Recognizing Infants and Toddlers using Fingerprints: Increasing the Vaccination Coverage

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Introduction

- ~1.5 M children (<5 years old) die every year from vaccine preventable diseases
  The vaccine-preventable diseases responsible for 1.5 million infant deaths
  Pneumococcal diseases 32%
  Whooping cough 13%
  Hib 15%
  Tetanus 4%
  Measles 9%
- Sub-saharan Africa and South Asia together account for 4 out of every 5 deaths
- “Vaccine wastage rates are higher than 50% in some of the most challenging geographies. For every $100 in new vaccines purchased, $50 will never go into the arm of a child in need.” - VaxTrac

The Big Question

Can fingerprints, or, for that matter any other biometric modality, be used for tracking vaccination schedule of children (0-4 years)?

Capturing Fingerprint Images

Challenges
- Semi to non-cooperative subjects
- Oily/wet finger skin
- Small finger size

Desirable sensor characteristics
- Portability
- Usability
- Fast capture speed

Data Collection
- Digital Persona U.are.U 4500 (500 ppi) optical fingerprint reader

Sample Fingerprint Images

Matching Fingerprint Images

Matching Challenges
- Poor Quality
- Difficulty in feature extraction
- Large non-linear distortion
- Variations in finger skin condition

Proposed Matching Strategies
- Up-sample the fingerprint image
- Capture multiple impressions per finger
- Fuse matching results of two fingers
- Update the gallery by including fingerprint impressions captured in all previous sessions

Results
- Latent SDK performs better than tenprint SDK

Benin: The real challenge
- High temperature and humidity
- Open air clinics
- Most subjects < 6 months old

Current Focus and Next Steps
- Explore alternative capture methods
- Collect longitudinal operational data