Pyramid of Arclength Descriptor for Generating Collage of Shapes

Supplementary Material

This supplementary material contains the following five parts:

1. More results
2. Visualization of gaps and overlaps in results
3. Clip arts used in results shown in paper

Part I

More Results

Figure 1: *"Doodle II."*

(a) Result without deformation.

(b) Result with gap-filling and overlap-avoidance.

Figure 2: *"Sea Creatures."*

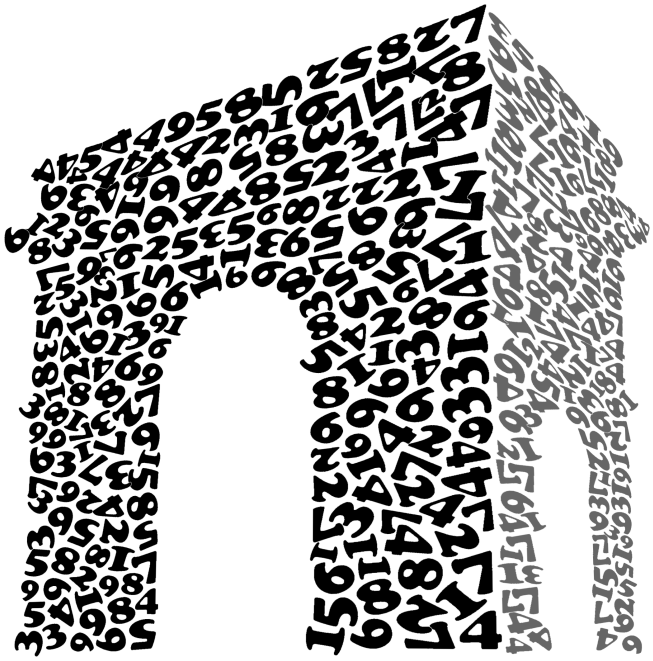
(a)

(b)

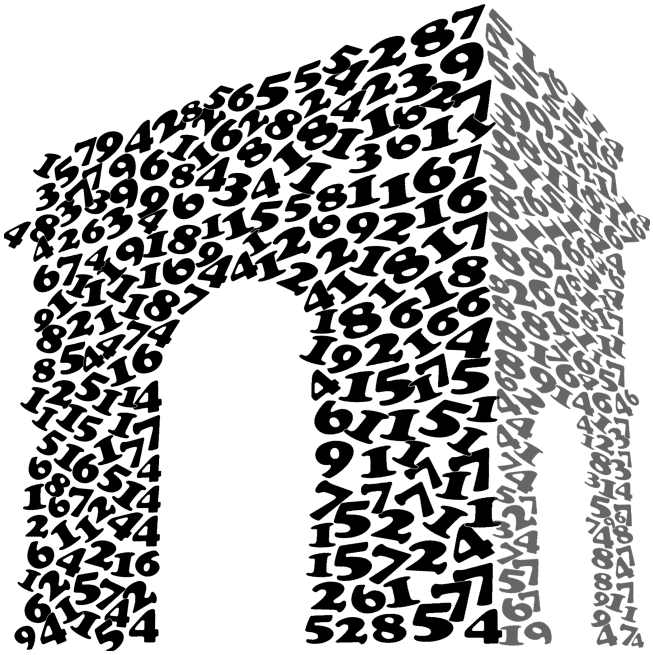
Figure 3: *"Cartoon Animals." We may introduce an additional constraint to employ each animal shape exactly once in the collage. The tiling stops when the shape library is exhausted. Different seed shapes are used in generating (a) and (b) above.*

(a) Photo of "The Arc de Triomphe"

(b) Canvas (rectified regions)



(c) Without orientation constraint



(d) With orientation constraint

Figure 4: *A creative design. (a) A photo of "The Arc de Triomphe." (b) We segment out three regions on the photo and rectify them as planar regions manually. (c) Our result of filling numbers (shapes) in the three regions without orientation constraint. (d) Our result with orientation constraint on the numbers.*

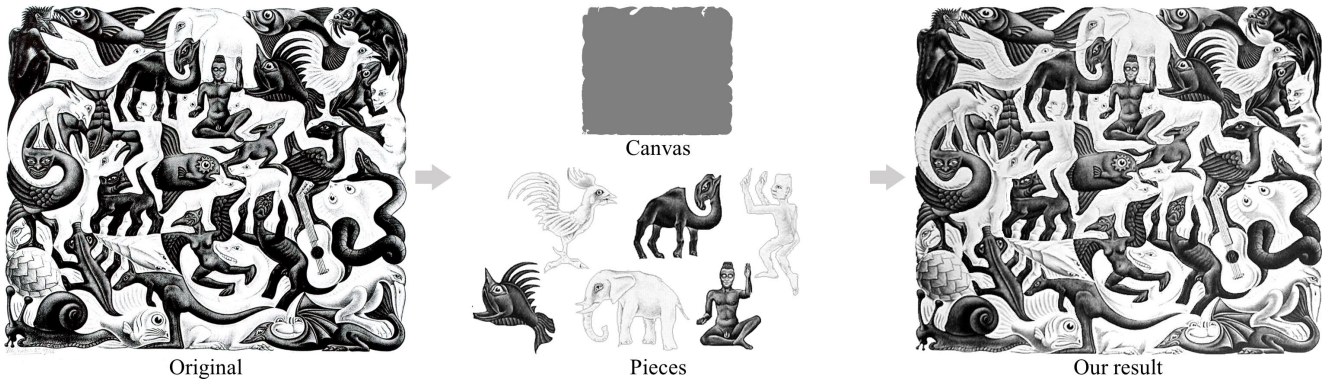


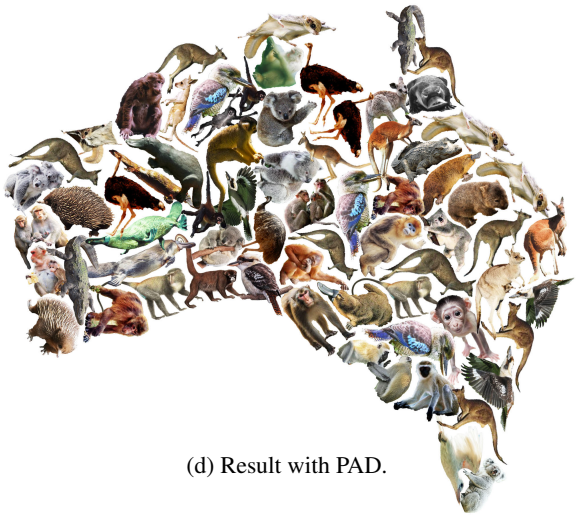
Figure 5: *An experiment with "Plane Filling II." Given an image of "Plane Filling II" (left), we extract the canvas and individual shapes (middle) from the image. We then take these as inputs to our method and generate a collage result (right). The result here shows that even though our method is greedy, it can interlock the shapes and produce the same tiling arrangement as in "Plane Filling II." All M.C. Escher works*

Figure 6: *We can generate multiple collage results using the same library of shapes but different seeds manually-prepared by the user, see the orange shape in each of the minimap views.*

(a) Result by random docking.

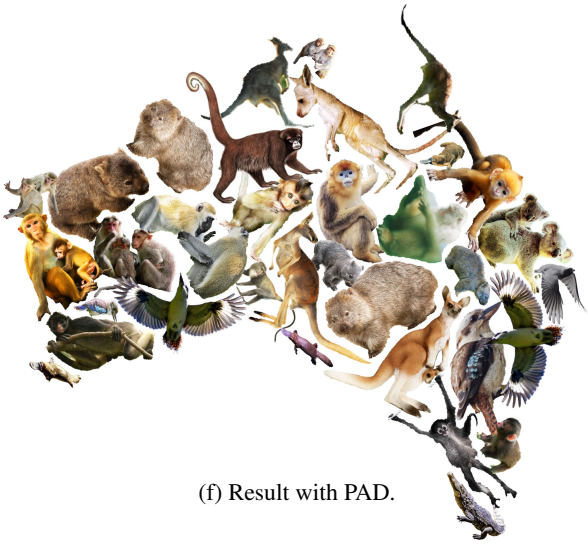
(b) Result with PAD.

(c) Result from random docking.



(d) Result with PAD.

(e) Result by random docking.



(f) Result with PAD.

Figure 7: *We compare collage generation with PAD (b)&(d)&(f) against random docking (a)&(c)&(e) under the same setting: using the same canvas and library of shapes. In each step of random docking, we randomly choose a boundary point around the canvas and the tiled shapes, and dock a new random shape with random scale and orientation around the point. We accept the new shape in the collage if the shape overlap is small. Comparing the two sets of results, we can see that shapes tiled by random docking do not couple well with one another, resulting in a large amount of gaps in-between the shapes, while tiling with PAD produces much stronger shape coupling.*

(a) Result by random docking. (b) Result with PAD.

Figure 8: *"Mosaic Fish." (a) A collage result generated by random docking (see Fig. 7 caption for the procedure). (b) A collage result generated with PAD.*

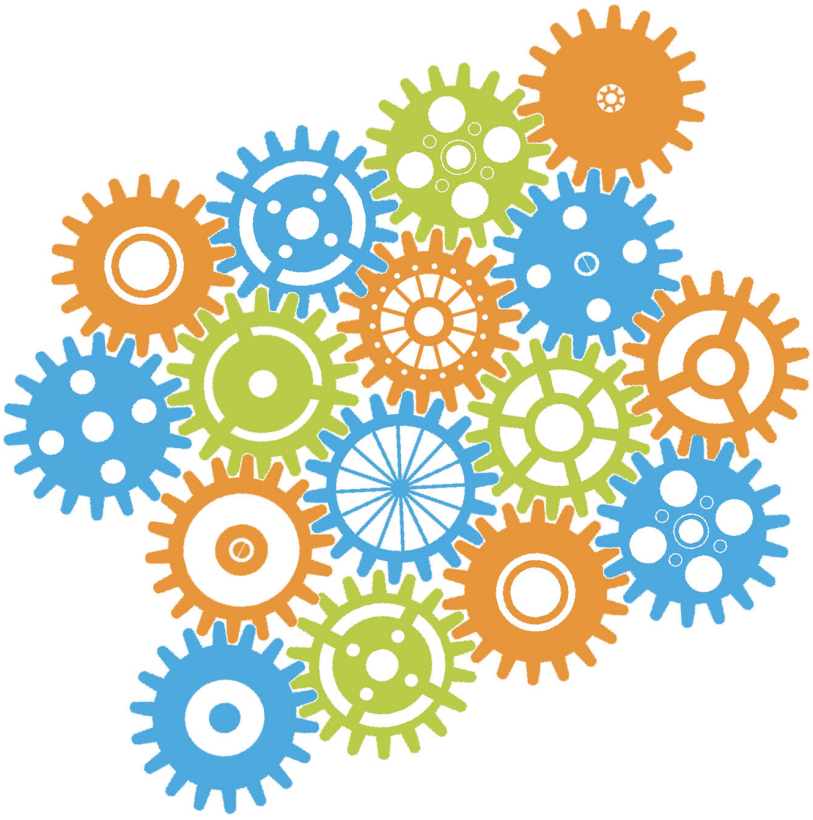


Figure 9: *"Gears."*

Figure 10: *"Chicken Puzzle."*

Figure 11: *Result of "Icons in PAD" before local refinement.*

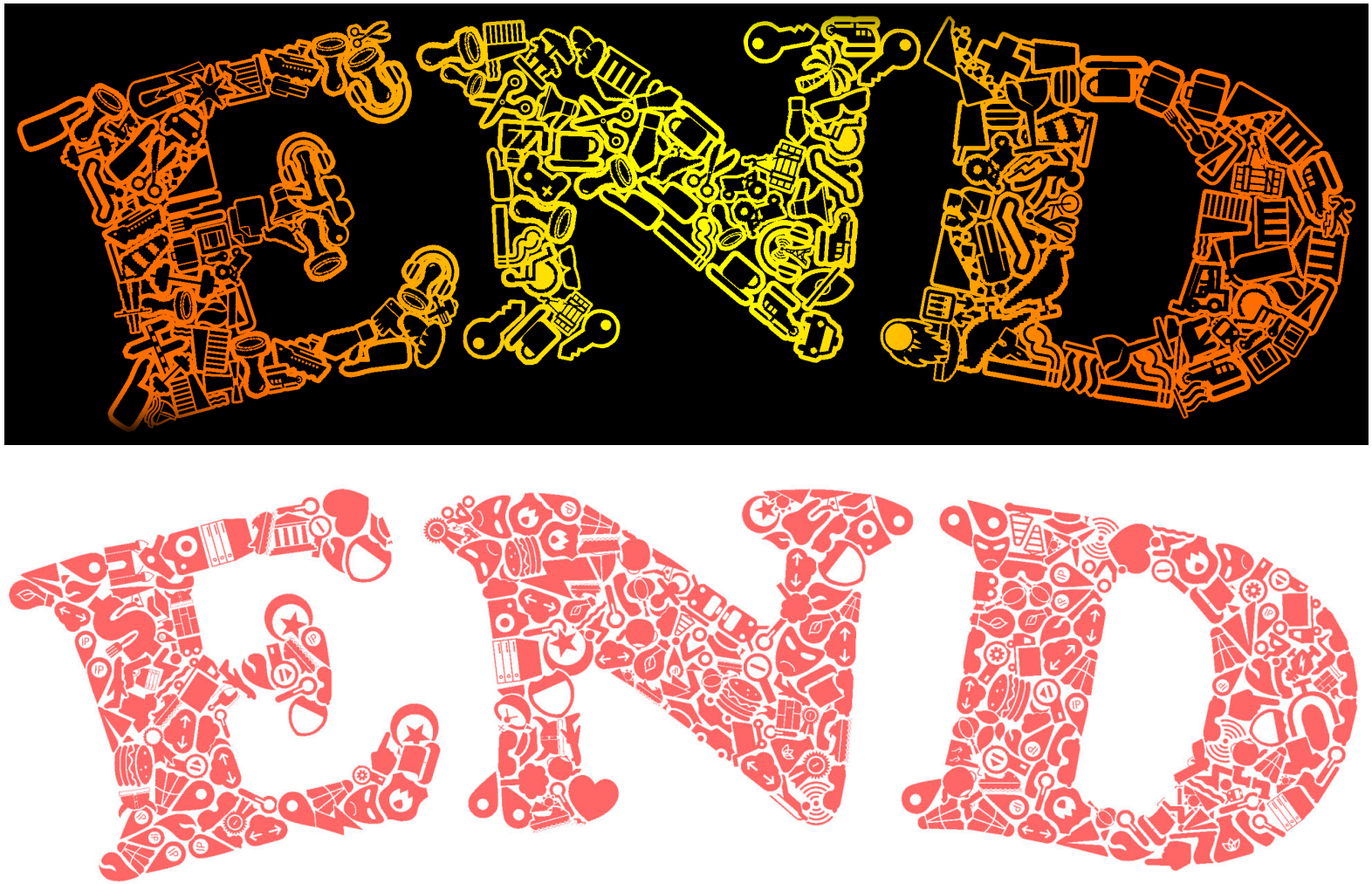


Figure 12: *We can use different libraries of clip arts and generate collage results with different styles.*

Part II

Visualization of Gaps and Overlaps in Results

In this part of the supplementary material, we present visualizations of the overlaps and gaps in-between shapes in the collage results presented in the paper. In these visualizations, red indicates overlaps while yellow indicates gaps.

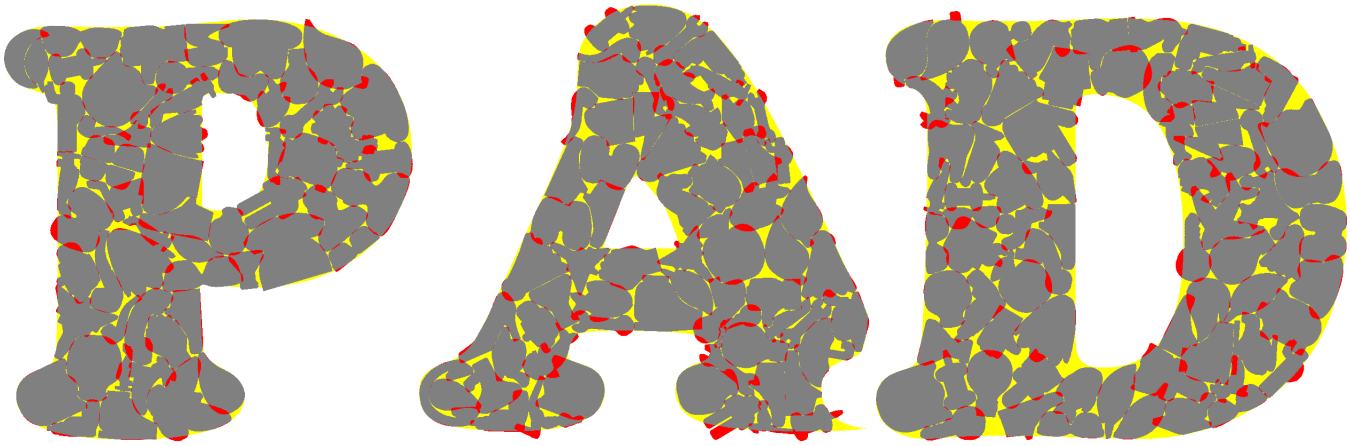


Figure 13: *Visualization of the gaps and overlaps in "Icons in PAD" (Fig. 1 in paper).*

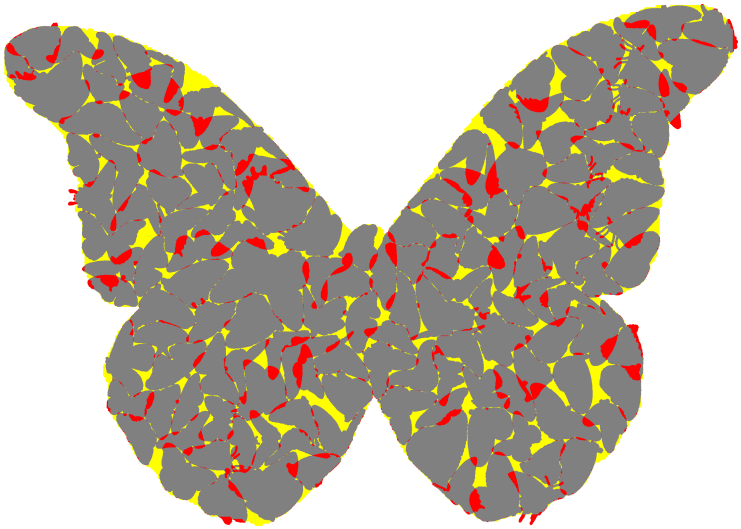


Figure 14: *Visualization of the gaps and overlaps in "Butterflies in Butterfly."*

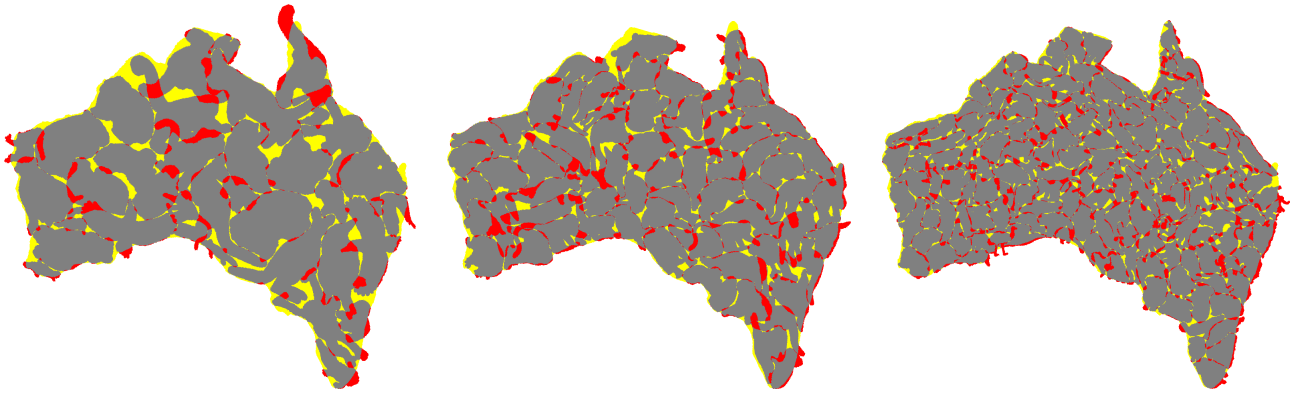


Figure 15: *Visualization of the gaps and overlaps in "Australian Animals."*

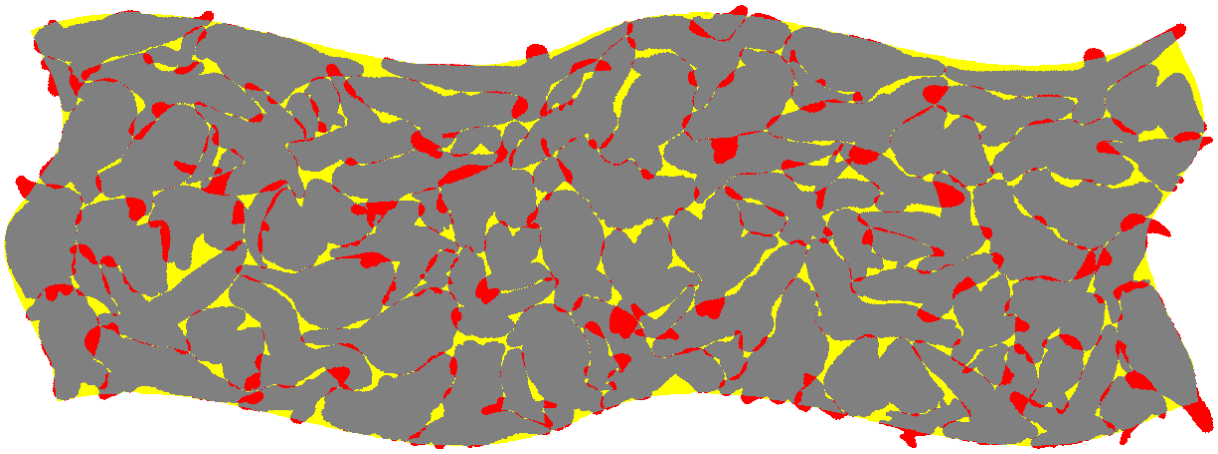


Figure 16: *Visualization of the gaps and overlaps in "Flock of Birds."*

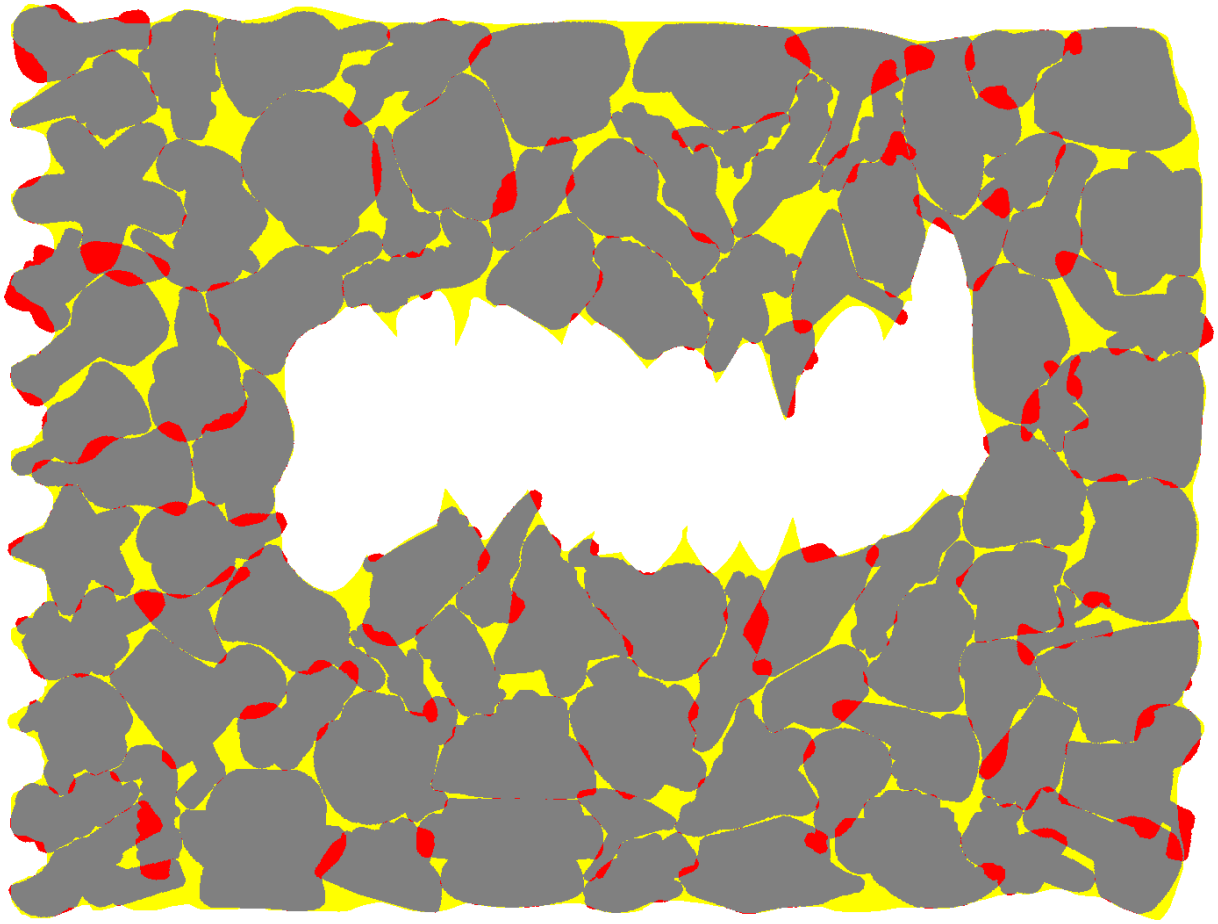


Figure 17: *Visualization of the gaps and overlaps in "Doodle."*

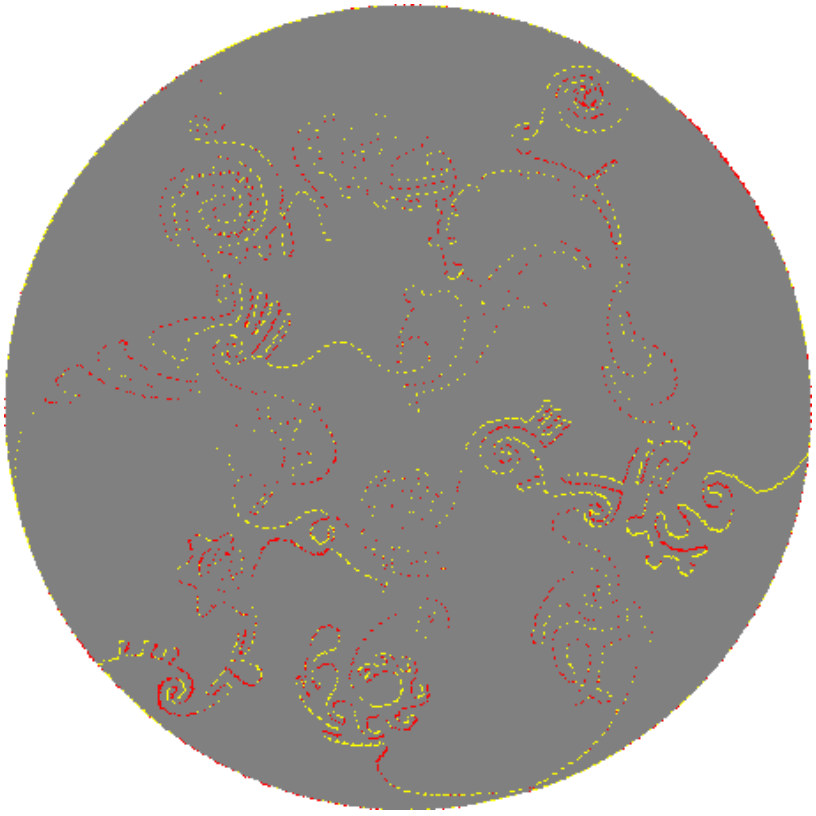


Figure 18: *Visualization of the gaps and overlaps in "A circle puzzle."*

Figure 19: *Visualization of the gaps and overlaps in the image mosaic results.*

Part III

Clip Arts used in Results shown in Paper

Figure 20: *"Icons in PAD."*

Figure 21: *Three different seed shapes of "Icons in PAD."*

Figure 22: *Clip arts used in "Icons in PAD."*

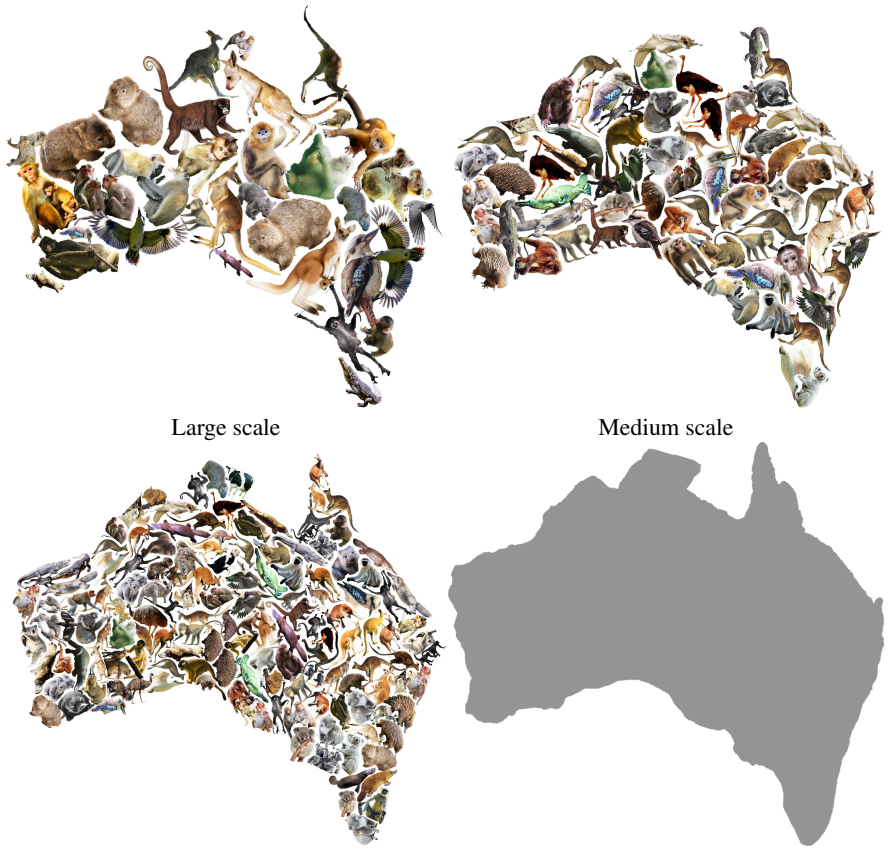


Figure 23: *"Australian Animals."*

Figure 24: *Clip arts used in "Australian Animals."*

Figure 25: *"Butterflies in Butterfly." (Left) Collage result without deformation. (Right) The result with gap-filling and overlap-avoidance.*

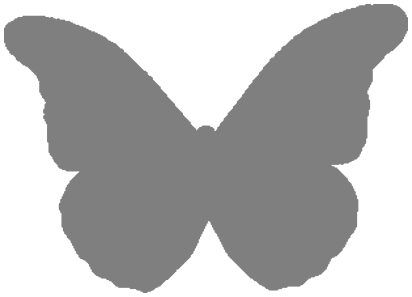


Figure 26: *Seed shape of "Butterflies in Butterfly."*

Figure 27: *Clip arts used in "Butterflies in Butterfly."*

Figure 28: *"Flock of Birds."*

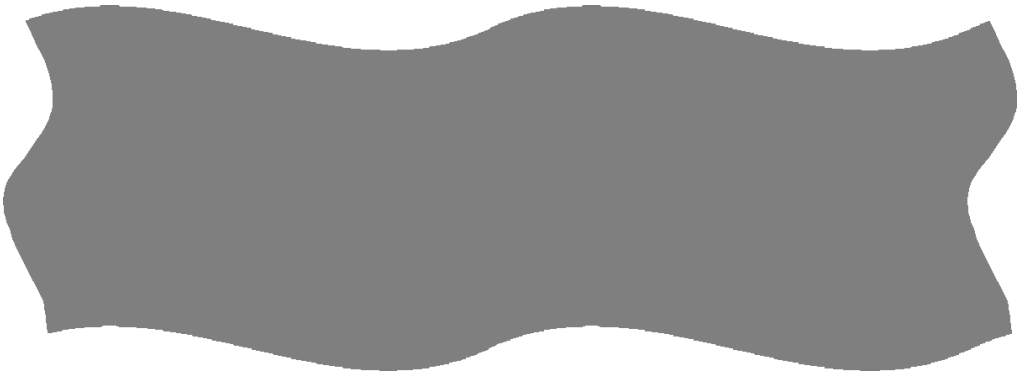
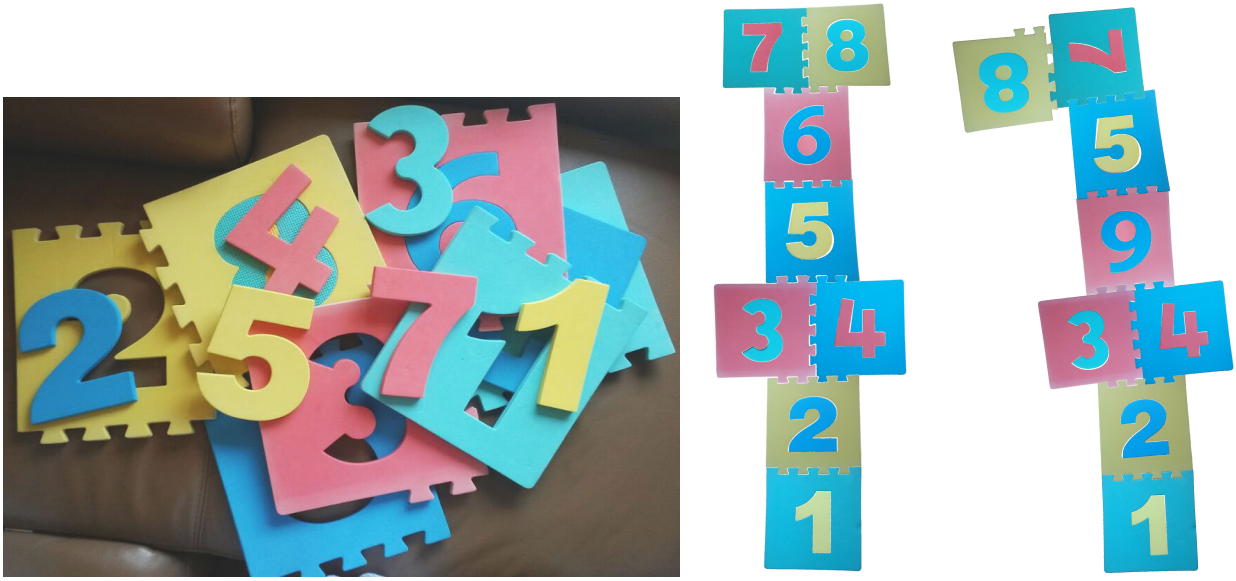


Figure 29: *Seed shape of "Flock of Birds."*

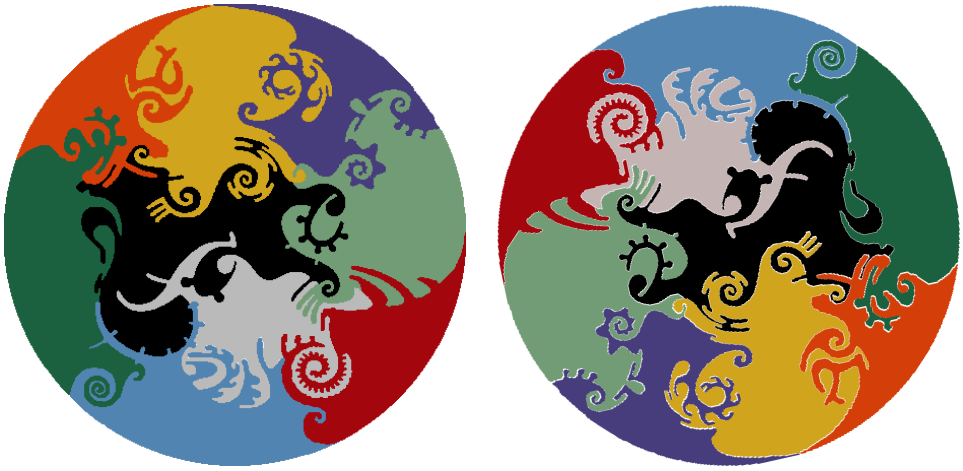
Figure 30: *Clip arts used in "Flock of Birds."*



The puzzles pieces | Ground truth | Our result

Figure 31: *Puzzle solving.*

Figure 32: *Pieces of puzzle solving. The seed shape is highlighted by a red box.*



Ground truth Our result

Figure 33: *"A circle puzzle".*

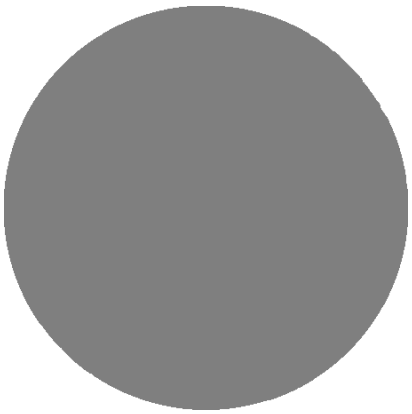
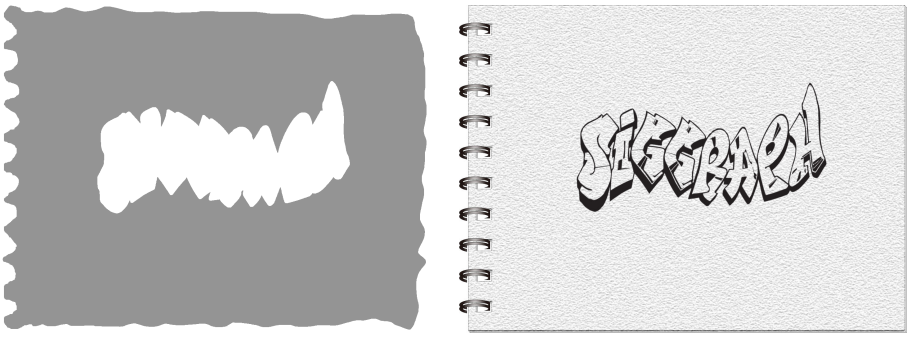


Figure 34: *Seed shape of "A circle puzzle."*

Figure 35: *Pieces of "A circle puzzle".*

Figure 36: *"Doodle."*



(a) (b)

Figure 37: *(a) Seed shape of "Doodle." (b) The corresponding image of the seed shape.*

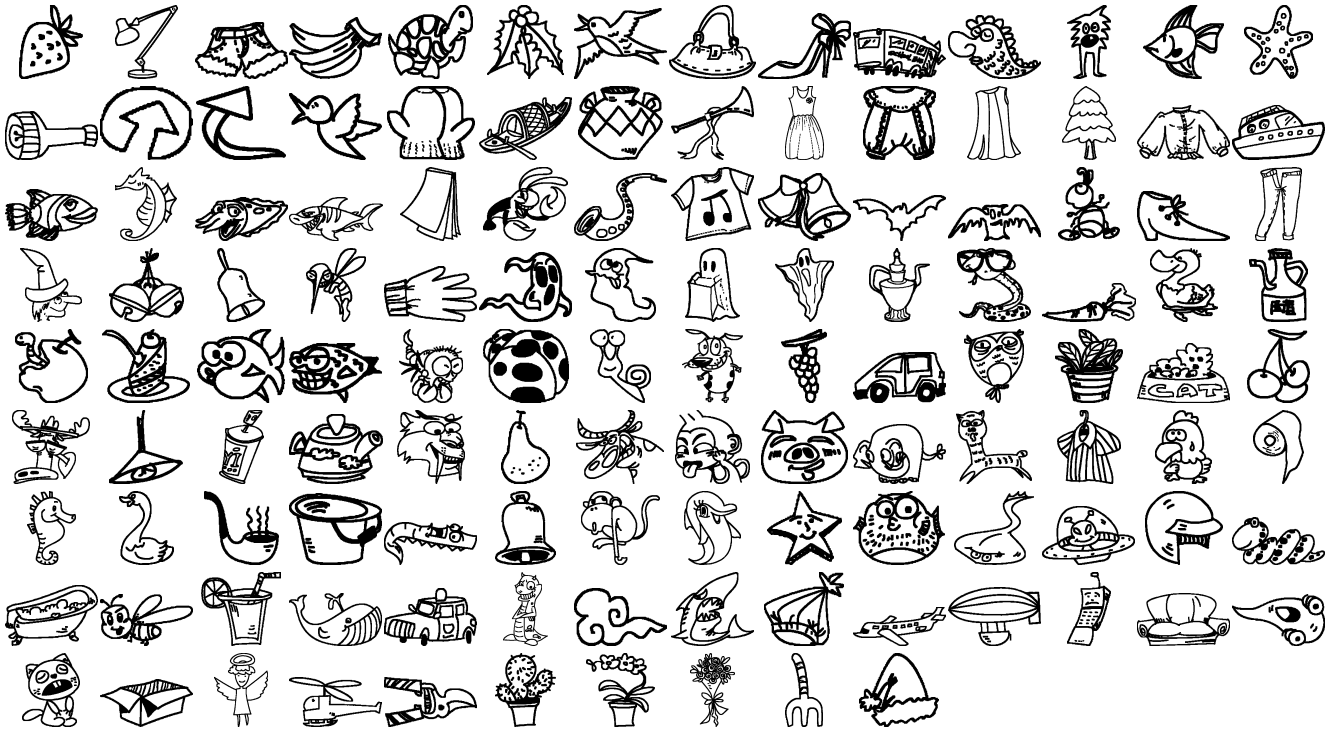
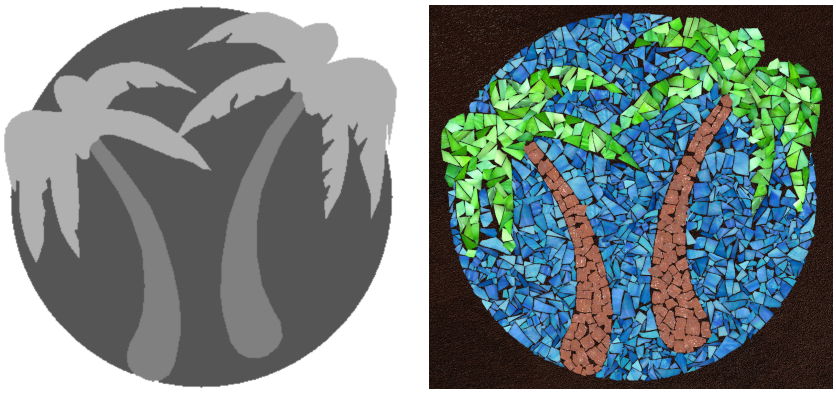


Figure 38: *Clip arts used in "Doodle."*



Seed shapes being filled Our result

Figure 39: *Image mosaic.*

Figure 40: *Real mosaic photos from which we collect the tile pieces.*

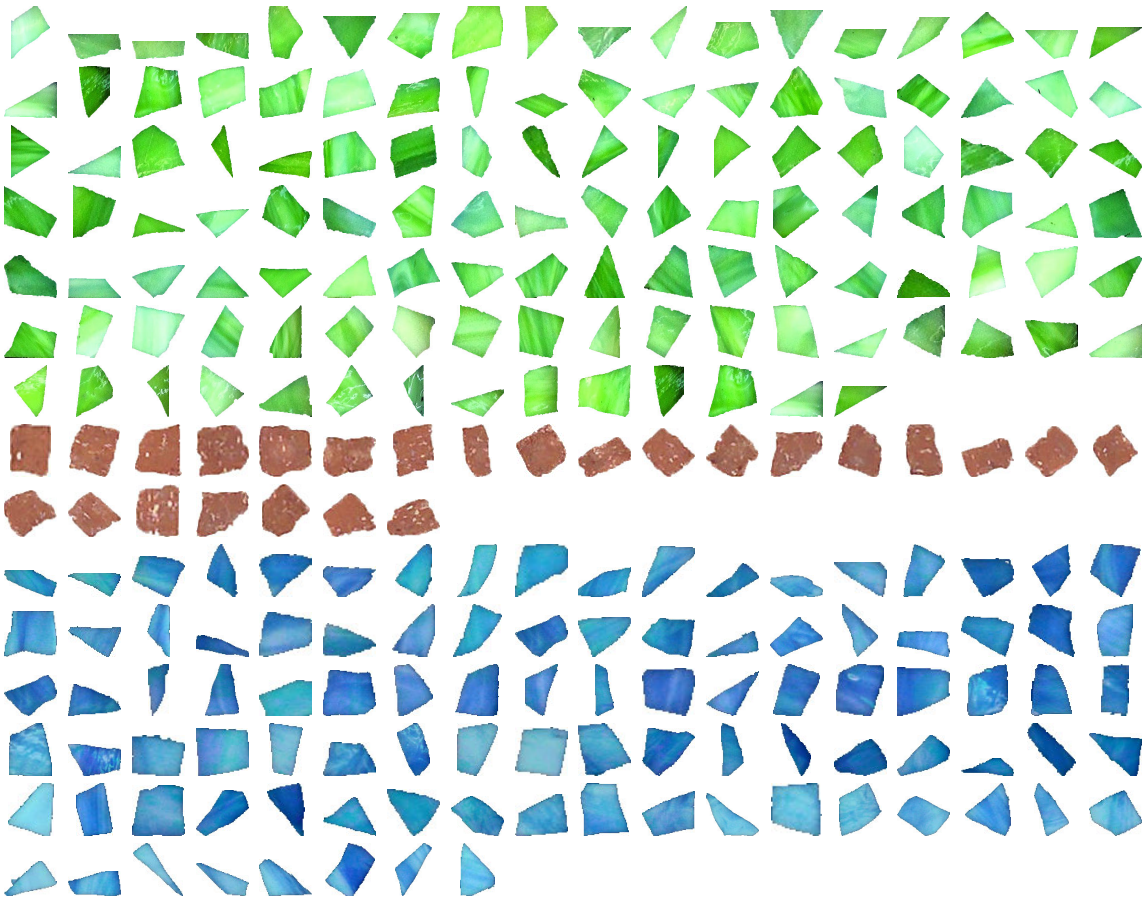


Figure 41: *Pieces of image mosaic.*