Headbanger: Authenticating Smart Wearable Devices Using Unique Head Movement

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**Head Movement for Authentication**

**Challenges:**
- For the head movement:
  - No long-term personal habit
  - Low degree of freedom
- For the device:
  - Limited input & display area
  - Constraint computing resource

**Our solution:**
1. Induce the user by a music cue
2. Authenticate the user based on the musical head movement

**Prototype**

- Google Glass SDK
- Java Speech Tool Kits
- Fast DTW: $O(n^2)$ -> $O(n)$

**System Overview**

- **Filtering:** remove high frequency noise
- **Distance computing:** use Dynamic Time Warping to find the best alignment path
- **Ranking:** find the represented samples for the comparison

**Performance**

- Low Equal Error Rate (EER) : 4.43%
- Low False Accepted Rate in Attack Mode : 6.94%

**Demo Scenario: Attack Challenge**

**Owner can be authenticated:**
1. Owner wears the Glass and perform the movement
2. The Glass displays “Welcome Back!”

**Attacker imitates the Owner:**
1. Attacker watches the video
2. Attacker tries to mimic the movement shown in the video
3. Headbanger displays the result of this attack.