Automatic identification of landmarks by shape recognition

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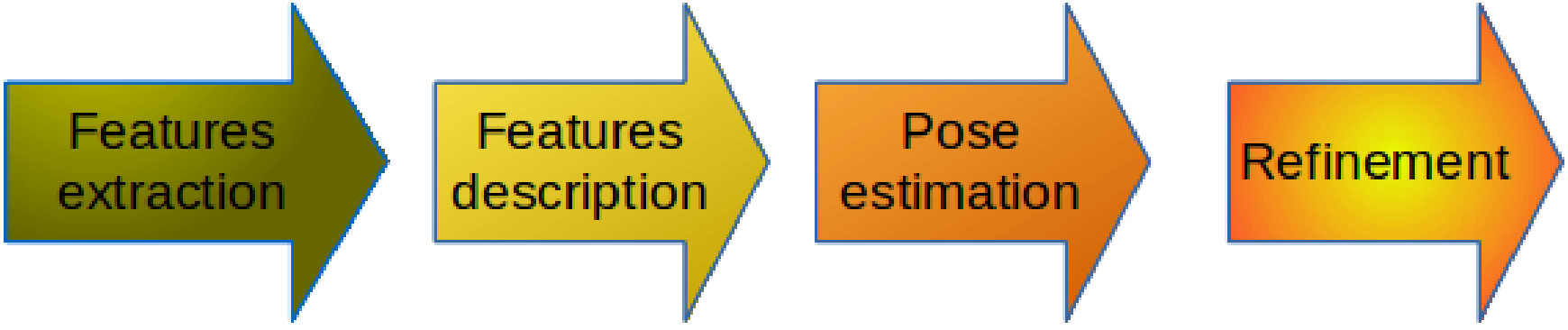
Contents

Introduction

- Shape analysis by landmarks is increasingly used in biological and medical applications.
- Indicate the landmarks:
  - By hands
  - Automatically

Introduction

The propose method[1] includes four steps:



Segmentation

Purpose:

- Extract the features (edge) from images
- Get the approximate lines

Method:

- Indicate the threshold value by analysis histogram of image
- Canny
- Break edge algorithm

Result: The set of approximate lines

Pairwise geometric histogram

Purpose: detecting the present of scene image in model image

Method[2]:

- Construct the local PGH
- Construct the shape PGH
- Matching shape's PGH by Bhattacharyya metric

Pairwise geometric histogram

Local PGH and shape PGH

Local PGH : PGH for each feature (line)

Shape PGH : contains many **Local PGH**

PGH : a matrix two dimensions: angle axis and distance axis

PGH information : angle between two lines and perpendicular distance from two endpoints of scene line to reference line.

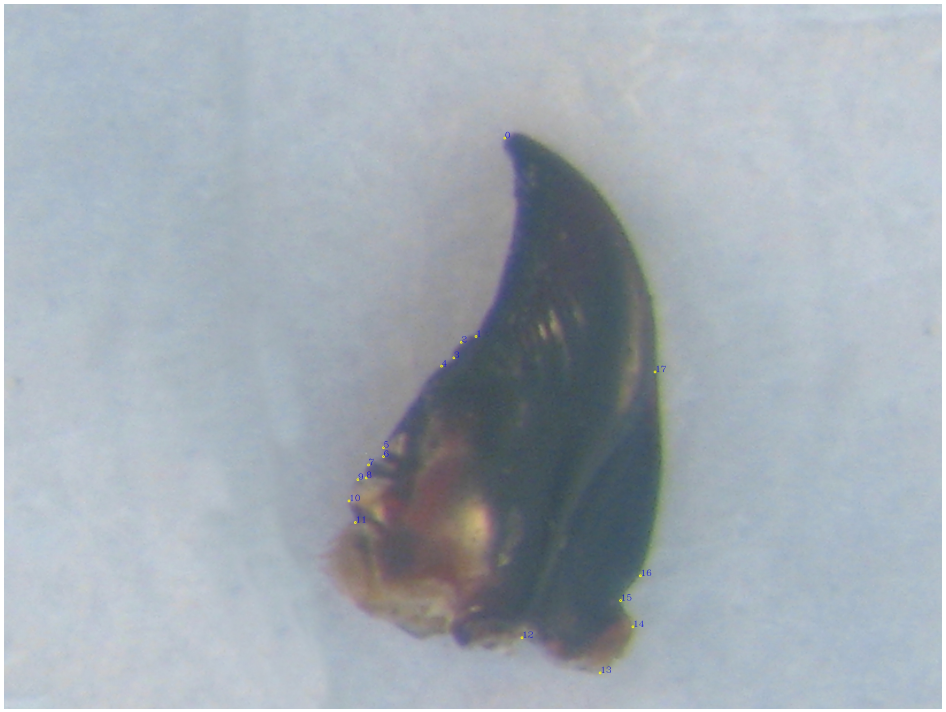
Probabilistic Hough Transform

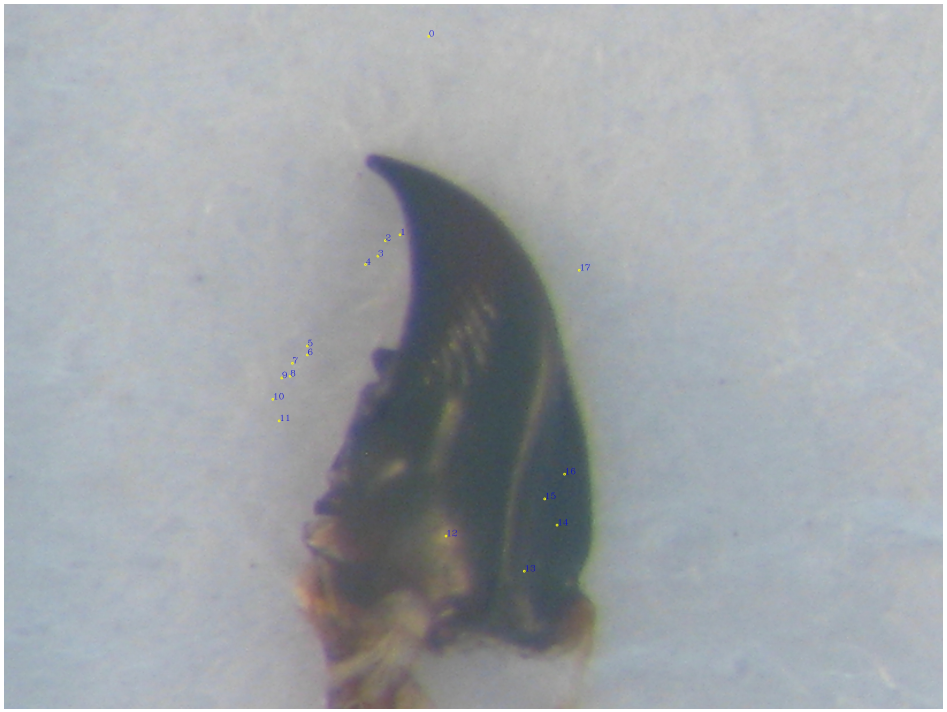
Purpose:
- Determine the presence and location of model image in scene image
- Estimate the landmarks in the scene image

Method:
- Construct the reference table
- Find the pair scene lines have the best “vote”
- Estimate the “reference point” in scene image
- Estimate the landmarks

Result: Estimated model landmarks on scene image

Probabilistic Hough Transform





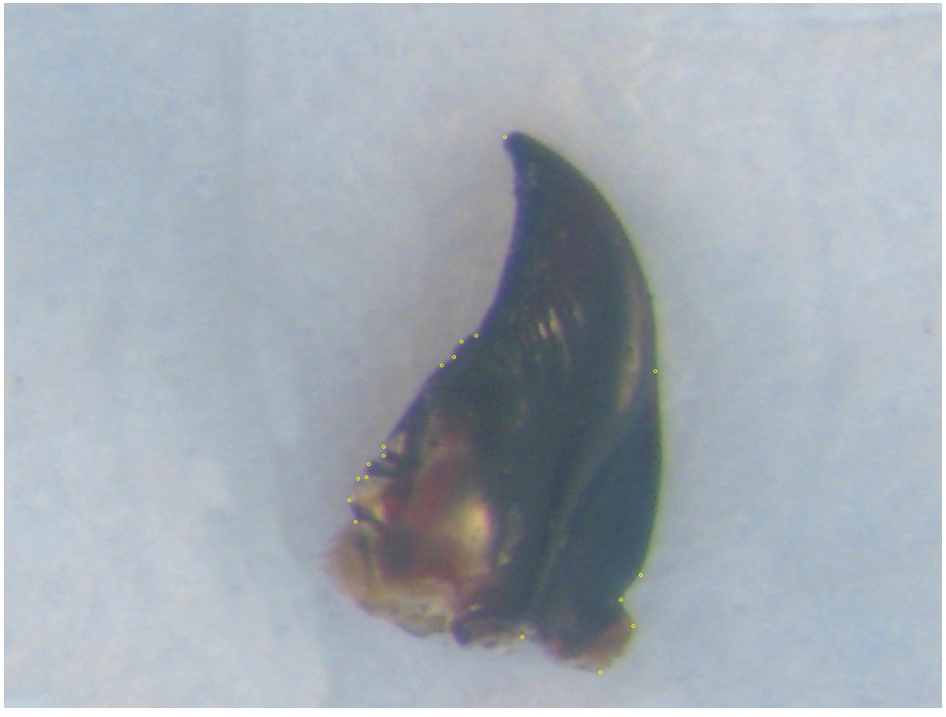
Template matching

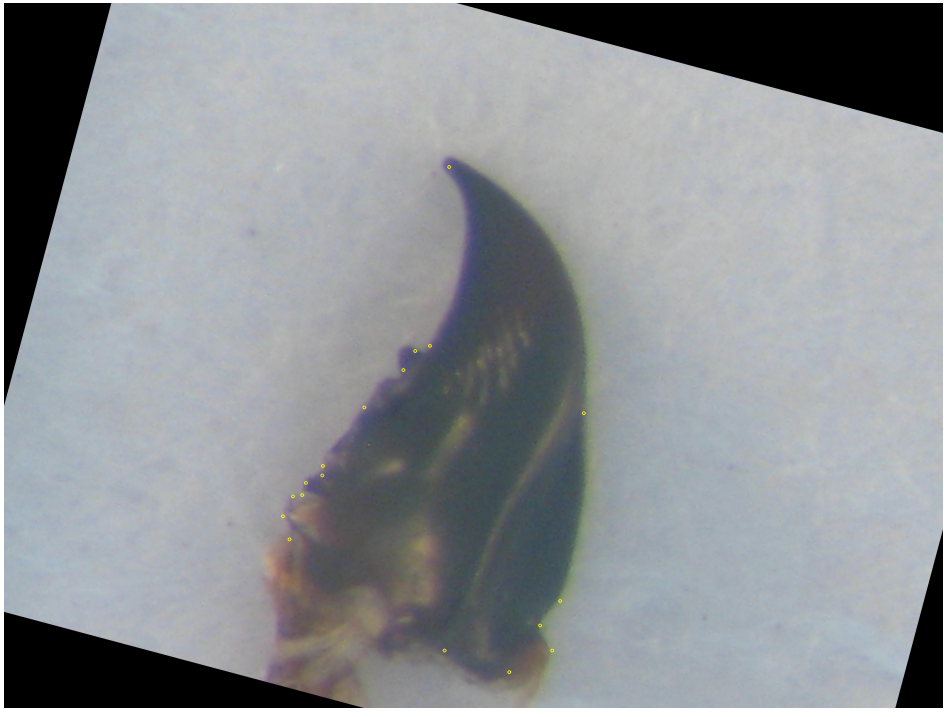
Purpose: Refine the estimated landmarks on the scene image

Method:

- On model image: For each landmark, create a bounding box with size "*t1*" and *landmark* is center point of box
- Rotate scene image to match with model
- On scene image: For each estimated landmark, create a bounding box with size "*t2*" and *landmark* is center point of box
- Sliding *t1* on *t2* and find the the best match (cross-correlation)

Template matching





Result

- Dataset: *Mandibule droite* and *mandibule gauche*
- Method can be estimated landmarks but the accuracy of the landmarks (compare with original landmarks) is not good.

References I

Palaniswamy, Sasirekha, Neil A. Thacker, and Christian Peter Klingenberg
Automatic identification of landmarks in digital images
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Thacker, Neil A., P. A. Riocreux, and R. B. Yates.
"Assessing the completeness properties of pairwise geometric histograms."
Image and Vision Computing, 13.5 (1995): 423-429.

Thank you !