

# Giving Infants an Identity: Fingerprint Sensing and Recognition



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#### Motivation

 Growing demand for biometrics-based authentication of infants (0-12 months old)



Tracking vaccination schedules



National ID programs (e.g., India's Aadhaar)

# **Custom Fingerprint Reader**

• 500 ppi fingerprint readers work well for children > 12 months old

• In collaboration with NEC, we developed a compact (7 cm X 3 cm X 7.5 mm) and highresolution (1,270 ppi) fingerprint reader to capture infant fingerprints



**NEC Zakuro prototype fingerprint reader** 



Age: 6 weeks

### **Fingerprint Data Capture**

• Data collection was done in Dr. Bhatnagar's office at Saran Ashram hospital, Agra, India



Signing the consent form



**Fingerprint capture** 



Waiting outside doctor's office



**Receiving incentive** 

Dat	abase
# Infants	66
Age group	0-6 months
# Sessions	2
Time gap	2-4 days
# Images	3 each of left and right thumb



Face images and right thumb prints captured in two different sessions of (a) a 6 hours old infant and (b) a 1 week old infant

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# Image Enhancement & Matching

• We designed an algorithm to enhance infant fingerprint images to improve feature extraction (minutiae points) and matching

• We conducted verification (1:1 comparison) and identification (1:N comparisons) experiments using a state-of-the-art commercial fingerprint matcher

Verification Results (1:1 comparison)		
Age group	True Accept Rate (%)	False Accept Rate
$\leq$ 4 weeks	43.43	0.1
>4 weeks	79.72	0.1
Identification Results (1:N comparisons)		
Age group	Rank-1 (%)	Rank-10 (%)
$\leq$ 4 weeks	38.44	44.05
> 4 weeks	73.98	79.95



fingerprints. Extracted minutiae points from images in (b) are marked in red and green. Corresponding minutiae are connected in blue.

#### **Future Work**

- Design better enhancement and matching algorithms
- Conduct longitudinal study for infant identification
- Determine the youngest age for identifying infants with acceptable accuracy (95 % TAR at 0.1% FAR)

