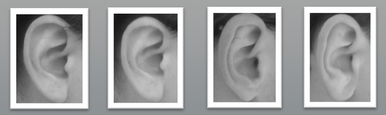

Project SEARCH: Scanning Ears for Child Health

Ear biometrics' potential for solving patient identification challenges in global field settings

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Abstract

Project SEARCH aims to solve a long standing global public health challenge: *identifying people over time and space.* The developed application allows health personnel to establish patients' identities via biometrics of a captured ear image.

Background

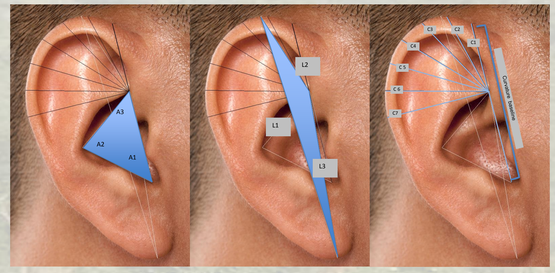
- In LMICs, the ID systems we take for granted (SSNs, birthdates, insurance cards, etc.) do not exist or are unreliable
- Most patient encounters act in isolation with devastating effects on major public health efforts, including chronic infectious disease management (ART, TB, etc), vaccination efforts, and longitudinal studies
- Biometrics allow for unique identification based on physical features

Why the Ear?

- Non-invasive *vs. DNA or Picture of face*
- Not affected by mood *vs. Facial Recognition*
- Does not cause anxiety *vs. Iris*
- No hygiene problems *vs. Finger/Palm printing*
- Stable with age *vs. Picture of face*
- No social stigma *vs. Fingerprinting*

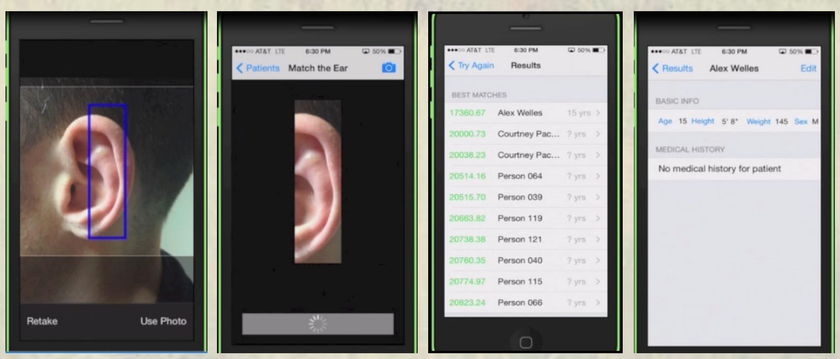
Proof-of-Concept Study

- Developed a simplified ear measurement ID algorithm
- Collected image data from 25 individuals' L and R ears
- Performed blinded matching experiments to test comparability between three investigators' measurements
- Algorithm provided high stdev between subjects (high variability between ears) but low stdev between investigators (high accuracy)
- When using both L and R ears, matching accuracy was 100%



Inner Triangle | Outer Triangle | Curvature

iOS Phone Application



This application has been developed as a proof of concept for research purposes only

Comparative Study

- To select a feature extraction technique for representing an ear, we first performed a comparative study of three techniques:
  1. Scale Invariant Feature Transform (SIFT)
  2. Fourier Transform (FT)
  3. Local Binary Patterns (LBPs)
- Results of study below were obtained from ~500 images of 125 subjects' right ear from the IIT Delhi Database

Methodology	Recognition Rate (Top 1)	Recognition Rate (Top 5)
SIFT	96.5 %	98.4%
FT	96.0 %	99.2%
LBPs	95.5 %	98.1%

Future Work

Use crowdfunding and SPH pilot grant awards to:

1. Improve and test application's invariance to environment
2. Conduct longitudinal study to test application's ability to identify infants over rapid periods of growth
3. Test in Zambian field setting with community health workers

References

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