

## Supplemental Materials for “Differential Operators on Sketches via Alpha Contours”

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### COMPARISON WITH ALPHA SHAPES

In this section, we compare our results with the alpha shapes for the same value of  $\alpha$ . The results are shown in Figs. 1-5 for all the sketches in the paper. We compare the areas of alpha shapes and our sketch shapes, and provide the accuracy of our algorithm in Table 1. Note that our area is always smaller, implying that our fit is tighter.

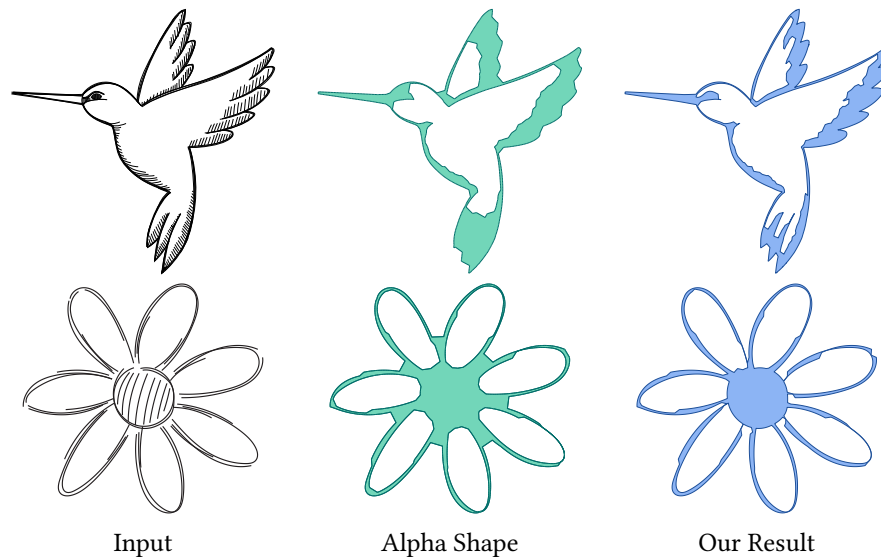


Fig. 1. The inputs from Figs.1, 2 in the paper.

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Fig. 2. The inputs from Figs. 3, 11, 14 in the paper. Koala image ©Enrique Rosales.





Fig. 3. The inputs from Figs. 12, 16, 17 in the paper. Input images: Dirigible ©David Revoy, human back ©Anton Gulic CC-BY-4.0, toucan ©Enrique Rosales.

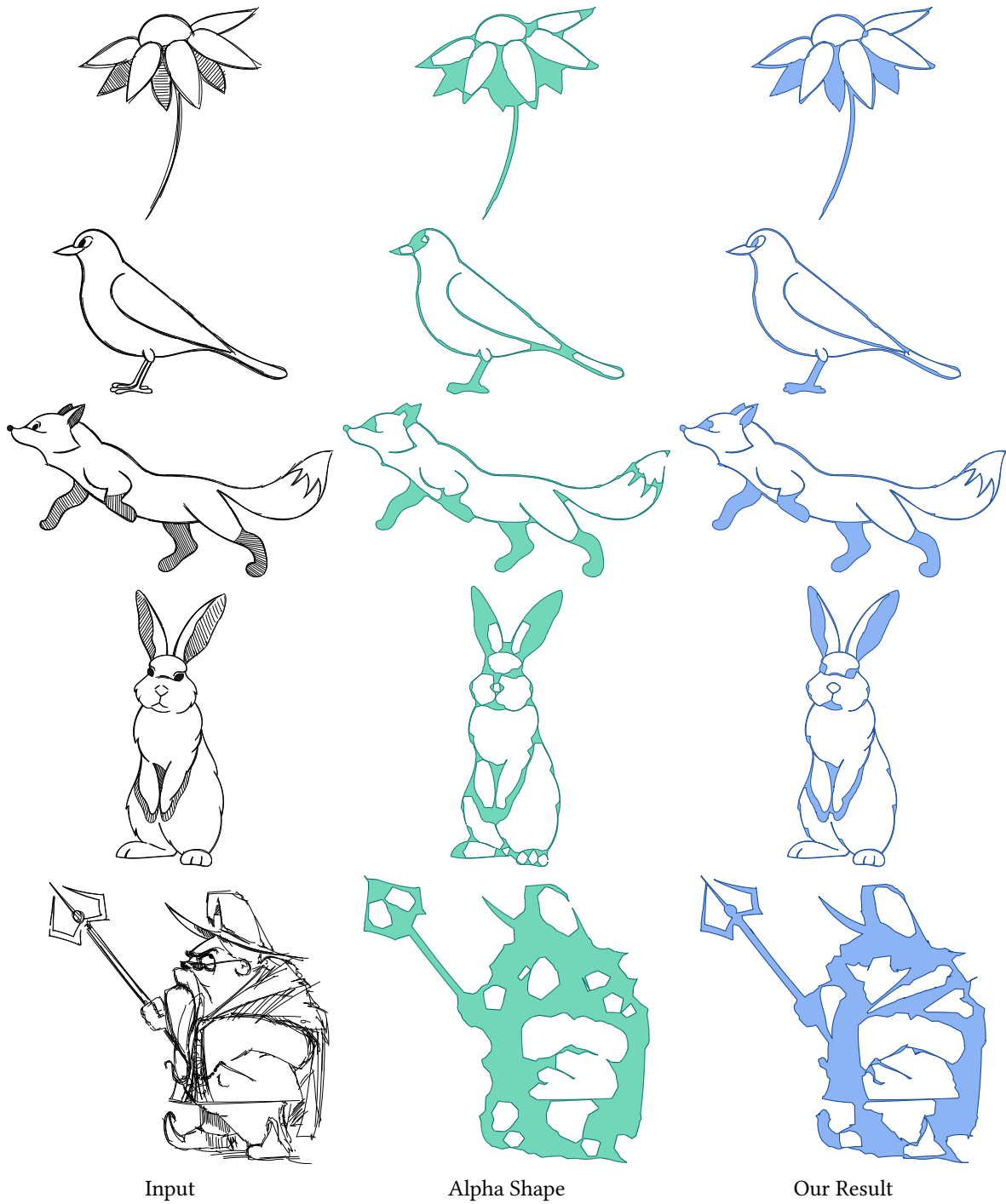


Fig. 4. The inputs from Fig. 18 in the paper. Wizard image ©AP CC-BY-SA-3.0.



Fig. 5. The inputs from Figs. 12, 18, 19, 20 in the paper. Input images: Spider-man ©Graham Wilson CC-BY-4.0, fish and penguin ©Enrique Rosales.

Table 1. We compute the relative difference between the area of the alpha shape and the area of our sketch shape, divided by the area of the alpha shape. We use the same  $\alpha$  parameter for both algorithms for a fair comparison.

Input	Area difference
Hummingbird	21.5%
Flower	18.8%
Muscular	33.9%
Letter A	12.5%
Dragon	23.7%
Witch	23.1%
Girl with a blanket	20.9%
Boy with a dog	33.5%
Dancer	41.4%
Kettle	25.7%
Koala	25.4%
Bear	30.9%
Hand	12.7%
Dirigible	18.9%
Human back	23.2%
Toucan	33.4%
Daisy	15.9%
Sparrow	16.7%
Fox	7.8%
Rabbit	27%
Wizard	18.1%
Spiderman	31.3%
Snail	19.5%
Turtle	14.4%
Fish	30%
Penguin	15.6%
Average	22.9%

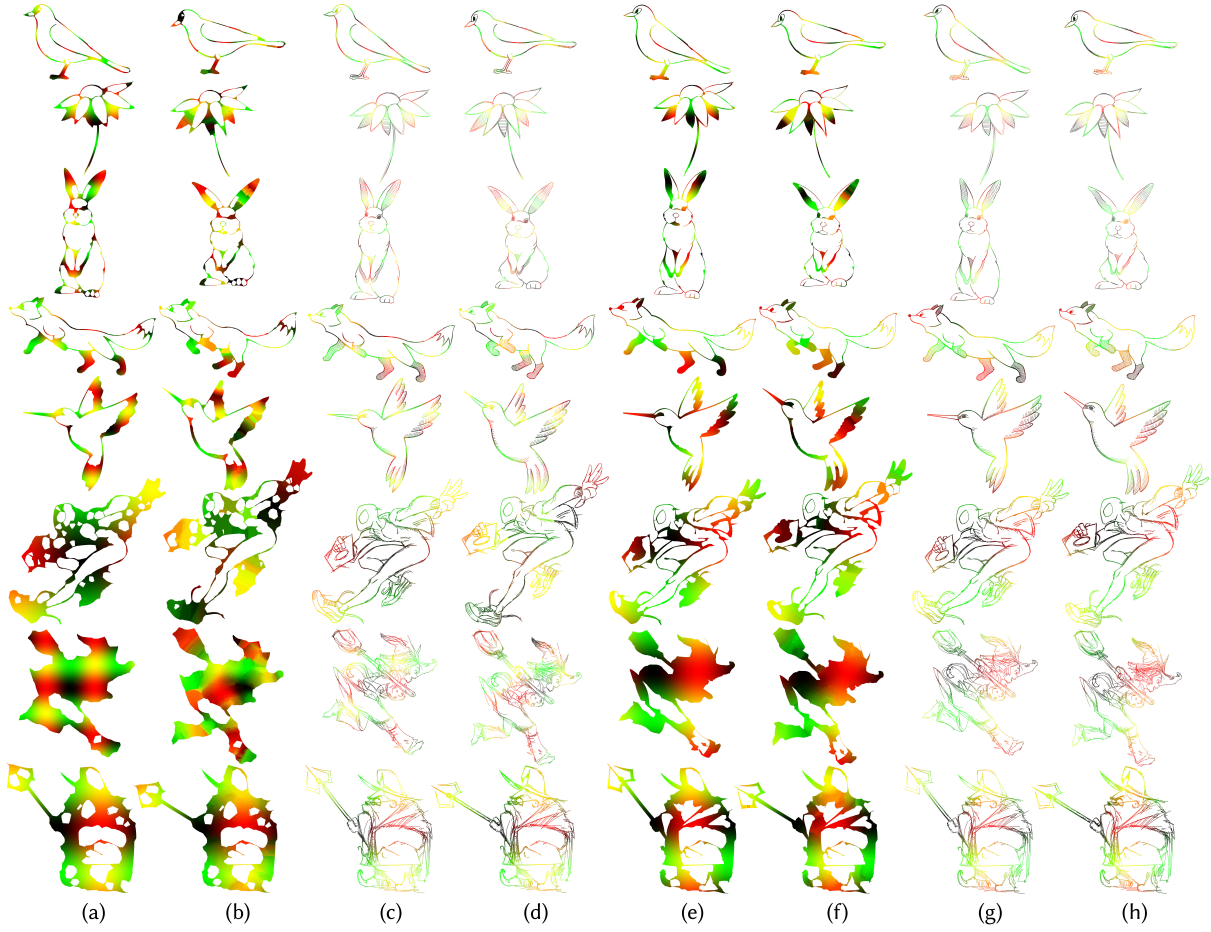


Fig. 6. A comparison between functional maps on alpha shapes (a,b) and our sketch shapes (e,f). Each functional map is visualized using a smooth function on the first shape (a,e) and its image function after mapping to the second shape (b,f). The corresponding restrictions of the functional maps onto the sketch strokes are shown in (c,d) and (g,h) respectively. Input images: Spider-man ©Graham Wilson, witch ©David Revoy CC-BY-4.0, wizard ©AP CC-BY-SA-3.0.

## HEAT FLOW AND INTERPOLATION

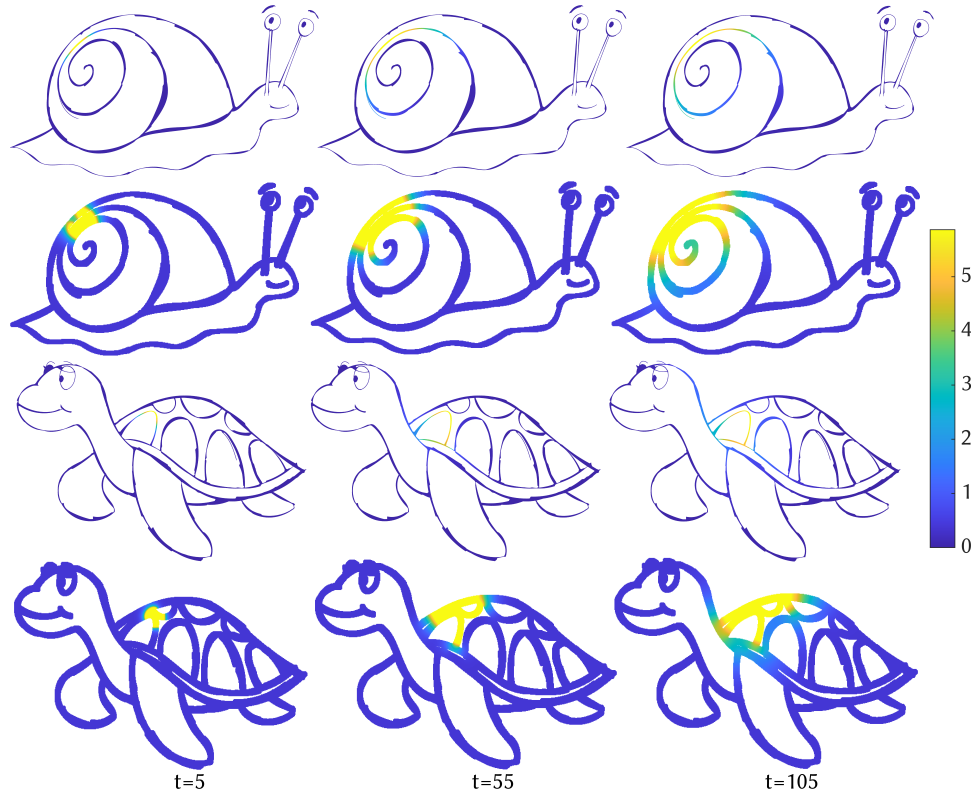


Fig. 7. Supplementary to Fig. 20 in the paper. Heat flow on the full domain: our sketch shape (top) and a raster sketch dilated by a structuring element with its radius equal to our sketch shape  $\alpha$  value (bottom).

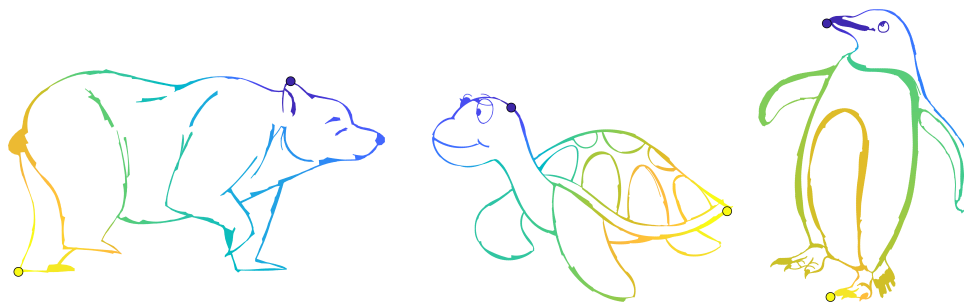


Fig. 8. Supplementary to Fig. 21 in the paper. Harmonic interpolation between two values (blue and yellow circles) over the sketch shape. Penguin image ©Enrique Rosales.