

Automatic identification of landmarks by shape recognition

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Introduction

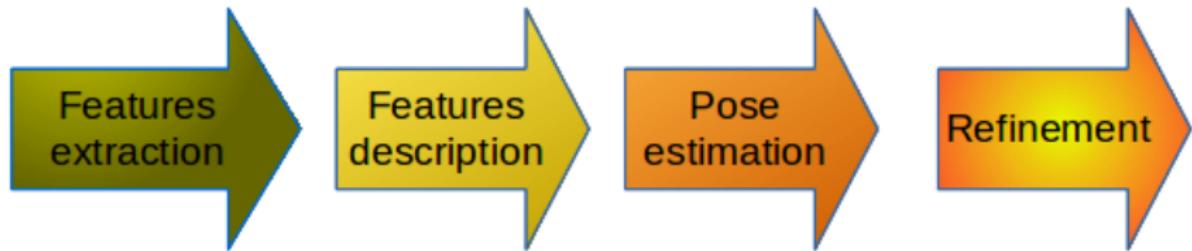
- Shape analysis by landmarks is increasingly used in biological and medical applications.
- Indicate the landmarks:
 - By hands
 - Automatically: implement from the article *Automatic identification of landmarks in digital images*^[1]
- The method was examination on two sets of MorphoSpecie image: *mandibule droite* and *mandibule gauche*

Introduction



Introduction

The proposed method^[1] by Palaniswamy includes four steps:



segmentation PGH PHT Matching

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.

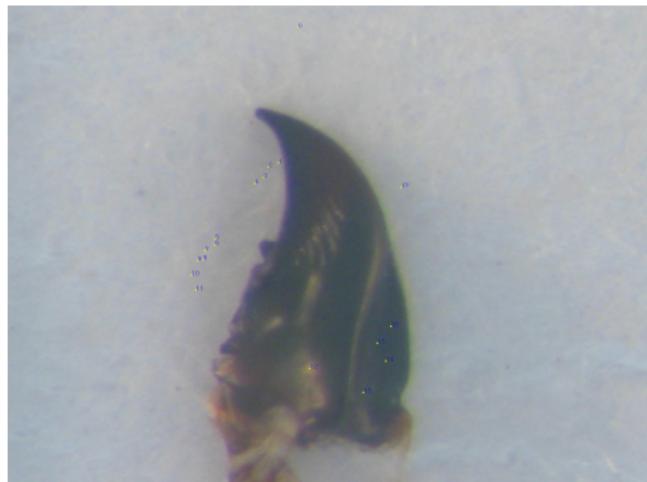
Probabilistic Hough Transform

- 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

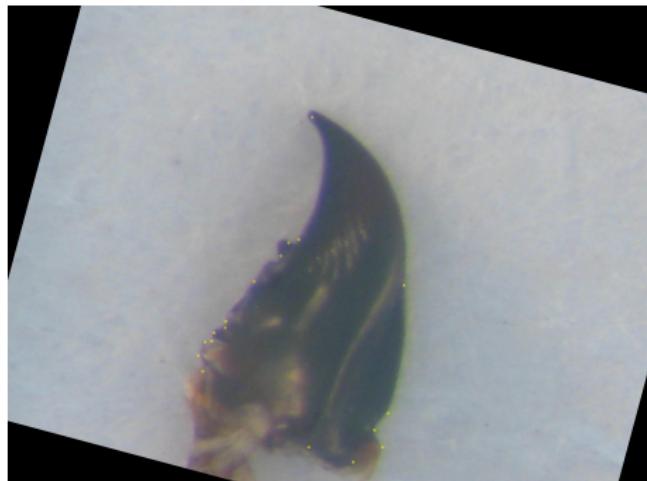


Template matching

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 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
IET Computer Vision, 4.4 (2010): 247-260
-  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 !