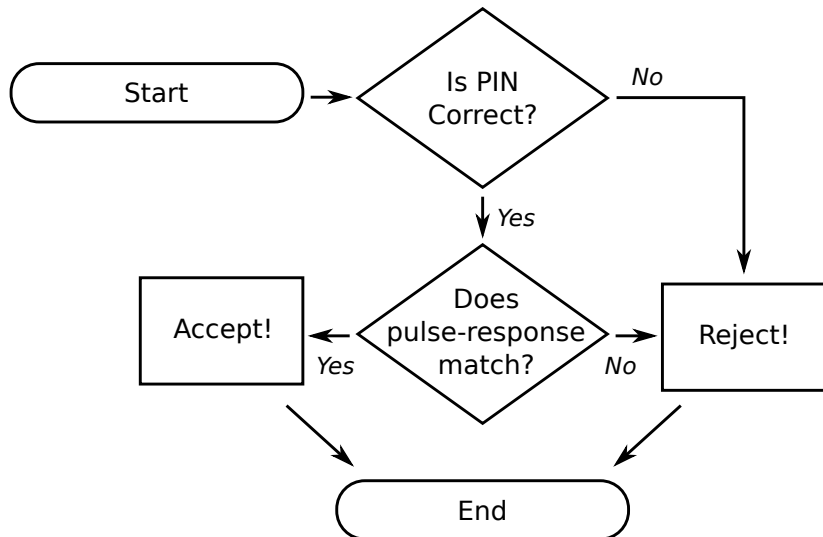
Continuous Authentication

Continuously confirm the identity of a user.

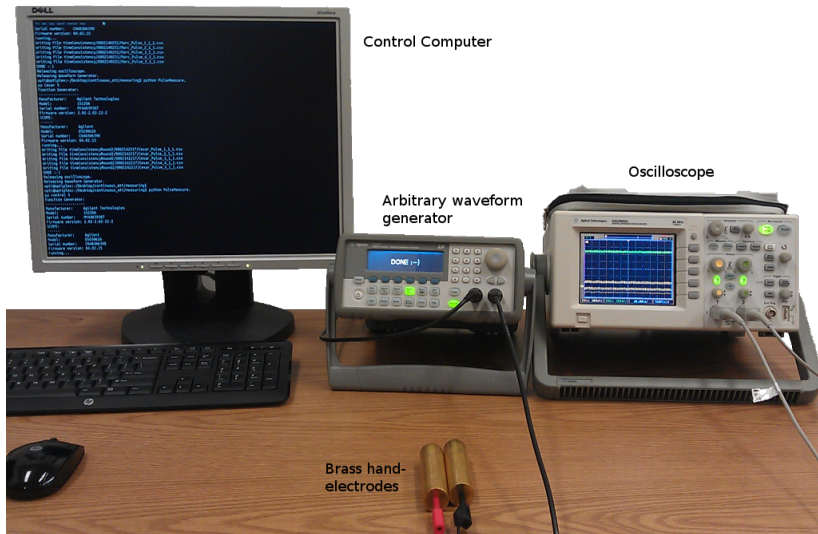
Hardening PIN Entry Systems



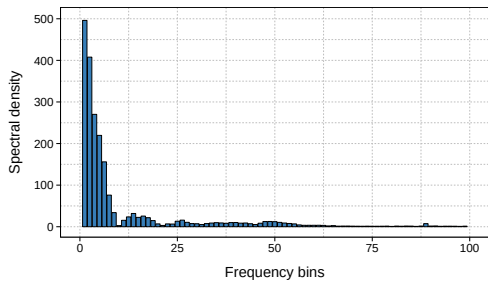
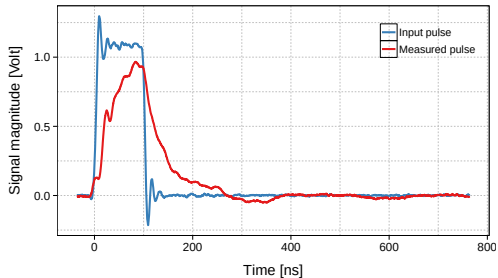
ATM Decision Flowchart



Experimental Setup



Signals



FFT:



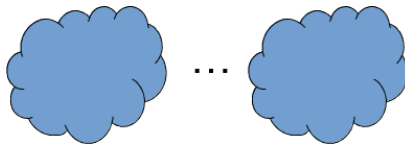
LDA

Feature vector:

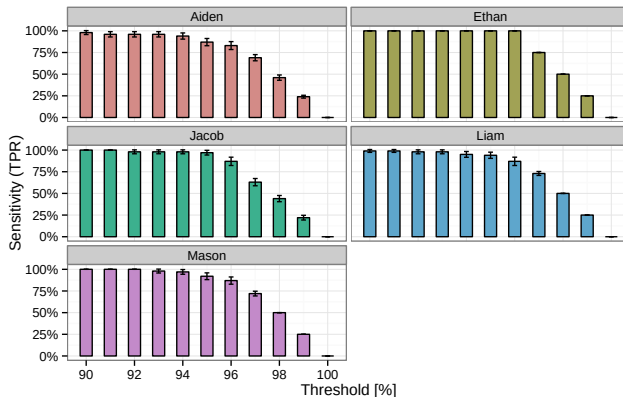


SVM

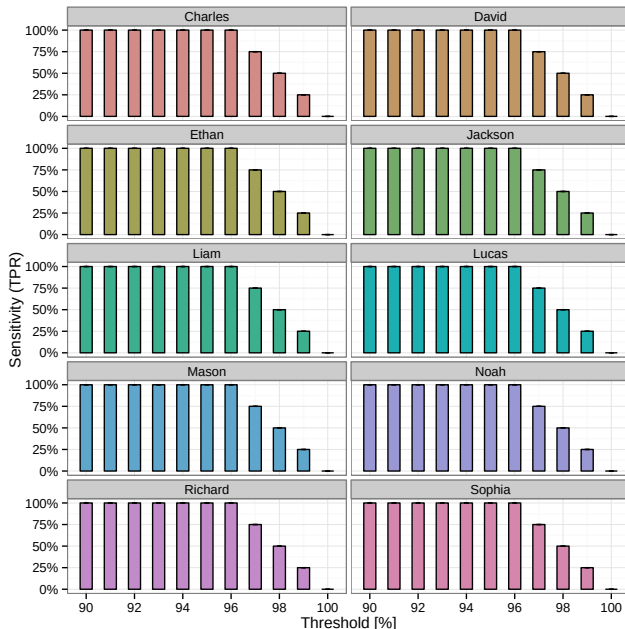
Classification:



Over Time



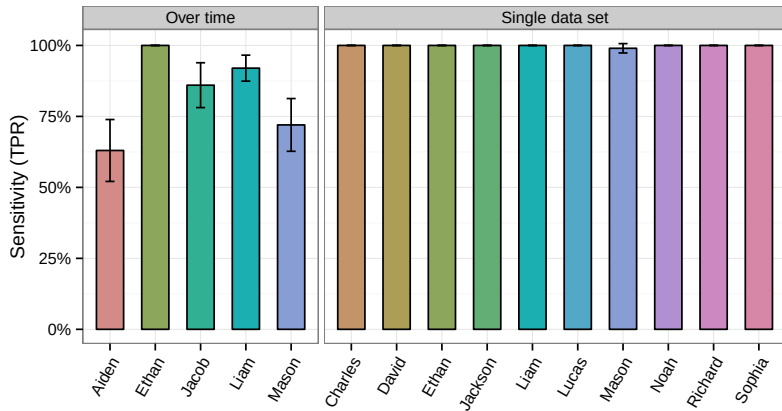
Single Session



Identification Classifier



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Prototype

- Build PIN entry prototype.
- Gather experience on acquisition time, etc.
- Gather data.

Acquisition Signal

- Higher bandwidth
- No signal
- Effects of stress, blood sugar levels, etc.
- Test impersonation strategies.

- A new biometric based on Pulse-Response.
- A scenario where Pulse-Response can be easily integrated.
- Fantastically promising results. Very high degree of uniqueness and remarkably stable over time.

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ACM WiSec'14

Paper submission:
March 10th, 2014

Conference date:
July 23rd - 25th, 2014

RFIDSec'14

Paper submission:
March 1th, 2014

Workshop date:
July 21st - 23rd, 2014



<http://rfidsec2014.cis.uab.edu/>

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- A scenario where Pulse-Response can be easily integrated.
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Thank you for your attention. Questions?

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