Pouring a Solid Foundation: Addressing Common Questions about Speaker Verification

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Terminology

**Speaker Authentication**

Question: Is this person who they say they are?

**Speaker Authentication Solution**

Uses one or more technologies to answer that question.

**BEWARE**

Sometimes “speaker authentication” is used as a synonym for “speaker verification.”
# Speaker Authentication Solution

## Authentication Technologies

<table>
<thead>
<tr>
<th><strong>Possession</strong></th>
<th><strong>Knowledge</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Something you have</td>
<td>PIN</td>
</tr>
<tr>
<td>Mobile phone</td>
<td>password</td>
</tr>
<tr>
<td>ID</td>
<td>birth date</td>
</tr>
<tr>
<td>token</td>
<td><strong>Strength</strong></td>
</tr>
<tr>
<td>Possession</td>
<td>Secret</td>
</tr>
<tr>
<td><strong>Weakness</strong></td>
<td>Learned</td>
</tr>
<tr>
<td>Lost</td>
<td>Shared</td>
</tr>
<tr>
<td>Stolen</td>
<td></td>
</tr>
<tr>
<td>Spoof</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Biometric</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Who you are</td>
</tr>
<tr>
<td><em>voice</em></td>
</tr>
<tr>
<td>face</td>
</tr>
<tr>
<td>Fingerprint</td>
</tr>
<tr>
<td>DNA</td>
</tr>
<tr>
<td>Iris</td>
</tr>
<tr>
<td>Nose</td>
</tr>
<tr>
<td>Hand bacteria</td>
</tr>
</tbody>
</table>
Biometric Errors

False Acceptance
(False Match)
let impostors in

False Rejection
(False Non-match)
Keep legitimate users out
Speaker Verification (SV)

1. **Uses information about the vocal tract** Uses the physiology and anatomy (size & shape of throat, mouth, etc.) and speaking behavior.

2. **Enrollment: Creates a voice model for each person** This *NOT* a recording. It is a digital map of features gathered and analyzed under point #1. (reference model)

3. **Verification: One-to-one comparison** Compares the voice of an authorized user with the voice of a person claiming to be that user.

4. **Vulnerabilities** DEVICE: device mis-match – also channel mismatch; ENVIRONMENT: Noise on channel or background USER: change in voice (ex. Fatigue, yelling), DNA similarities
Speaker Verification

Kinds of Spoken Input

- Free speech (text independent)
- Password (text dependent)
- Challenge-response (text prompted)
SV – How It Works

Enrollment

• Validate enrollee’s identity
• Collect samples
• Create model (reference model)
• Store securely
SV – How It Works

Verification

• **Claim of identity**
• Collect samples
• Create Model
• Retrieve reference model
• Matching = One-to-one comparison
• Decision = Accept / Reject / Undecided
SV – How It Works

Verification

• Claim of identity
• Collect samples
• Create model
• Retrieve reference model
• Matching (One-to-one comparison)
• **Decision= Accept/Reject/Undecided**
Setting the Threshold

Errors and Thresholds

Looser Match (more FA)

Tighter Match (more FR)
Beyond Authentication

Authentication focuses on the user

- Make sure your application complies with corporate and regulatory requirements
- Check to see that security holes don’t allow bypassing of the authentication security
Resources

1. *Speaker Identification and Verification (SIV)*
   Requirements for VoiceXML Applications, Speaker Biometrics Committee -VoiceXML Forum, 2005

2. Mobio Project (biometrics on mobile devices)
   www.mobioproject.org/


5. *Speaker Identification and Verification Applications*
   Speaker Biometrics Committee -VoiceXML Forum, 2006
Standards

1. Media Resources Control Protocol (draft 20), Internet Engineering Task Force

2. VoiceXML Version 3 SIV module (draft), W3C - Voice Browser Working Group, 2010


4. Speaker Recognition Format for Raw Data Interchange (SIVR-1) (INCITS 456), ANSI/INCITS
Thank you

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