

Personal Authentication using Hand Geometry

Project Evaluation

Phase I

Biometrics – EEL851

BY

Ch.Ravikanth

Pooja Agrawal

K.Venkata Pratyusha

Outline

- Acquiring Image
- Preprocessing
 - Extraction of hand Image.
 - Thresholding.
 - Pegs Removal.
 - Contour Extraction.
- Feature Extraction.
- Performance Plots.
- Identification.

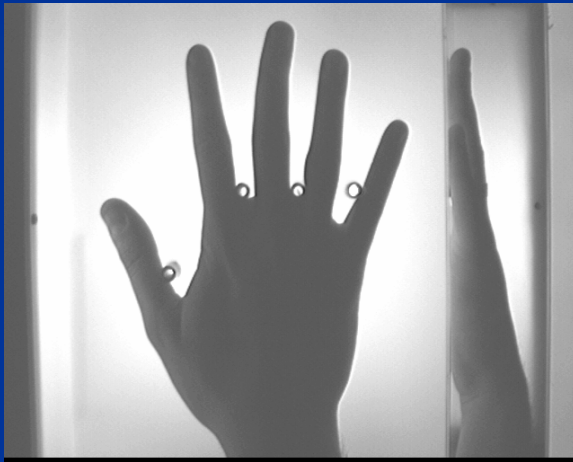
Acquisition

- Platform designed to guide the hand to fixed location.
- Six tops placed in determined positions
- Each of them equipped with pressure sensors
- When all are activated trigger the camera.



Preprocessing

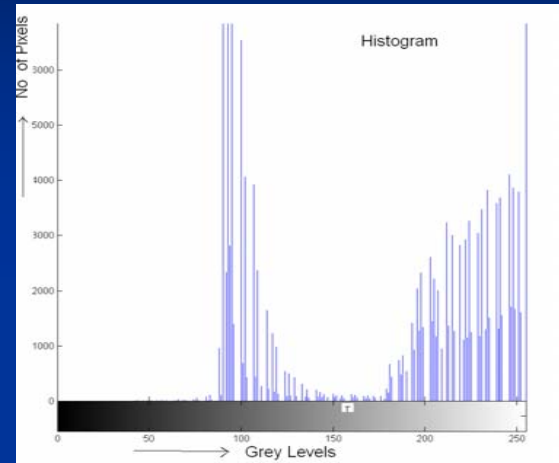
- Extracting Hand Image.



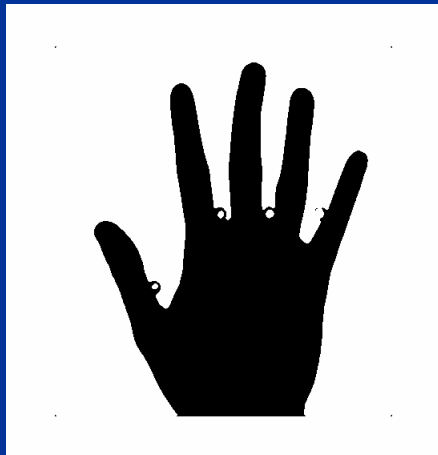
Preprocessing



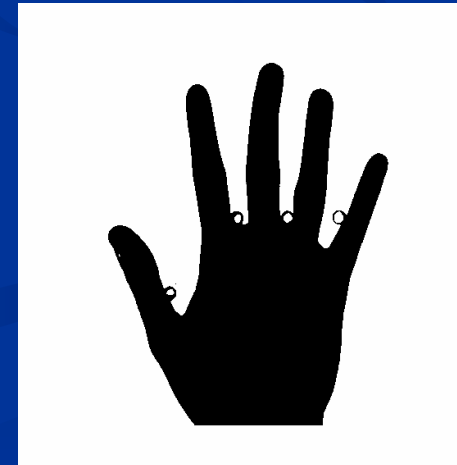
Histogram



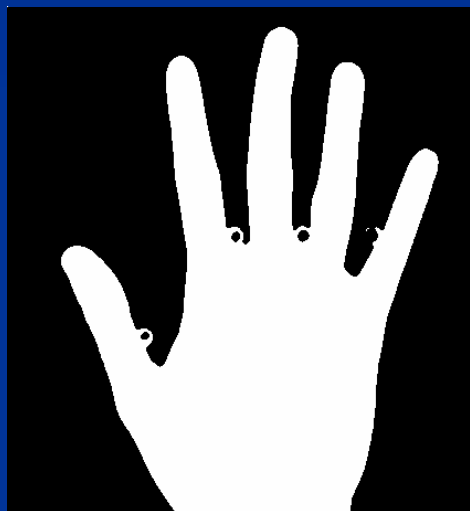
Thresholding



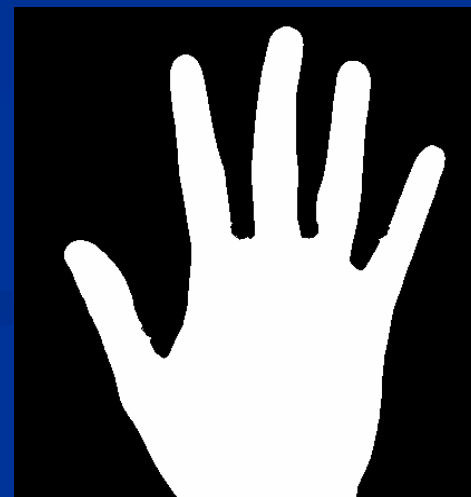
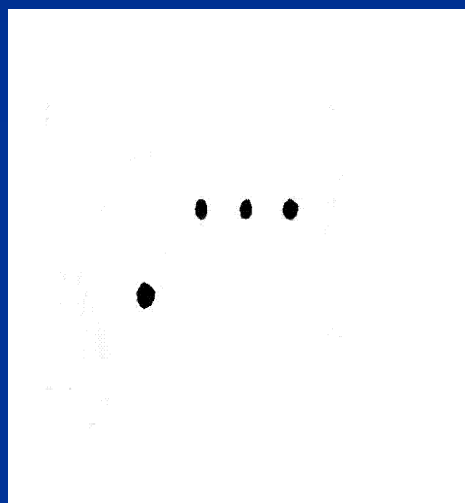
Averaging



Pegs Removal

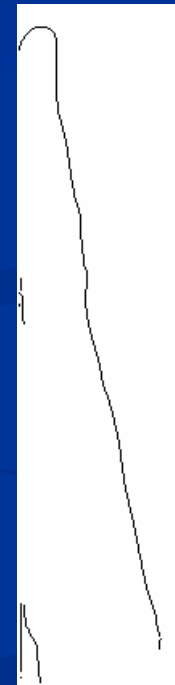
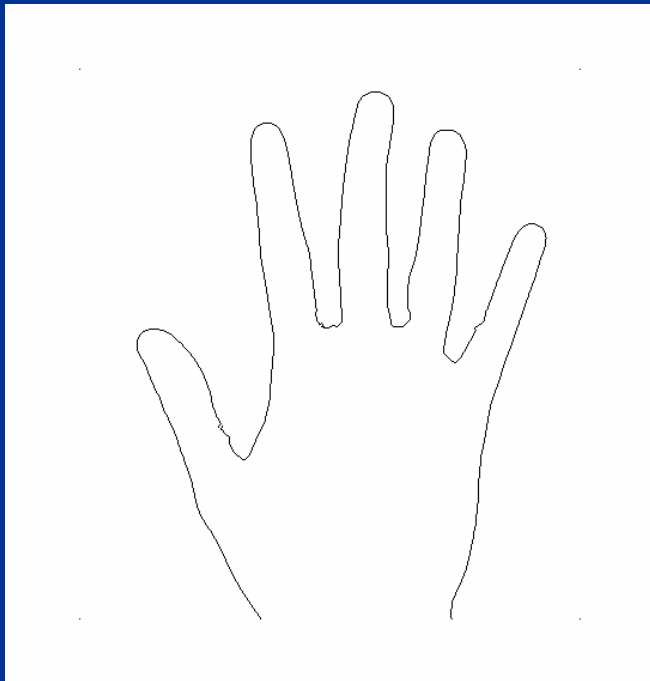


AND
Operation



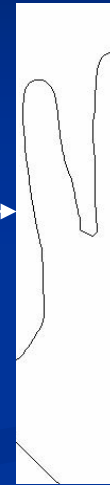
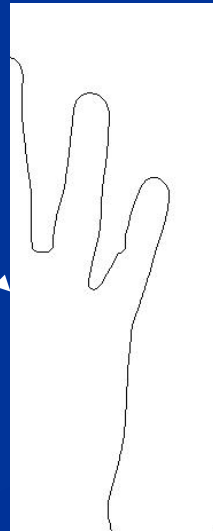
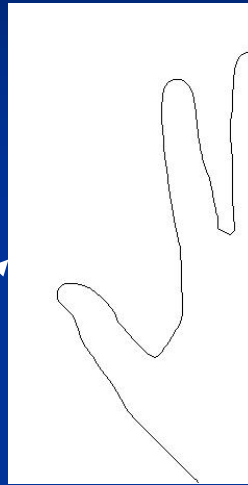
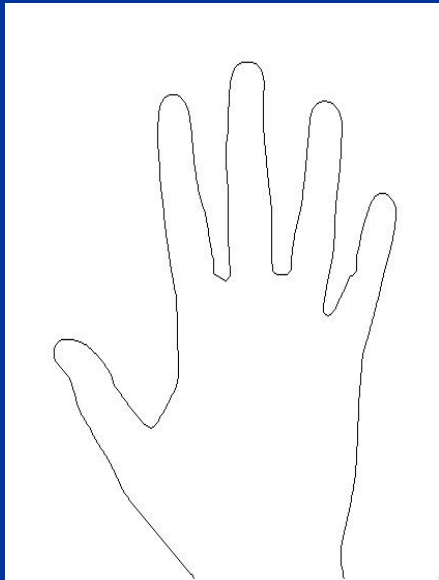
Contour Extraction

- Sobel operator is used to compute the contour



Feature Extraction

- Tip points
- Valley points

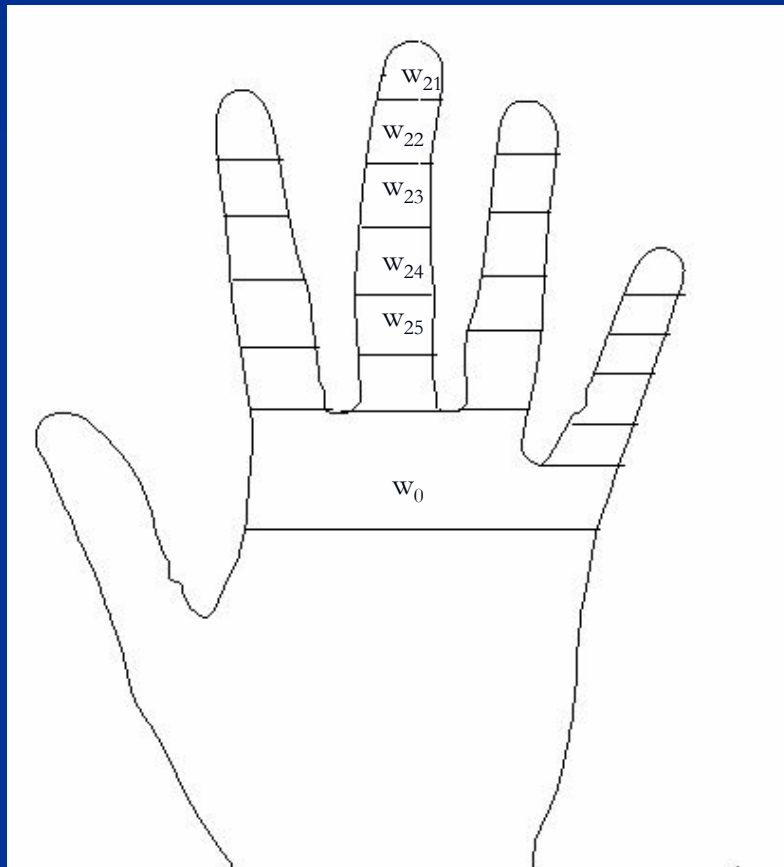


Feature Extraction

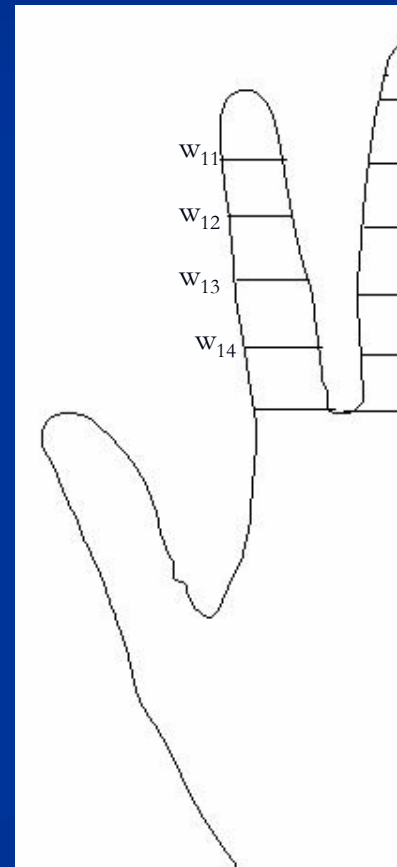
- Width of the Fingers and Palm(17).
- Deviations(3).
- Distance between inter finger points(6).
- Angles(2).
- Perimeter.
- Area.
- Heights(2).

Feature Extraction

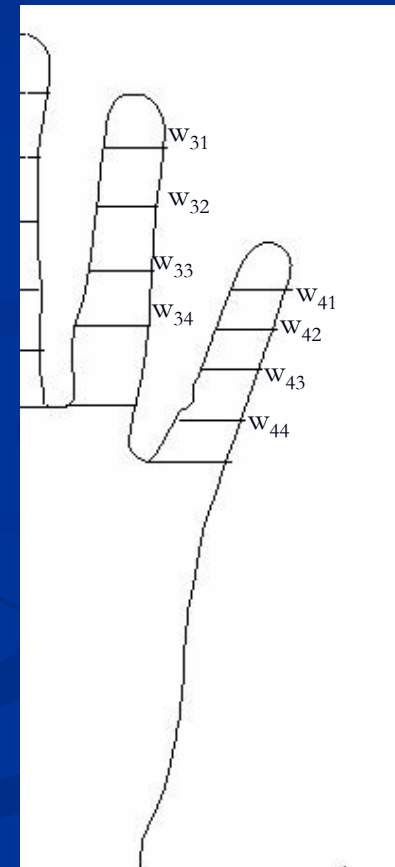
■ Width



=



+



Feature Extraction

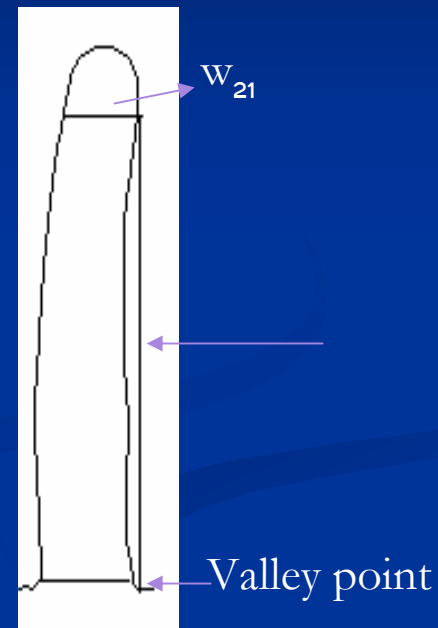
- Deviation

- Perimeter

Total pixels in contour image

- Area

Total pixels in Threshold image of Hand.



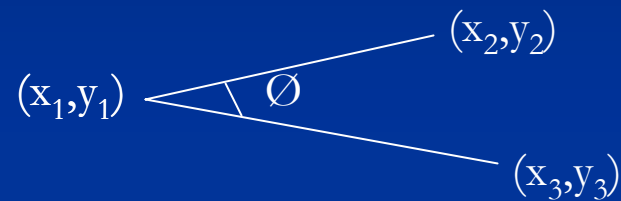
Feature Extraction

■ Angles

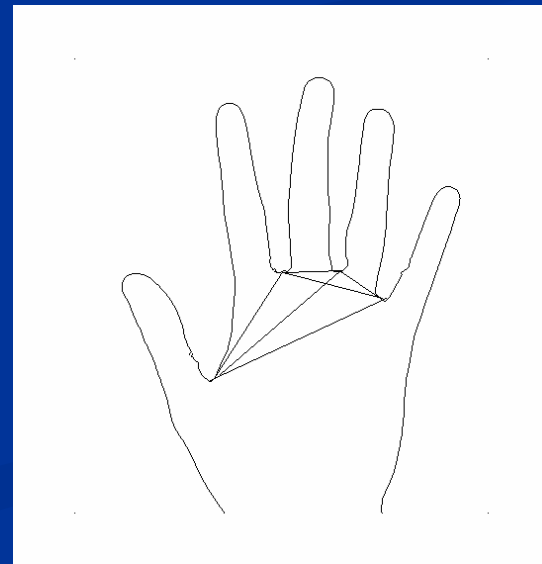
$$\emptyset = \tan^{-1}((m_1 - m_2) / (1 + m_1 * m_2))$$

$$m_1 = (y_2 - y_1) / (x_2 - x_1)$$

$$m_2 = (y_3 - y_1) / (x_3 - x_1)$$



■ Distance between Inter finger points

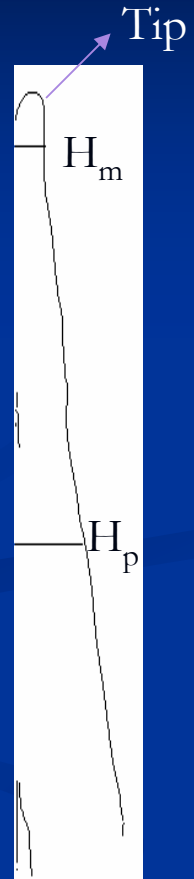
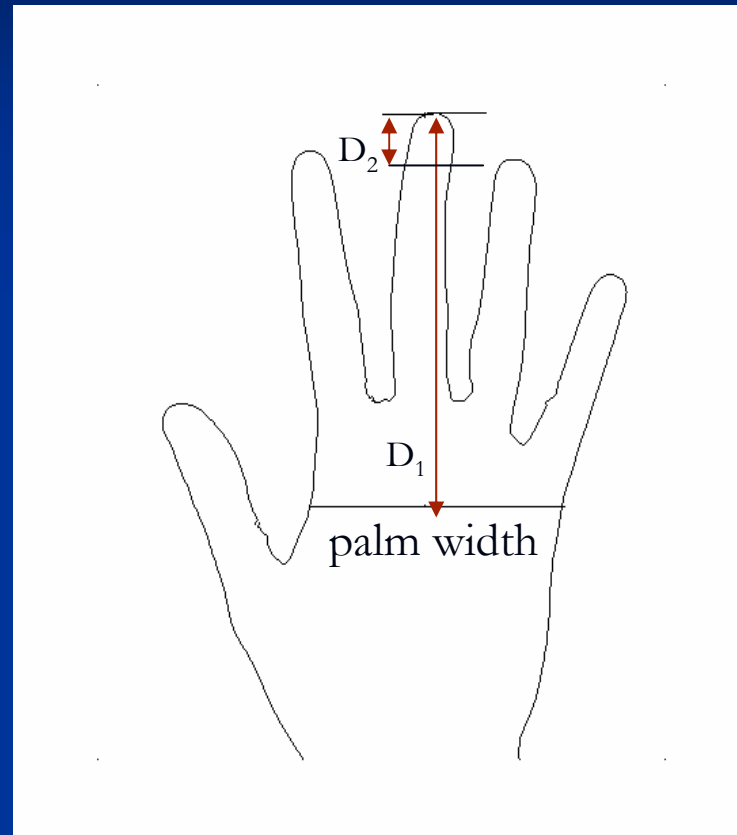


Feature Extraction

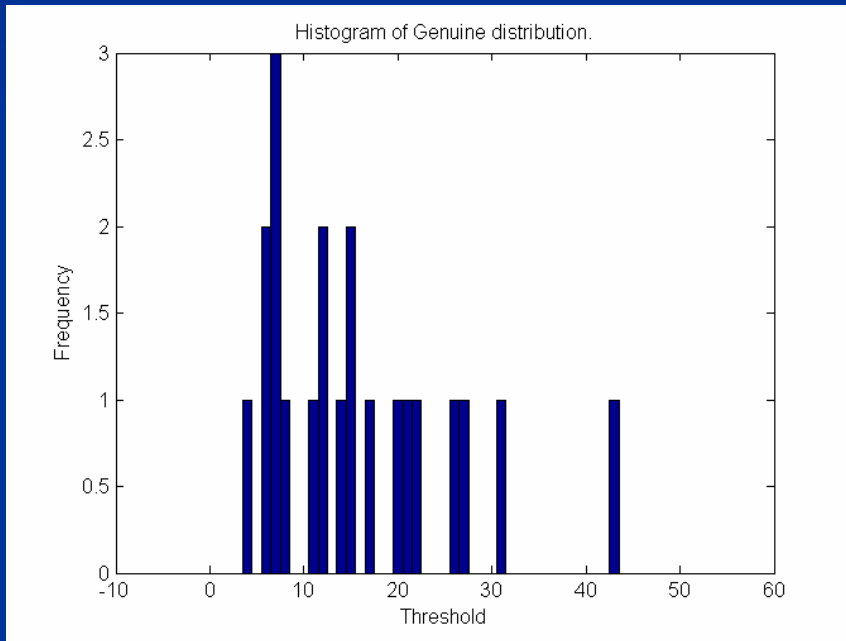
- Heights

$$H_m = \text{Tip} + D_2$$

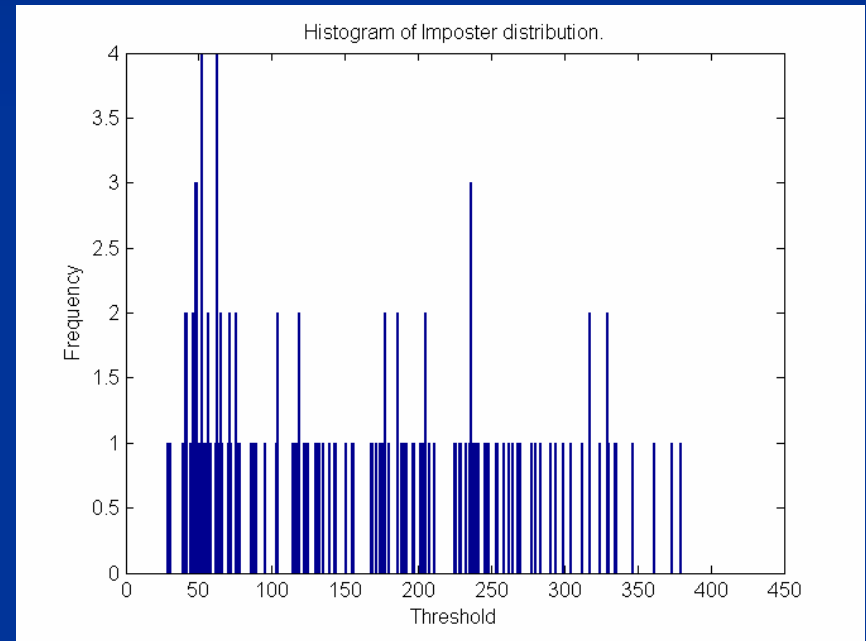
$$H_p = \text{Tip} + D_1$$



Performance Plots

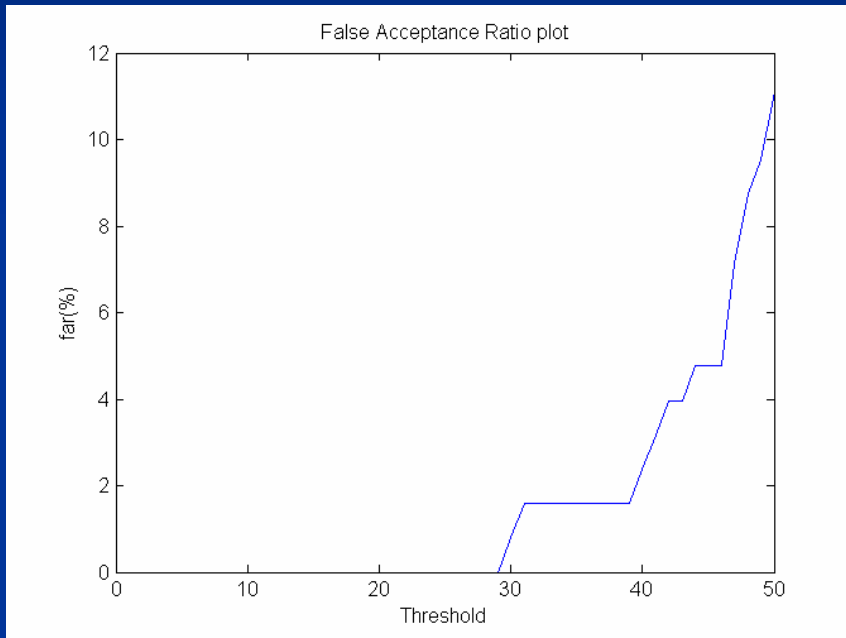


Genuine Distribution

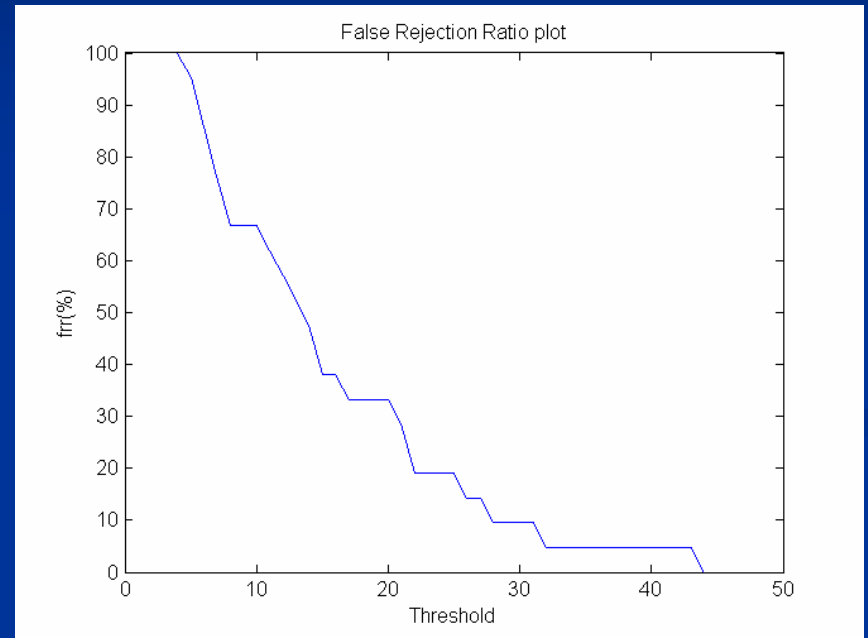


Imposter Distribution

Performance Plots

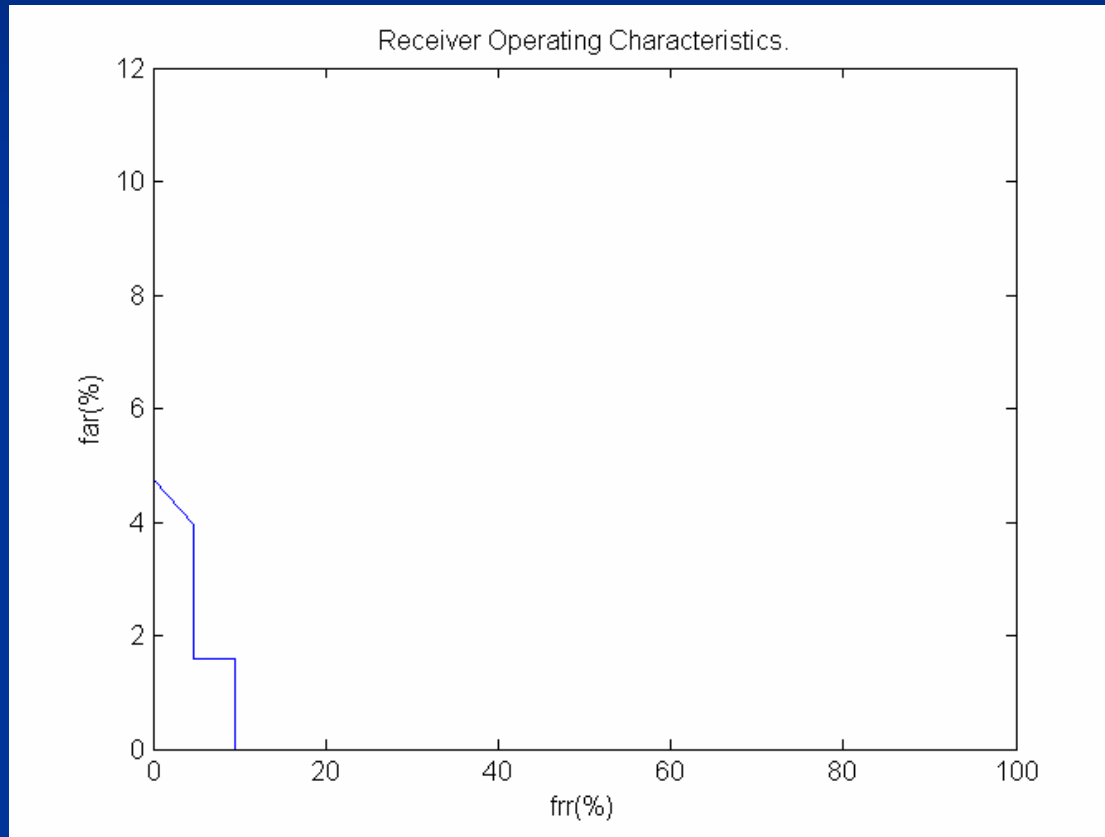


FAR Plot



FRR Plot

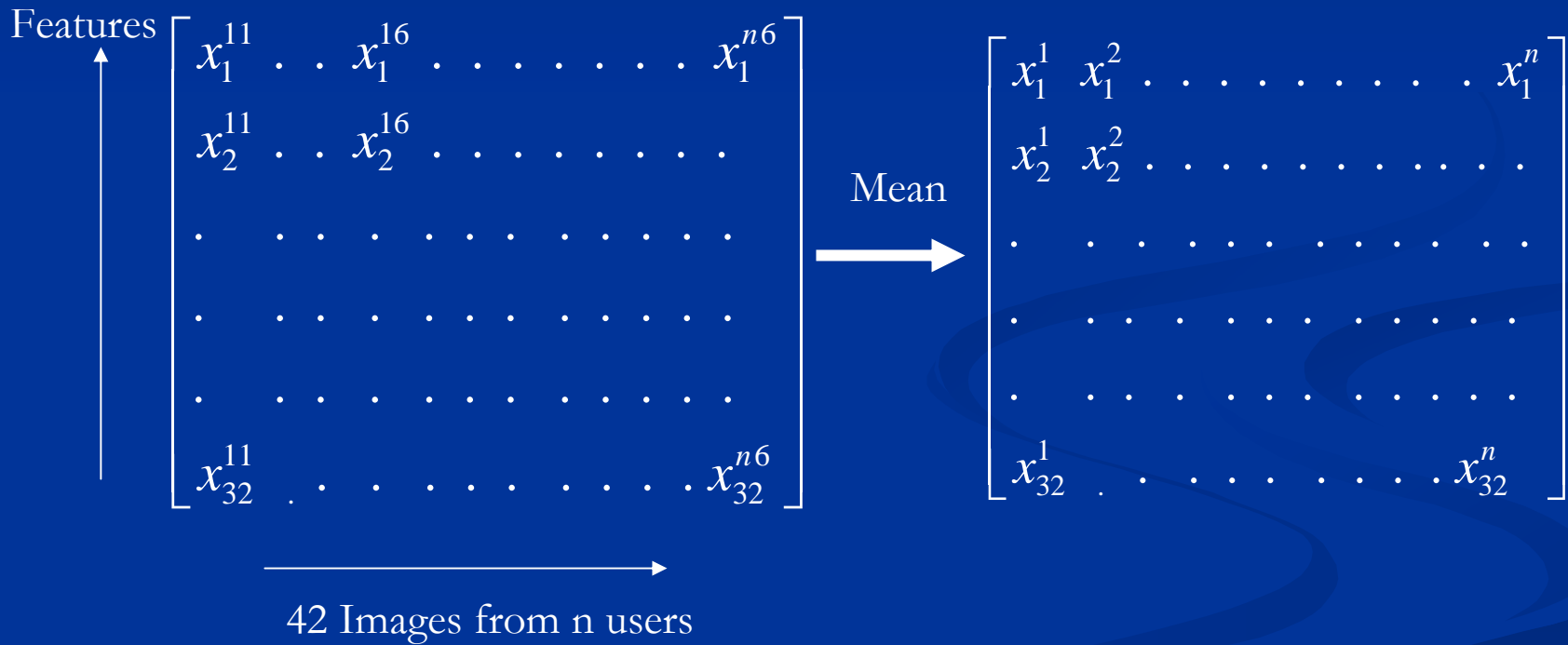
Performance Plots



ROC Plot

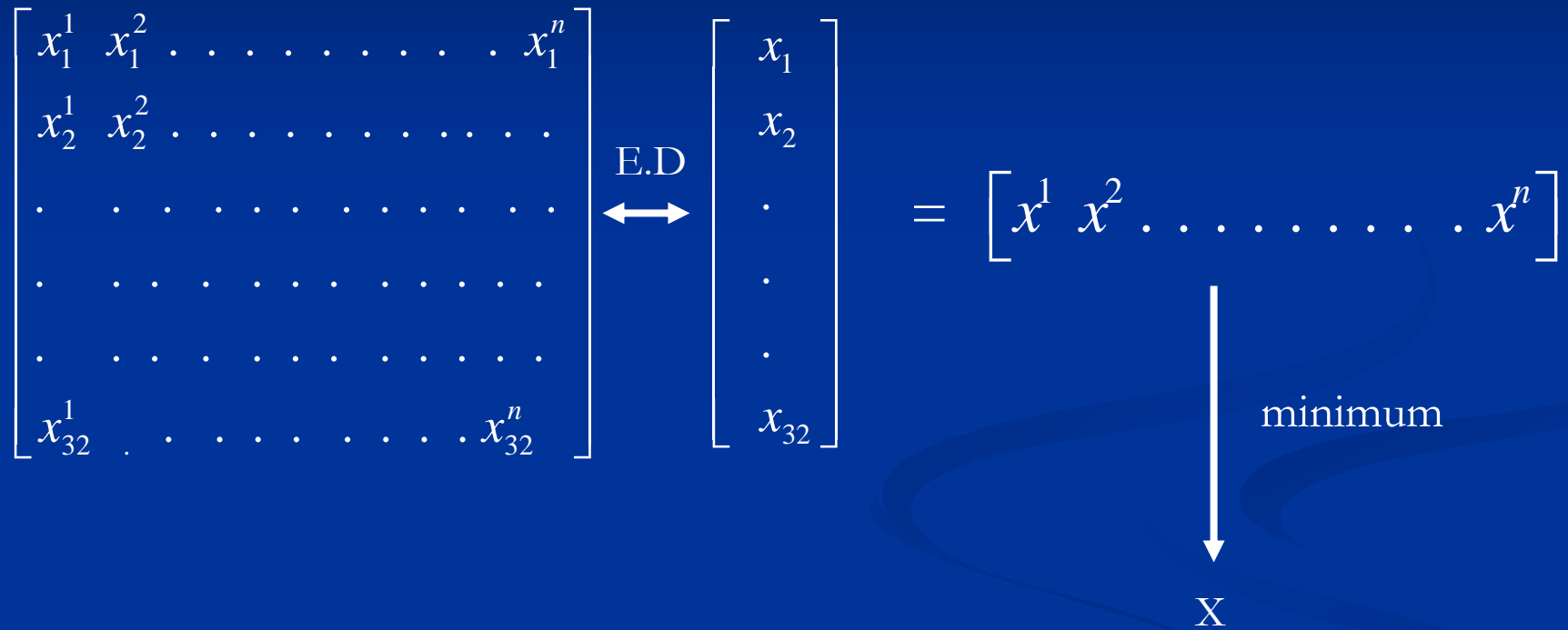
Identification

Template Feature Vector

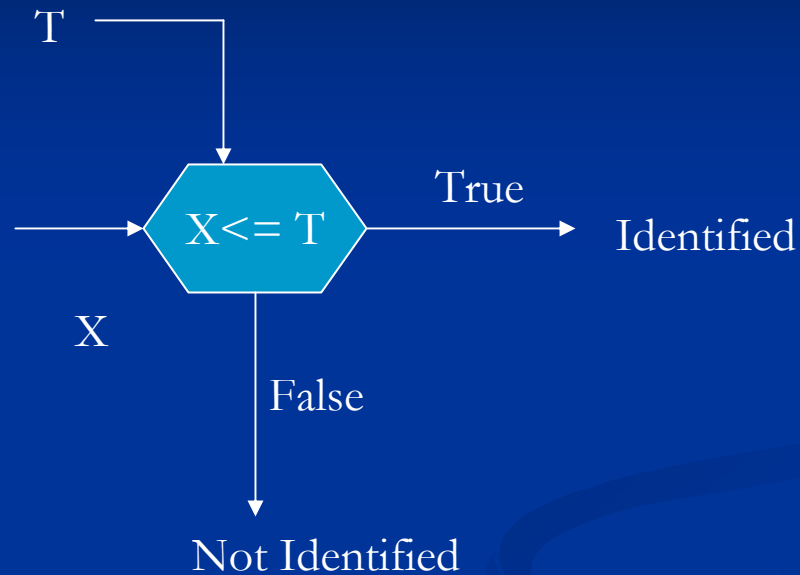


Total number of users $n = 7$

Identification



Identification



T = Predefined Threshold

X = Minimum Euclidean between unknown and Template feature vector.

Bibliography

- 1) “Biometric Identification through Hand Geometry Measurements.”, *PAMI oct 2000* by R.S.Reillo, C.S. Avila, Ana Gonzalez
- 2) “Personal Identification using 3-D finger Geometry.”, *IEEE trans., information forensics and security, 2006* by S.Malassiotis, Niki A., Michael G.Strintzis.
- 3) “Hand Geometry pattern recognition through GMM” by R.Sacnchez-Reillo, *IEEE 2000*.
- 4) “Exploiting finger surface as a biometric identifier.” *A dissertation by Damon L. Woodard, Dec 2004*.
- 5) http://biometrics.cse.msu.edu/hand_geometry.html
- 6) <http://www.handreader.com/>