Augmenting the Generalized Hough Transform to Enable the Mining of Petroglyphs

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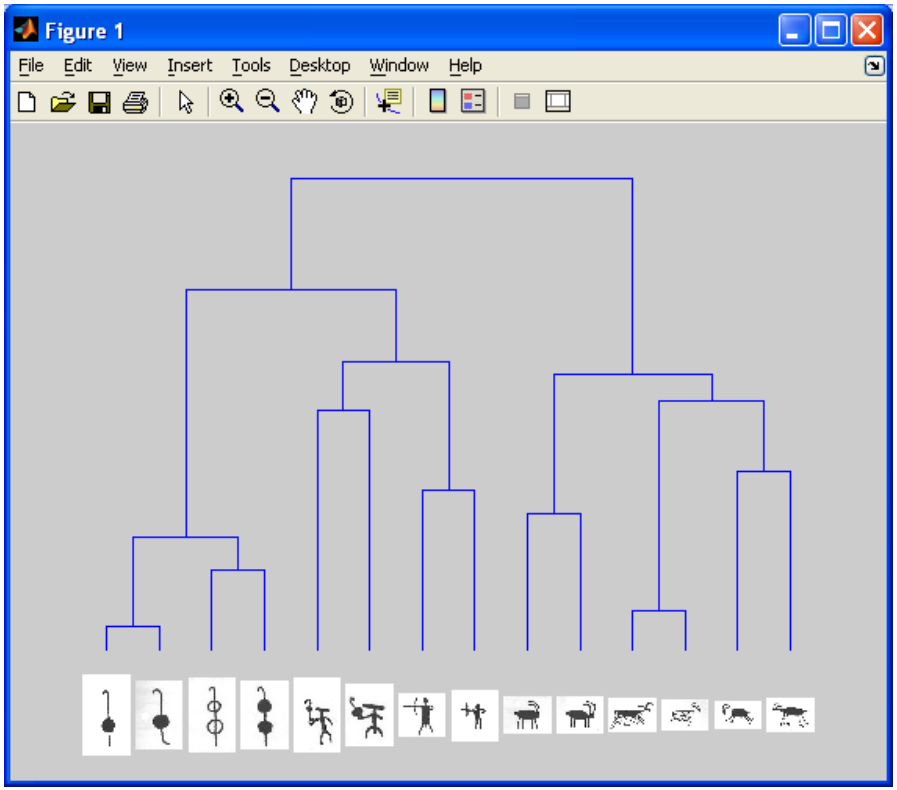
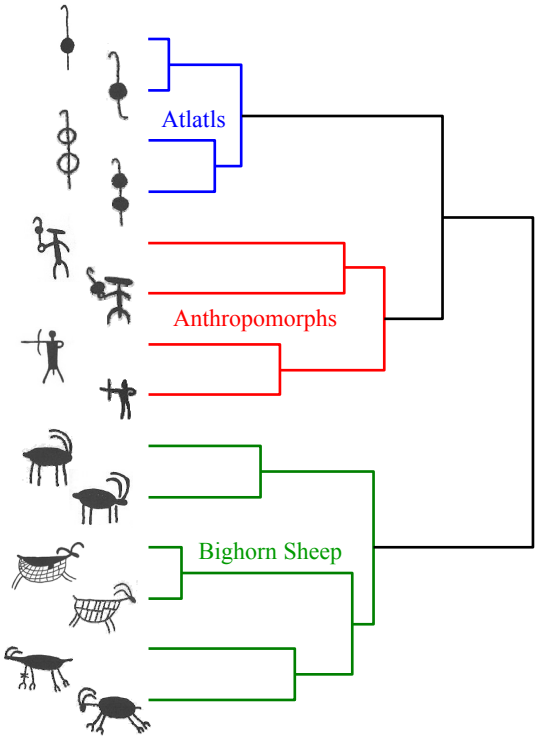
This file contains augmented versions of the figures in our paper, plus additional experiments and details that were omitted due to space limitations

All codes and datasets mentioned in this file can be found at:

http://www.cs.ucr.edu/~qzhu/papers/petro/Extra





Above: The result of the experiment. *Right*, a rotated and cleaned version for the paper

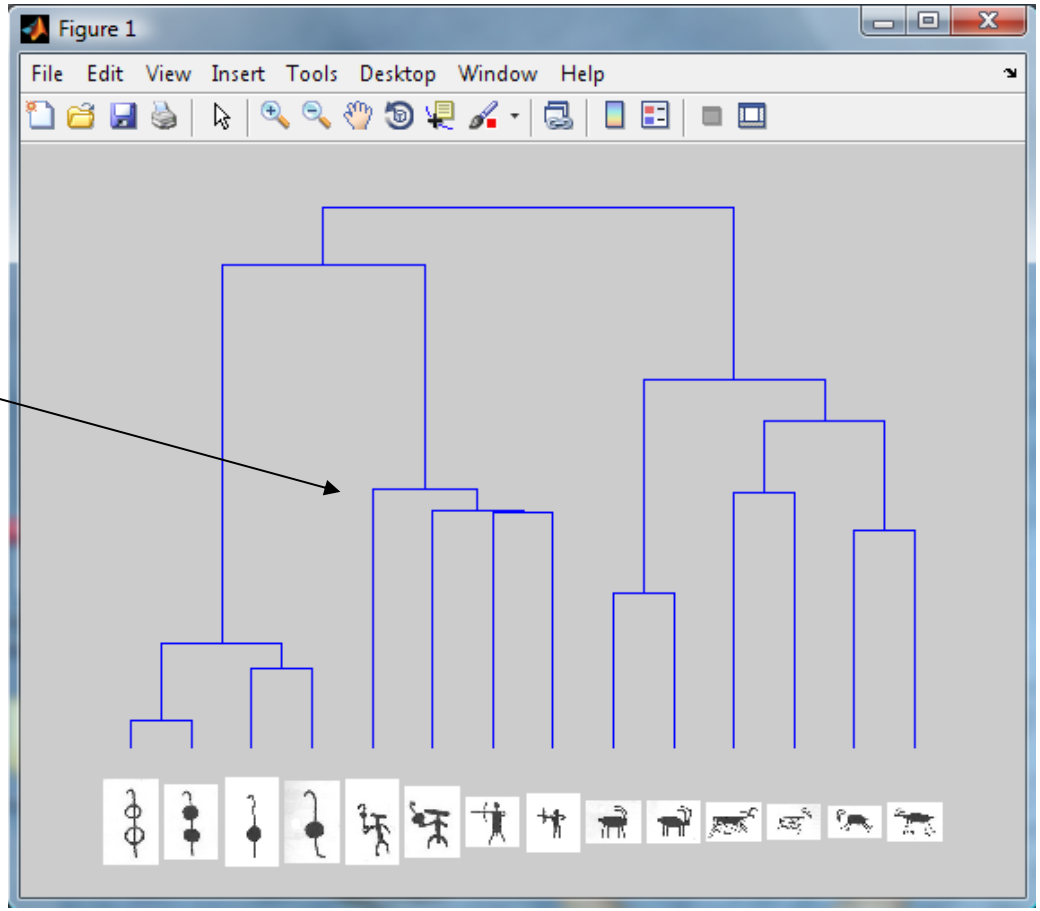
How to reproduce this result:

Download UI_Dendrogram_GHT.m and Sanity_check.zip. Unzip the 15 raw images from Sanity_check.zip.

At the matlab prompt, type

>> UI_Dendrogram_GHT(30) and choose the folder containing these15 raw images.

Note that the hausdorff does not work well here



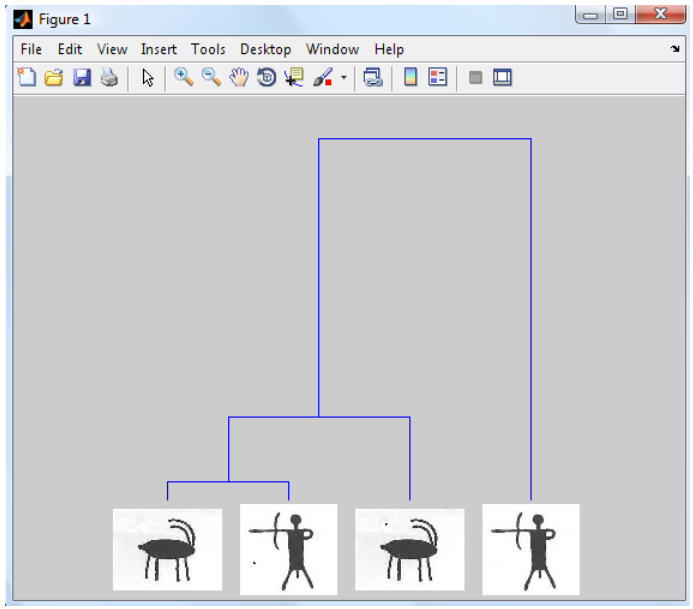
***Above**:* The result of the experiment by hausdorff distance

How to reproduce this result:

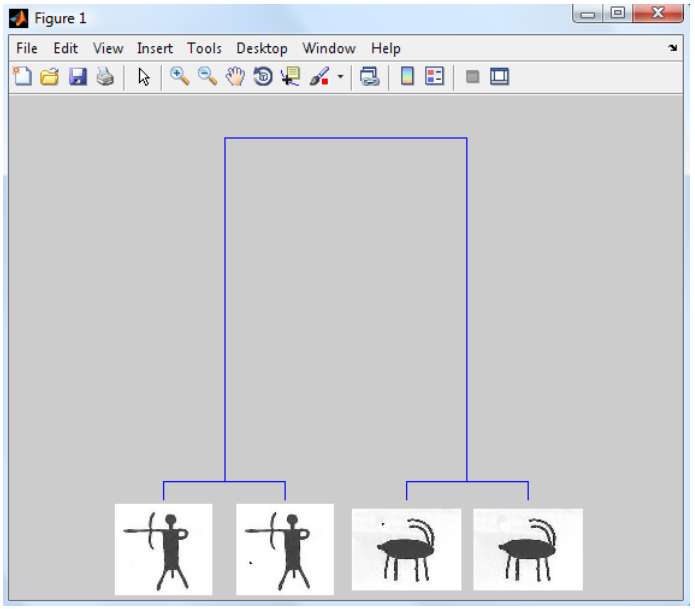
Download UI_Dendrogram_Hausdorff.m and Sanity_check.zip. Unzip the 15 raw images from Sanity_check.zip.

At the matlab prompt, type

>> UI_Dendrogram_Hausdorff(30) and choose the folder containing these15 raw images.



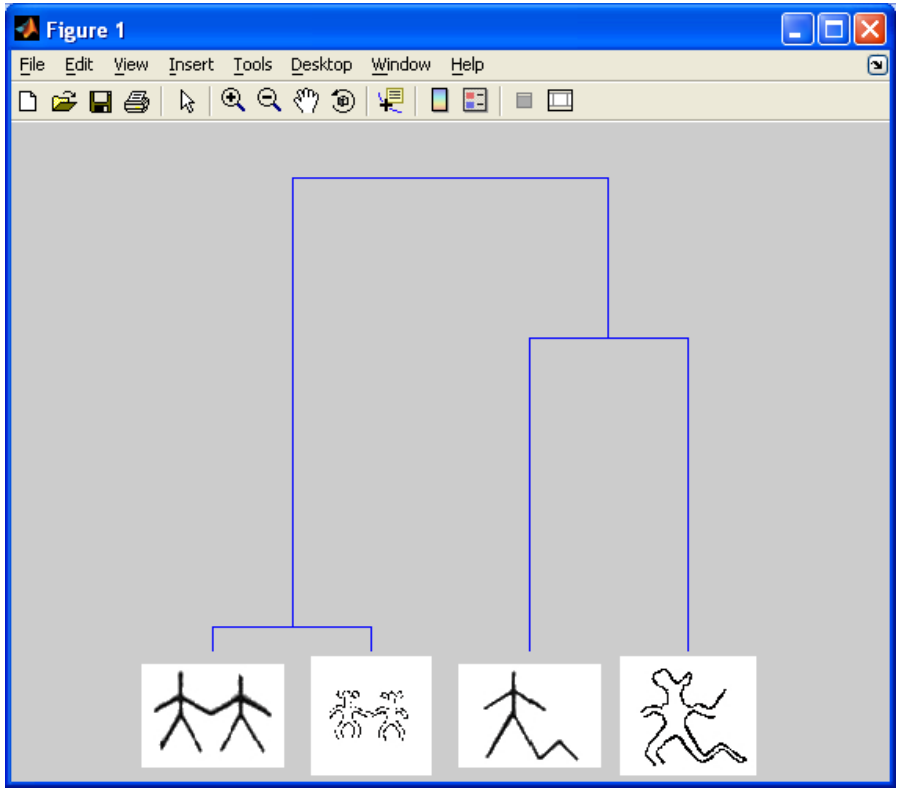
Hausdroff

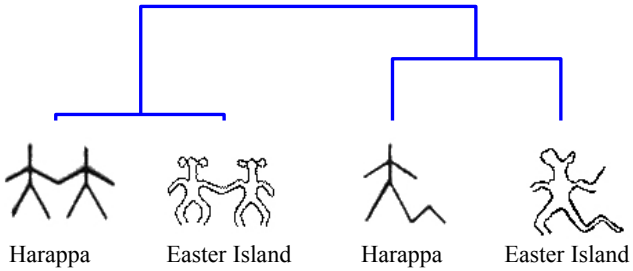


GHT

Experiment testing the result of noise, a single dot is randomly added to the four images…

The above two dendrograms are produced by: UI_Dendrogram_Hausdorff(30) and UI_Dendrogram_GHT(30) (codes are the same as two previous pages)
4 raw images are in Noise_check.zip





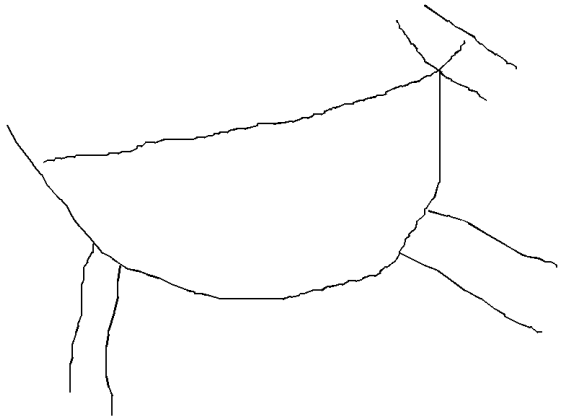
Above: The result of the experiment. *Right*, a cleaned version for the paper

How to reproduce this result:

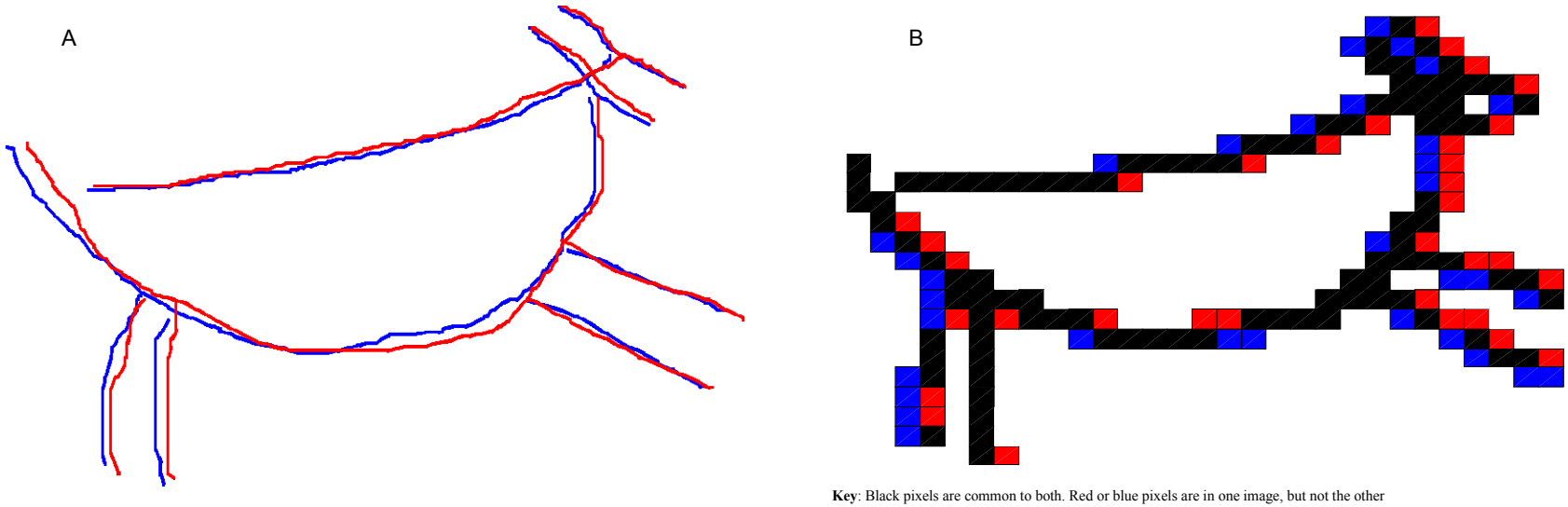
Download UI_Dendrogram_GHT.m and easter_island.zip. Unzip the 4 raw images from easter_island.zip

At the matlab prompt, type

>> UI_Dendrogram_GHT(30) and choose the folder containing these 4 raw images.



This is the original behind figure 4



Key: Black pixels are common to both. Red or blue pixels are in one image, but not the other

The skeletons are on a bitmap of 340 by 250. Although the two images are very similar, less than 3.5% of the pixels from each image overlap.
We can contrast this with the situation after converting the images to a down sampled representation as shown in shown in on the left. Here the images are transformed to a mere 30 by 23 grid representation. However, of the 130 pixels that form each image, 75.6% of the pixels are common to both

This is just a zoom in of figure 4

Preprocess on Petroglyphs from different sources

From a scanned book

Binarized

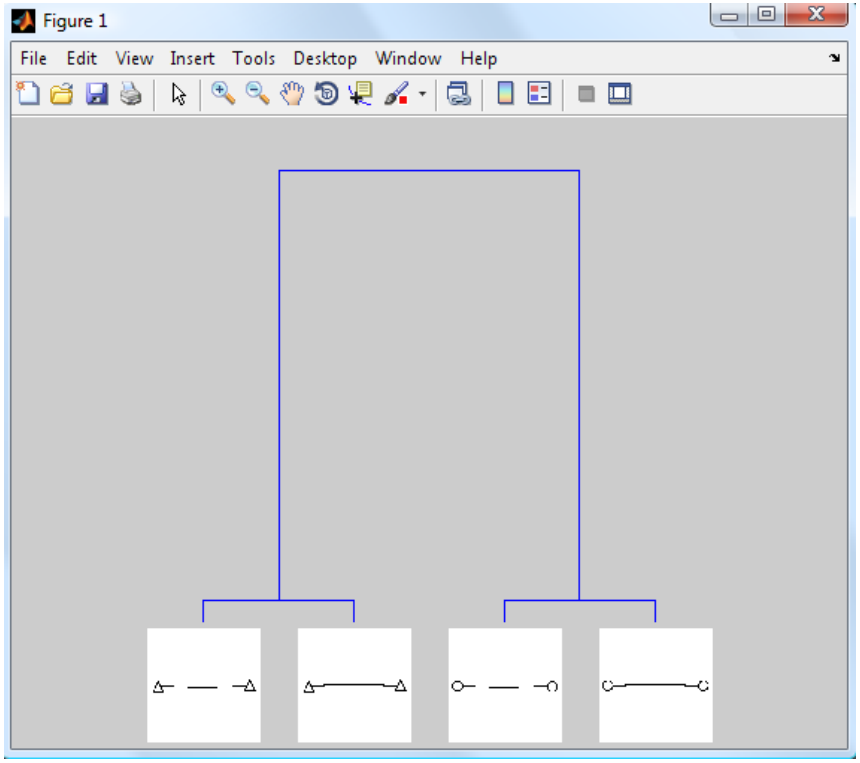
Thinned

Downsampled

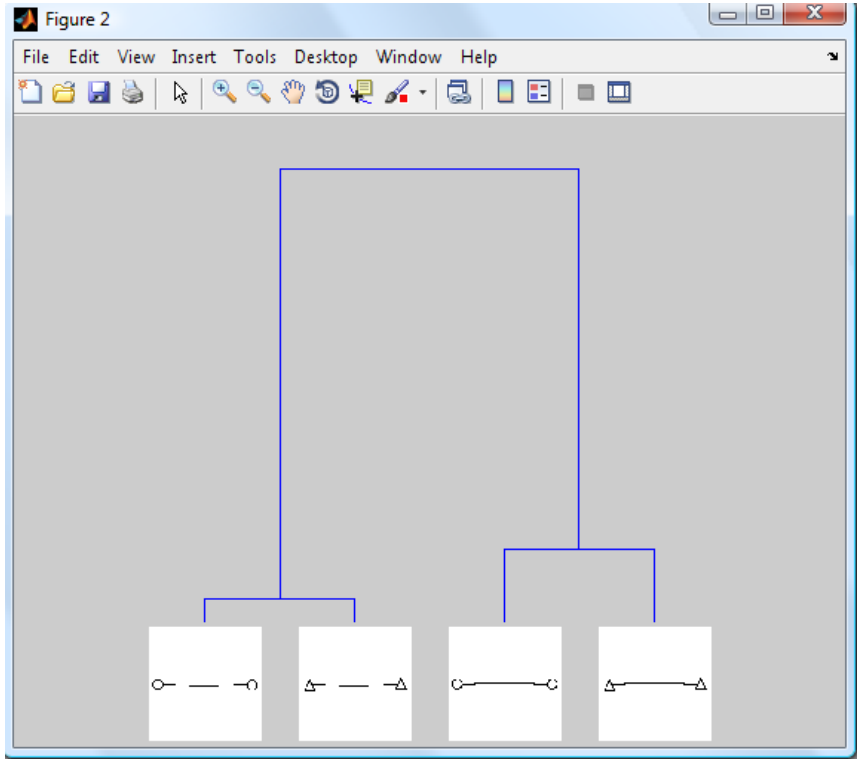
From a photo

Generated by Petroglyph Annotator

Downsampled



With Downsampling



Without Downsampling

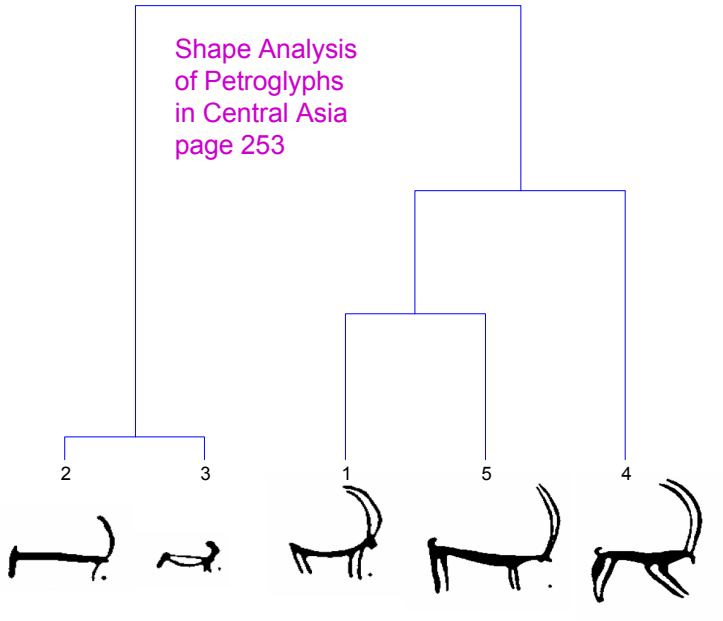
Another experiment to show the necessary of downsampling: triangles and circles are clustered together due to the similarity of curves in the original resolution. Note that full resolution images are shown for clarity.

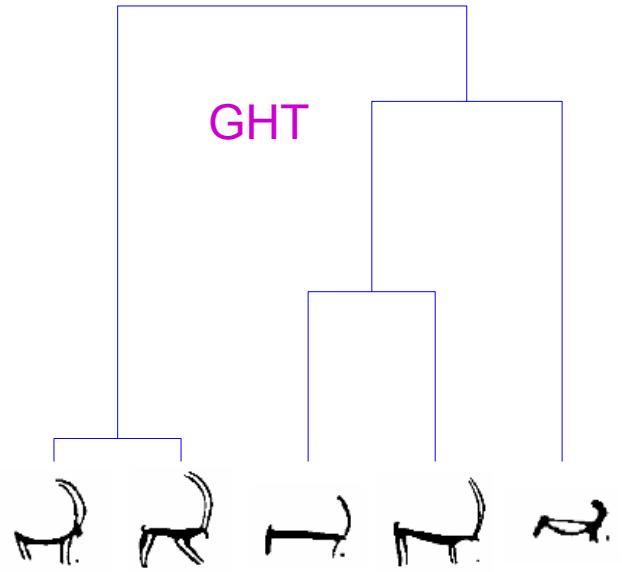
How to reproduce this result:

Download Original_Downsample.m and Triangle_Circle.zip. Unzip 4 raw images from Triangle_Circle.zip.

At the matlab prompt, type

>> Original_Downsample(30) and choose the folder containing these images.





These figures compare our distance measure to the only other distance measure for petroglyphs in the literature [a].

The next slide tells you how to reproduce both figures.

[a] Shape Analysis of Petroglyphs in Central Asia. Ryuji Takaki, Junichiro Toriwaki, Shinji Mizuno, Ritsuko Izuhara, Muhiddin Khudjanazarov and Marina Reutova Forma, Vol. 21 (No. 3), pp. 243-258, 2006

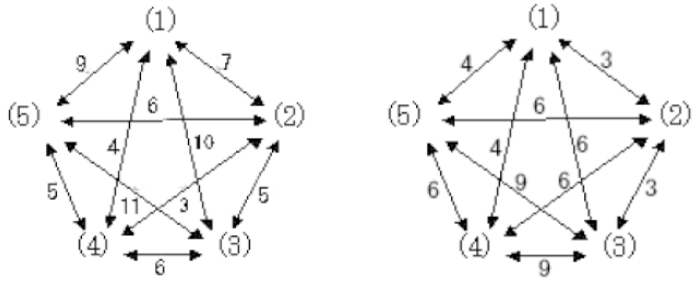
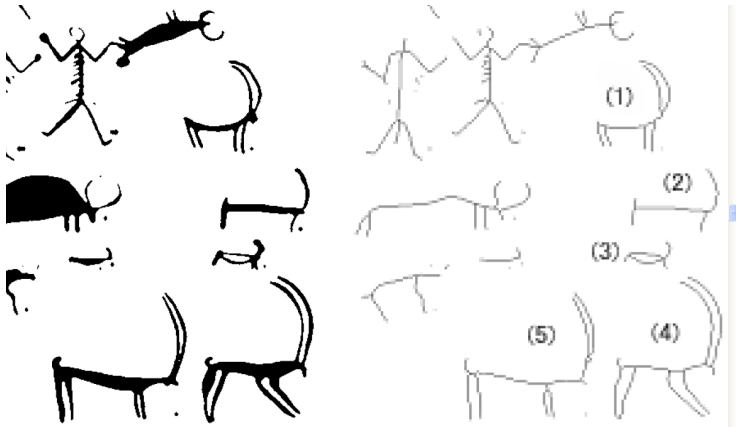


Fig. 7. Mutual distances among five ibexes drawn in the same figures, Fig. 4(g) (left) and Fig. 4(m) (right). The average distances within these figures are 6.6 and 5.6, respectively.

This table (fig 7 right) converts to the distance matrix shown to the left…

To create the GHT figure, just run UI_Dendrogram_GHT(30) and point to the folder unzipped from asia.zip (can be downloaded from our webpage)



(m) 071 fig9-65%-cl3 071 fig9-65%-cl3-sk

squareform(x)

ans =

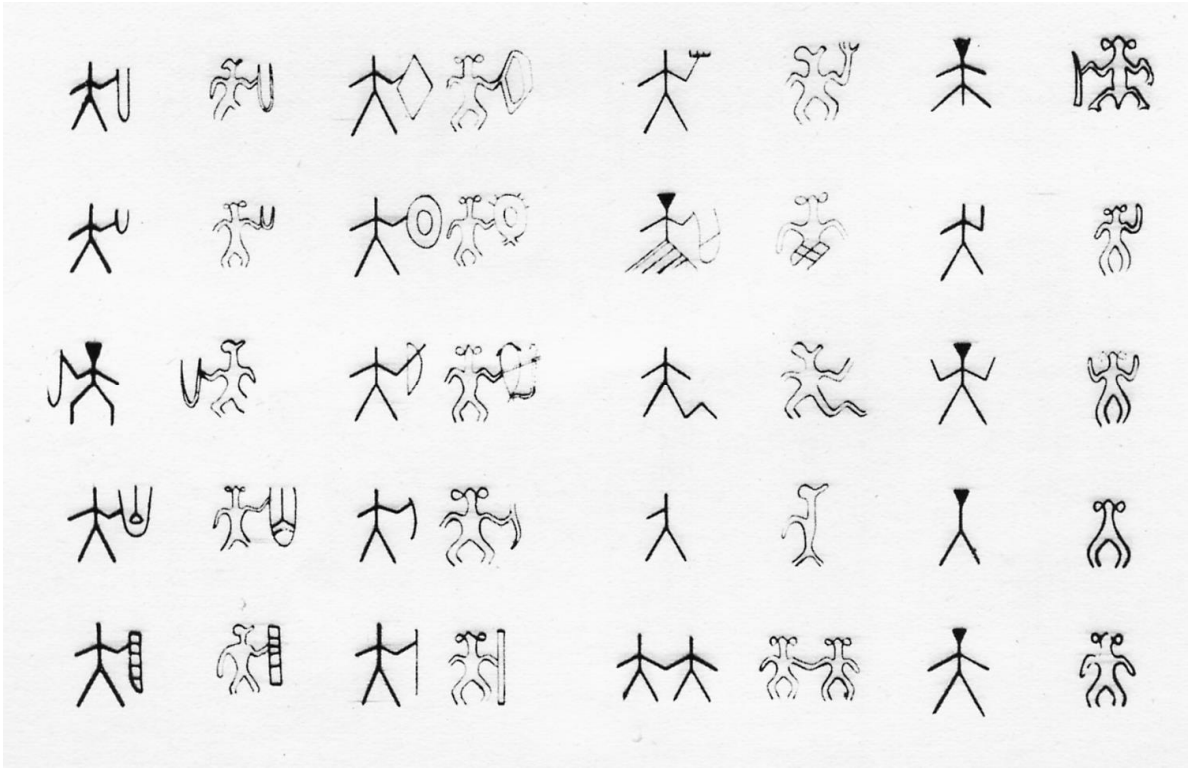
0	3	6	4	4
3	0	3	6	6
6	3	0	9	9
4	6	9	0	6
4	6	9	6	0

Z = linkage(x,'average');
dendrogram(Z)

CHAUVET

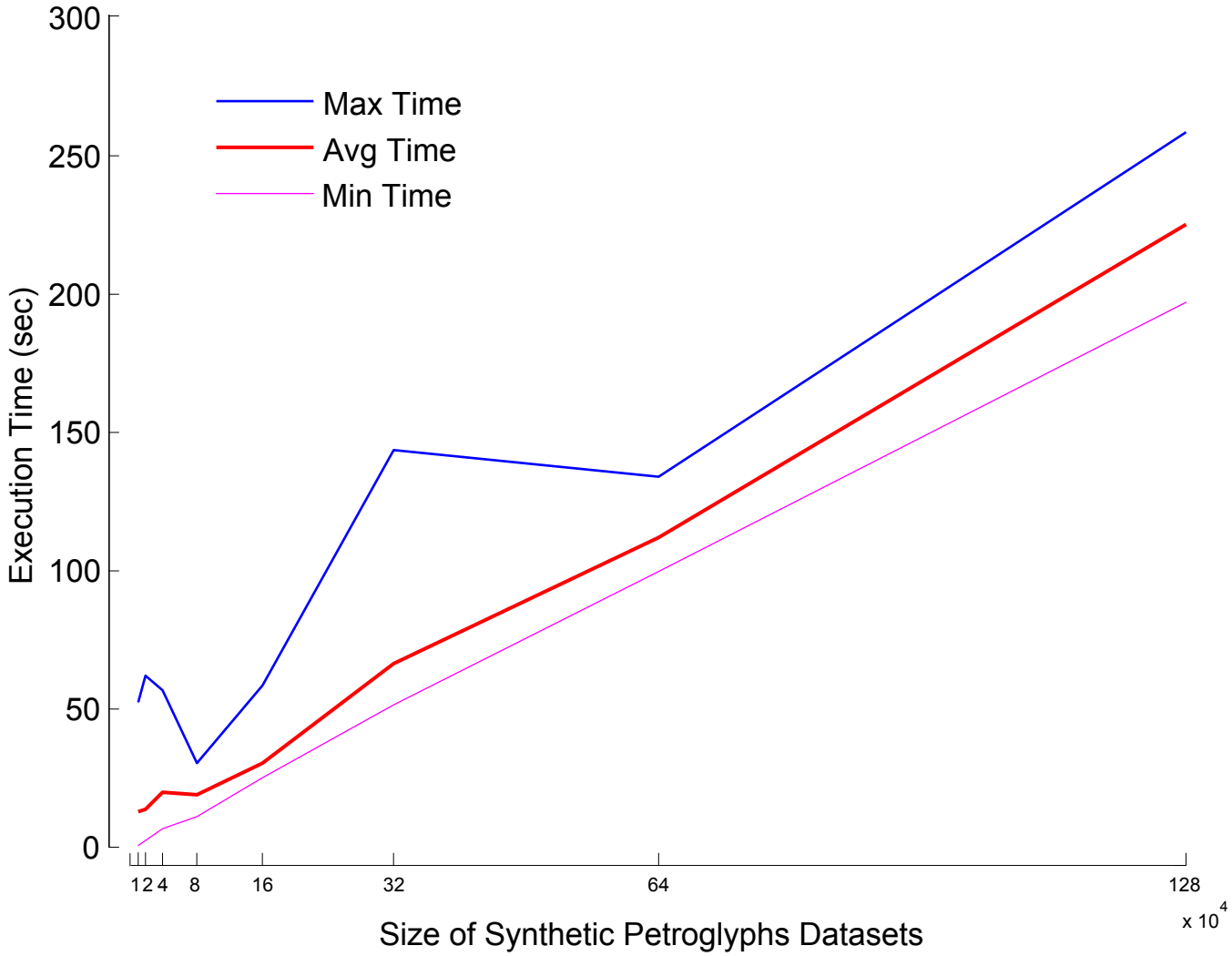
Easter Island and Its Mysteries

Plate LXVII. The characters on the left of each column were found at Harappa (Middle Indus) and at Mohenjo-Daro by John Marshall and they date back to 2700 B.C. On the right of each Harappan character is the character from Easter Island which, according to de Hevesy, most closely resembles it.



This is the original behind figure 12

The NORMAL scale version of Figure 18 in the paper



The NORMAL scale version of Figure 21 in the paper