

*Dental Biometrics:
Matching Dental X-rays for
Human Identification*

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<http://biometrics.cse.msu.edu>

Forensic Dentistry

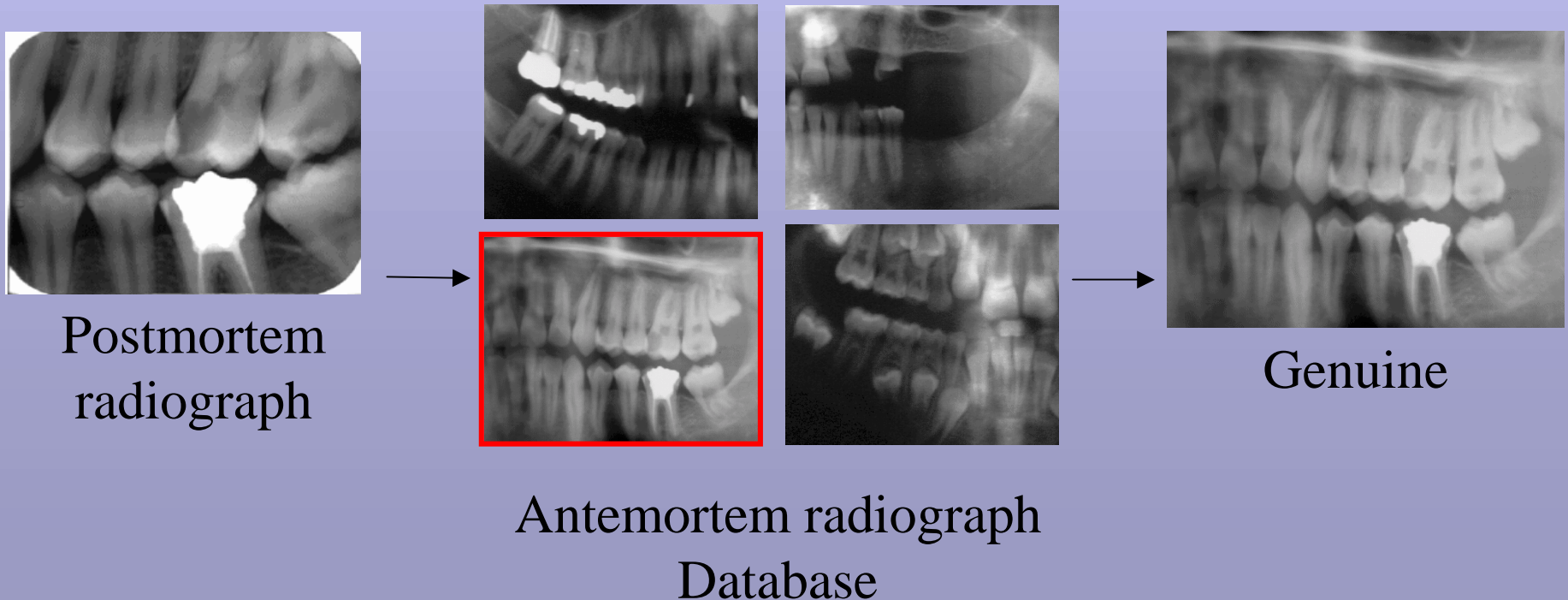


The main purpose of forensic dentistry is to identify deceased individuals, for whom other means of identification (e.g., fingerprint, face, etc.) are not available.

The dental biometrics is to automate this procedure.

Dental Biometrics

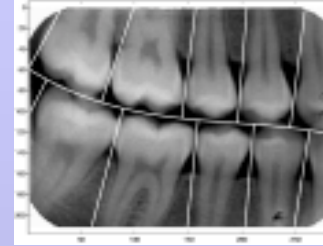
To verify or identify a person by matching his postmortem (PM) radiograph against labeled antemortem (AM) radiographs in a database.



Matching System

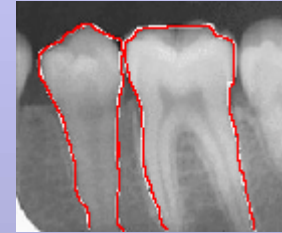
Location of each tooth

(Radiograph segmentation)



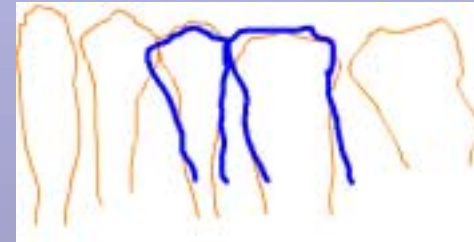
Contour extraction

(Crown shape and root shape)



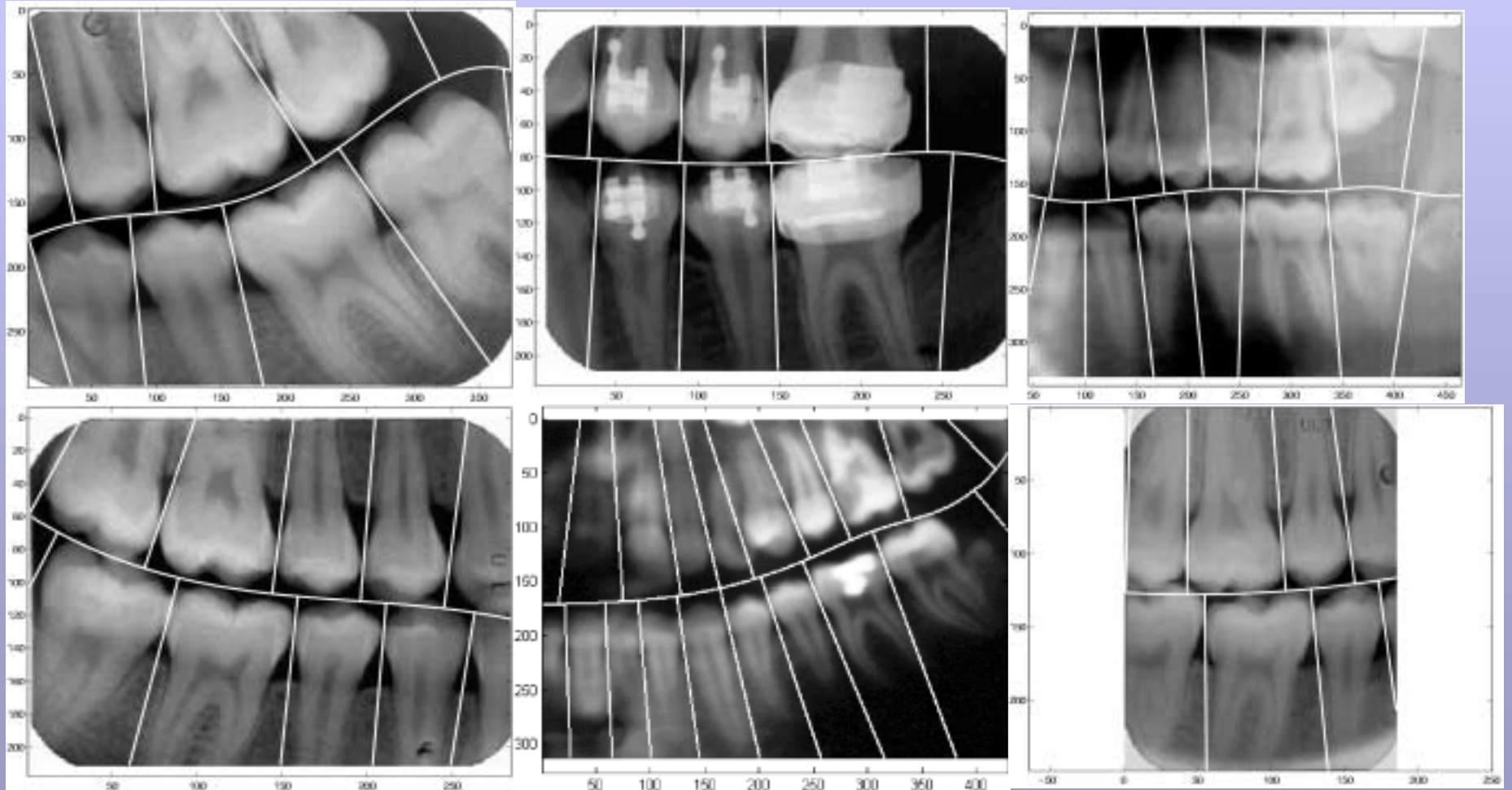
Contour Matching

(Alignment)



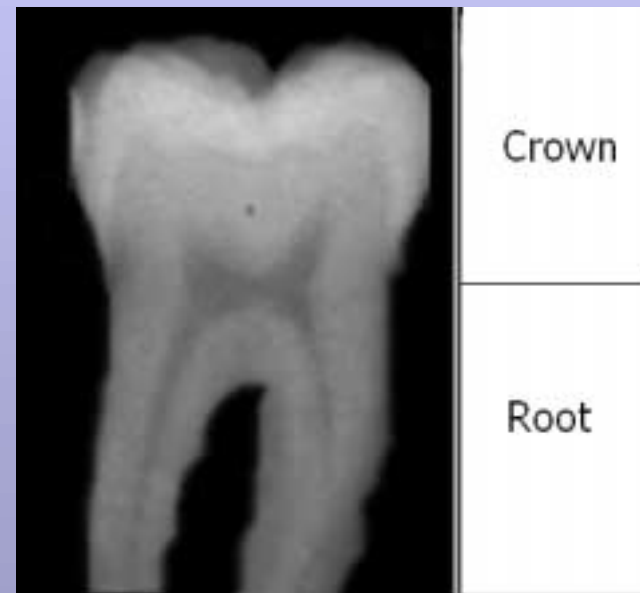
Output of Candidate List

Segmentation Results



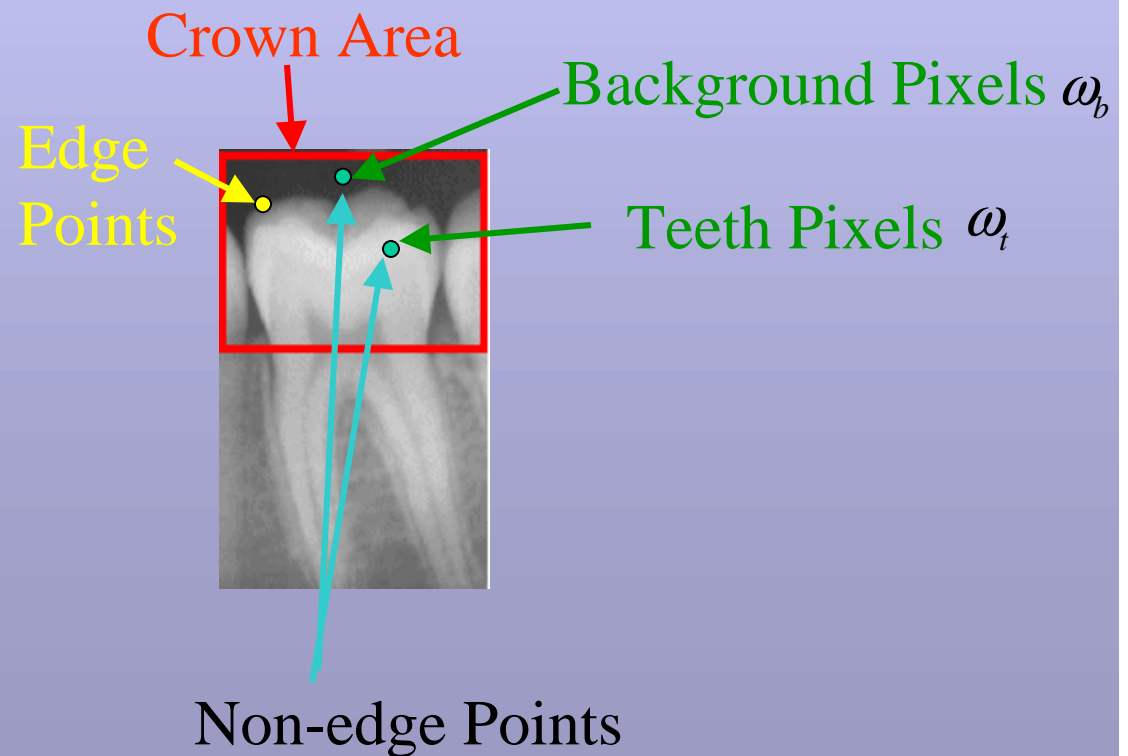
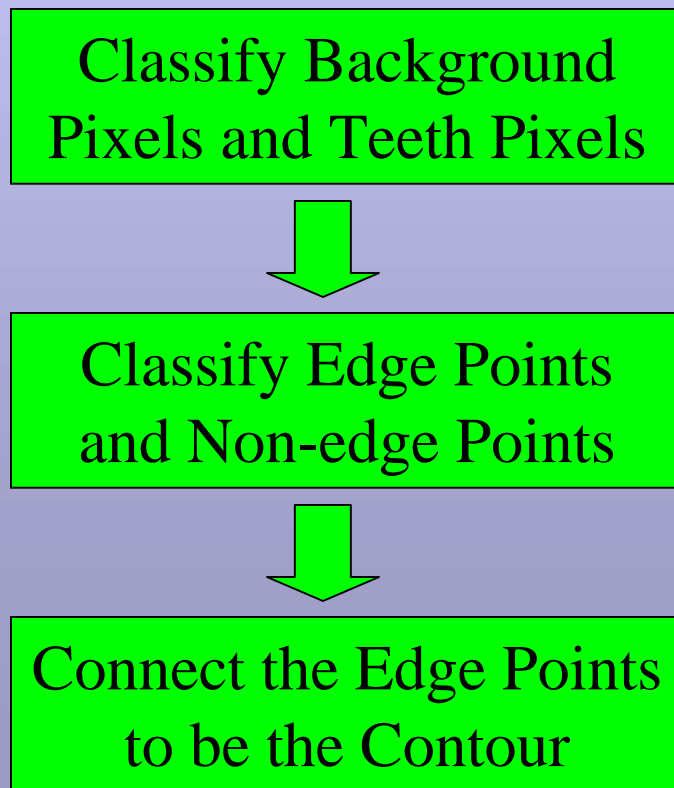
Tooth Shape Extraction

- Crown Shape Extraction
- Root Shape Extraction



Crown Shape Extraction

- Pixel classification problem:



Matching AM vs. PM Radiographs

- Differences

- Scale
- Rotation
- Translation
- View angle



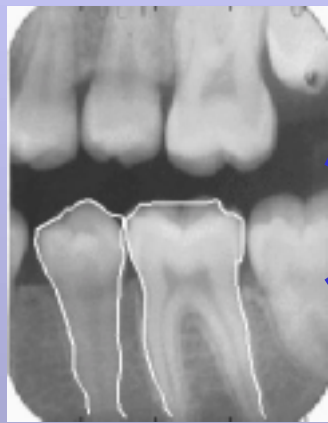
AM Radiograph



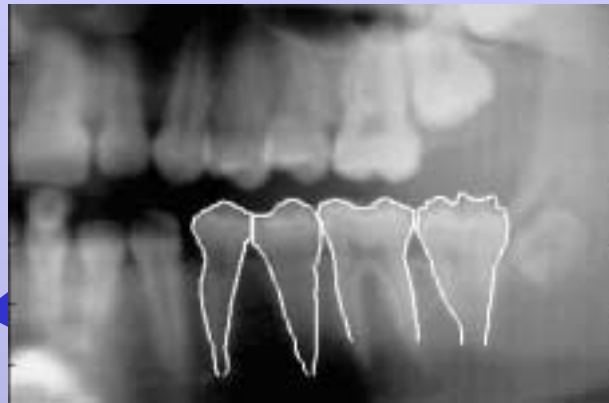
PM Radiograph

Since the variation in view angle is small, the **affine transformation** works well for matching radiographs before computing the **matching distance**.

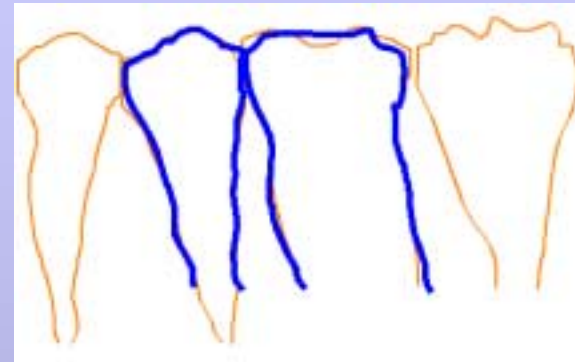
Matching Result



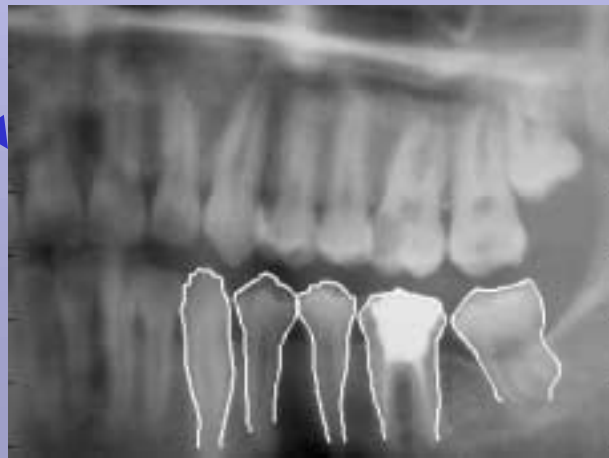
Query Image



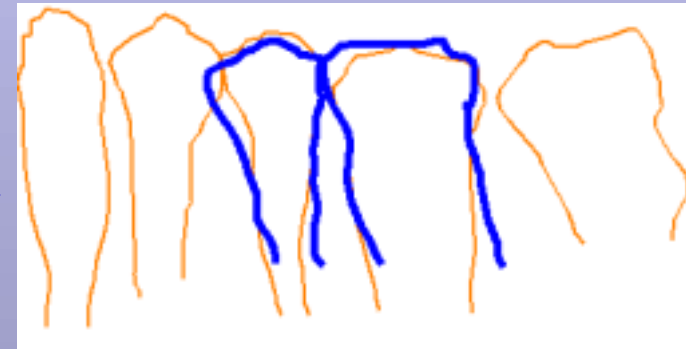
Genuine



Matching Distance = 4.22



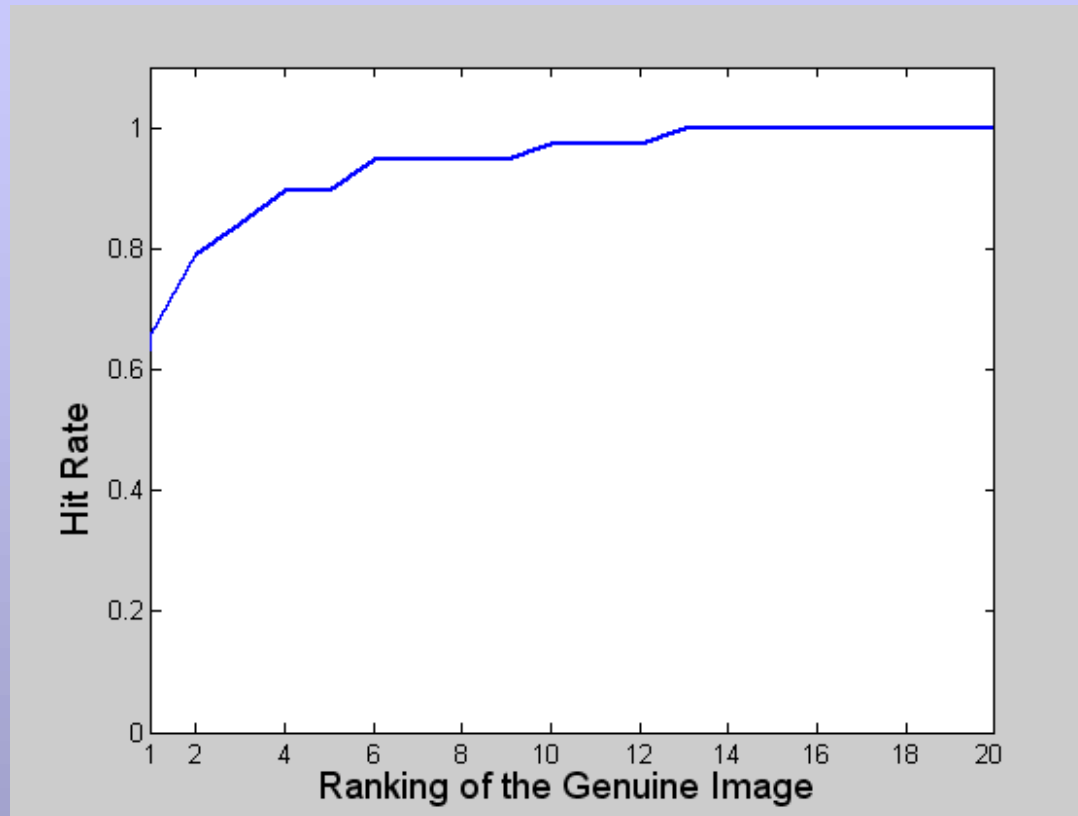
Imposter



Matching Distance = 27.57

Genuine image has a smaller matching **distance** than the imposter image. Images with smaller **distance** are included in the candidate list.

Experimental Results



- 38 queries on a database of 130 images
 - For 25 queries, genuine images were ranked in the top 1 retrievals
 - For 30 queries, genuine images were ranked in the top 2 retrievals
 - For 34 queries, genuine images were ranked in the top 5 retrievals